THE RESPONSES OF THE OVERWEIGHT INDIVIDUALS TO HIGH-INTENSITY INTERVAL TRAINING

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ABSTRACT

This dissertation begins with the realization that the connection between the Indian National Congress and the colonial British administration in India is rarely examined in either history or political science books. As a result of this, the dissertation investigates the publication archives of the Congress and how these materials have subsequently been used. I have argued that an ongoing dialogue was essential to the development of this relationship. This dialogue was initially established through the textual culture of the Congress, and then it was re-enacted, expanded, and embedded within the colonial state through the intra-departmental correspondence of the colonial state. Eventually, it was included in the archive of the colonial state. Because both disciplines are dependent not just on these embedded accounts but also on one another, having a more in-depth grasp of this technique is beneficial to both of them.

Keywords: *Weight loss, Overweight, Metabolic adaptations, High-Intensity, Interval Training*

INTRODUCTION

The prevalence of obesity has increased in recent decades, which is a key factor to the development of type 2 diabetes as well as other health concerns. Because of its ability to speed up metabolic rate, exercise is an essential component of any program designed to effectively reduce body fat. The amount of substrates, also known as fat and carbohydrates, that are used up during a workout is mostly determined by the intensity of the activity that is being performed. Exercise performed at a low to moderate intensity is typically advised for those who are overweight or obese in order to increase the amount of fat that is burned during exercise. Exercising at a low to moderate intensity has been suggested as a "safe zone" that can reduce the risk of injuries while maximizing the benefits in terms of tolerance increases. People who have been sedentary for a long time and are overweight or obese are encouraged to finish their fitness programs by increasing the intensity of their workouts to the level described below. Researchers have shown that high-intensity interval training (HIIT) is an effective approach to achieve the metabolic advantages of exercise that are more often linked with low-intensity exercises. This is because HIIT involves periods of intense activity followed by periods of less intense exercise. An increase in fat oxidation and a decrease in glucose intolerance are both caused by several different changes that occur in the skeletal muscle. Even though some persons who are overweight or obese have difficulty maintaining high-intensity exercise for lengthy periods of time, high-intensity interval training (HIIT) has been suggested as a

feasible strategy to elicit these adaptations. This is because HIIT consists of short bursts of exercise performed at a very high intensity.

High-intensity interval training (HIIT) is superior to continuous training at a moderate level when it comes to building cardiorespiratory fitness. Training at a high intensity for short bursts is known as high-intensity interval training (HIIT), and it is not only helpful but also safe and well-tolerated. According to popular belief, high-intensity interval training is more fun than the more traditional steady-state moderate intensity exercise. According to the findings of a recently published systematic review and meta-analysis, gains in aerobic capacity in young people who are otherwise healthy can be accomplished with either continuous moderate exercise or HIIT. However, a growing body of data shows that high-intensity interval training (HIIT) may be an effective, time-efficient strategy for improving functional capacity and decreasing the risk of death across the board in those who are overweight or obese and lead sedentary lives. This is due to the fact that HIIT involves short bursts of exercise performed at a high intensity. This article provides a summary of the findings of research on HIIT that were carried out on persons who were overweight or obese, with a particular emphasis on the effects of this style of exercise on the burning of fat and the reduction of weight.

HIIT Protocols

You will push yourself above your lactate threshold and go very close to your VO2max while performing high-intensity interval training (HIIT). In between bouts of intense exercise, you will rest for shorter periods of time. People who lead sedentary lifestyles, are overweight, or are obese might reap the benefits of this format since it gives them time to recuperate in between hard activities. The activity begins with a three- to five-minute warm-up phase, and then immediately transitions into thirty seconds of cycling at your absolute maximum effort against a load that is more than your maximum. The Wingate test served as the basis for the development of high-intensity interval training (HIIT), which involves a "all out" effort. The typical High Intensity Interval Training (HIIT) protocol consists of four to six Wingate tests, with each one being followed by around four minutes of recovery; this results in a total of two to three minutes of peak effort, which is conducted over the course of fifteen to thirty minutes. People who are already physically active and have a lot of drive would benefit more from high intensity interval training (HIIT) than they would from the Wingate protocol because of the Wingate protocol's intense physical demands and the fact that it is unpleasant.

Recent studies have shown that individuals who are overweight or obese and have a sedentary lifestyle may benefit from high-intensity interval exercise, sometimes known as HIIT. Whyte et al. [18] discovered that in overweight and obese men who were sedentary, two weeks of very high intensity sprint interval training (six sessions of four to six repeats of a 30-second Wingate with a recovery period of four to five minutes) improved insulin sensitivity, increased resting fat oxidation, decreased waist circumference, and lowered systolic blood pressure. In addition, Trilk et al. demonstrated that four weeks of HIIT (consisting of four to seven rounds of thirty seconds each of "all out" sprints, followed by four minutes of recovery) improved the circulatory function of overweight and obese women who led a sedentary lifestyle by producing a 12% increase in

VO2max, a 11.4% increase in stroke volume, and an 8.1% decrease in their resting heart rate. This was accomplished by producing four rounds of thirty seconds each of " After as little as one session of high-intensity interval training, obese men had a reduced risk of developing diabetes. This benefit is shown even after taking place in many sessions. After just one session of high intensity interval training (HIIT), which consisted of four 30-second sprints at "all out" effort followed by a four-minute rest period, obese men observed an increase in their ability to tolerate glucose. This was the case after just one session of HIIT. After just one session of high intensity interval training (HIIT), sedentary guys who were overweight or obese observed improvements in insulin sensitivity and fat oxidation. The workout consisted of four rounds of thirty seconds of "all out" sprints followed by four and a half minutes of recovery between each round.

Because test takers are expected to demonstrate a high level of motivation and to use a certain model of cycle ergometer, the Wingate test is susceptible to the drawbacks of being overly restrictive. Although these studies suggest that high intensity interval training (HIIT) at "all out" may be a beneficial method of exercise for individuals who are overweight or obese, the Wingate test cannot be performed on them. For this reason, several studies have utilized a modified low-volume HIIT protocol, which is anticipated to be more applicable than repeated Wingate tests for inactive individuals who are overweight or obese. Insulin sensitivity was tested by Hood et al., who utilized a modified protocol (10 x 60 seconds at 80-95% of heart rate reserve, 60 seconds of rest). The participants were sedentary obese individuals who participated in the study and did six training sessions spread out over a period of two weeks. They saw a 35% improvement in insulin sensitivity around 72 hours after their most recent training session. In a second, more recent study, researchers found that women who were overweight or obese experienced changes in body composition and skeletal muscle oxidative capacity after six weeks of a modified form of high-intensity interval training (10 sets of 60 seconds at less than 90 percent of their maximum heart rate, followed by 60 seconds of recovery). This training consisted of 10 sets of 60 seconds at less than 90 percent of their maximum heart rate.

The Effect of HIIT on Fat Oxidation

It is very necessary to exercise at a level of intensity that encourages the primary oxidation of fat when the body is engaged in physical activity. Skeletal muscle is thought to have difficulty digesting free fatty acids, which may be one of the factors that leads to obesity and the accumulation of additional pounds. According to research, persons who are obese have a diminished capability of their skeletal muscles to make use of free fatty acid. Because it prompts an increase in lipolysis and fatty acid oxidation in skeletal muscle, endurance training is an efficient strategy for both warding off obesity and bringing about a reduction in overall body fat. This spike is known to be reliant on the intensity of the activity that is being performed since the absolute rate of fat oxidation (g.min-1) increases from low to moderate intensity and then declines as the intensity of the exercise increases. It has been demonstrated that performing high intensity interval training (HIIT) six times over the course of two weeks can improve endurance performance, metabolic regulation, and oxidative capacity in skeletal muscle. HIIT sessions should be spaced out over the course of the two weeks. Over the course of a period of six weeks, research was carried out

to investigate the effects of high intensity interval training, often known as HIIT, on the burning of fat in untrained but recreationally active persons (104 minutes at 90% of VO2peak, 2 minutes rest).

After six weeks of high intensity interval training (HIIT), there was a substantial increase in the amount of fat that was burned while cycling at 60% of VO2peak. Results like these suggest that high-intensity training sessions are beneficial for enhancing the skeletal muscle's ability to oxidize fat, which can lead to weight loss. In a research, seven high-intensity interval training (HIIT) sessions were spread out over the course of two weeks, and the participants' average rate of fat oxidation during exercise was measured after each session. The participants were eight moderately active women. They discovered that the rate of lipid oxidation was 36% greater than it had been before. The benefits of high-intensity interval training (HIIT) on fat oxidation in inactive people who are overweight or obese have only been the subject of a few research. Two weeks of high intensity interval training (HIIT; six sessions of four to six repeats of thirty second Wingate with four to five minutes of recovery) increased the amount of fat burned while the participants were at rest in guys who were overweight or obese and inactive, according to the findings of Whyte et al. Participating in a high-intensity interval training (HIIT) program for 12 weeks (6-10 x 60s at 75-95% of HRmax, 75s rest) may be able to boost the fat-burning capability of women who lead a sedentary lifestyle and are overweight. This is the conclusion drawn from recent research. High-intensity interval training (HIIT) was performed under supervision for men who were either overweight or obese for a total of one hour and forty minutes, three times per week. Intervals of 30 seconds at 90% of the participants' VO2max were interspersed throughout the program. Each period was followed by 30 seconds of recovery. HIIT resulted in a 31% increase in the quantity of fat that was burned when compared to the baseline after 30 minutes of continuous load exercise performed at 45% of VO2max. It is obvious that high-intensity interval training (HIIT) has the potential to be a useful technique that can enhance a man's ability to burn fat and help him lose weight if he is overweight or obese.

The Effect of HIIT on Weight Loss

In addition to lowering body mass and elevating fat-free mass, exercise is an essential component of a weight reduction program since it may support the upkeep or improvement of basal metabolic rate and may help maintain or increase it. It has been shown in a number of clinical investigations that high-intensity interval training (HIIT) is effective for helping inactive people who are overweight or obese to shed extra pounds. After only two weeks of high-intensity interval training (HIIT), for example, men who had a sedentary lifestyle and were overweight or obese saw a considerable reduction in their waist circumference and the amount of subcutaneous adipose tissue. After taking part in a high intensity interval training (HIIT) program for a period of 12 weeks, visceral fat, total abdominal fat, and trunk fat all decreased significantly in the young men who were overweight.

Another study found that after 16 weeks of high-intensity interval training (HIIT; four sets of four minutes at a heart rate of at least 90% of its maximum, followed by three sets of three minutes at 70% of its maximum), sedentary individuals who were overweight and had metabolic syndrome lost 3% of their body weight and 5% of their waist circumference. HIIT consisted of four sets of four minutes at a heart rate of at least 90% of its maximum. High-intensity interval training caused

individuals to lose 0.9 and 2.4 kg of total body fat after three and twelve months of participation, respectively, according to the findings of Tjonna et al. Recent research conducted on women who were overweight or obese found that a low-volume HIIT program consisting of 10 sets of 60 seconds at 90% of their maximum heart rate followed by 60 seconds of rest led to significant improvements in body composition. In addition to a reduction in abdominal and overall body fat, the results of the DEXA scan indicated that there was a rise in the amount of lean body mass in the legs. On the other hand, participants in two recent studies that used HIIT who were inactive and overweight or obese did not show a substantial improvement in either their weight or their body composition after the intervention. A high-intensity interval training (HIIT) technique was utilized by Skleryk and colleagues in their short-term trial that lasted for two weeks. When compared to a lengthier 30-second exercise in this program, cycling at "all out" for 10 seconds may not have been sufficient to change body composition as effectively as the longer activity. After 12 weeks of training, Astorino et al. performed a more intensive HIIT regimen (60 seconds at 75-95% of HRmax, 75 seconds of rest), however they still did not see any change in body weight. Because of the stimulatory effect that exercise has on appetite, it is possible that this is one of the reasons why exercise routines do not contribute to weight loss.

A decrease in NEAT is one strategy that may be pursued in order to mitigate the increase in exercise-induced energy expenditure. The results of studies on the benefits of high-intensity interval training (HIIT) on weight and body composition in inactive people who are overweight or obese have indicated that this type of exercise has only a moderate influence on weight loss. Although more study of at least a year's duration is required, the results of several of the studies that were examined here show that high-intensity interval training (HIIT) may be able to assist in the reduction of weight for this demographic.

OBJEACTIVES

1. To study overweight individuals to high-intensity interval training.
2. To study High-Intensity Interval Training (HIIT).

RESEARCH METHODOLOGY

Participants

Participants in this research ranged in age from 21 to 34 and were all either overweight or obese. There were eight men and twelve women who chose to take part. On the basis of the categorization used for overweight-to-obese Asian populations (Mahase, 2022), participants were classified as having a body mass index (BMI) ranging from 23 to 30 kg/m2. Participants were not allowed to take part in the research if the Physical Activity Readiness Questionnaire determined that they had contraindications to exercise or if they had already participated in any exercise program during the preceding three months. None of the individuals engaged in any form of physical activity.

Experimental

The randomization between these two groups was done in a way that gave each group an equal number of male and female participants (four men and six women). During the first visit, which consisted of pre-test assessments and familiarization, anthropometric characteristics, metabolic outcomes (such as blood glucose and lipid profile), cardiorespiratory fitness, and familiarization with the experimental procedure were all measured. Following that, participants finished a five-week exercise intervention that consisted of S-HIIE and P-HIIE, with three exercise sessions per week (a total of 15 sessions) in the laboratory-based environment, and each session was separated by a minimum rest interval of two days (48 hours). During each and every HIIE session, the participants' perceptual reactions, which included their emotional responses (feelings of pleasure and displeasure), enjoyment, and perceived exertion, were analyzed and assessed. In order to reduce the impact of the effects of diurnal biological variation, every workout was done on a motorized treadmill (h/p/cosmos, Nussdorf-Traunstein, Germany) at the same time of day between the hours of 08:00 and 13:00. Following the intervention period of five weeks, all of the measurements that were taken at the initial visit were repeated with an ultimate minimum of four days (96 hours) following the conclusion of the final exercise training session. Temperatures and humidity levels in the laboratory were controlled to be consistent throughout all circumstances.

Anthropometric, physical activity measures, and energy expenditure

The subject's mass in kilograms and height in centimeters were measured to the closest 0.1 of each respective unit. The body mass index (BMI) was determined by dividing the individual's body mass in kilograms by the square of their height in meters. Prior to the experimental sessions, the participants' participants' daily habitual physical activity was evaluated using a validated version of the IPAQ-M. During the first, third, and final weeks of the exercise intervention period, the participants were responsible for providing their own self-reports of their nutritional consumption. Following that, a member of the study team analyzed the dietary intake data using nutritional software (Nutritics V 4.267 Academic Edition, Dublin, Ireland) in order to evaluate the variety and quantity of foods that were consumed. Throughout the entirety of the research project, participants were strongly encouraged to adhere to their typical lifestyle habits and refrain from deviating from their typical eating routines. In addition, the total amount of energy that both groups burned off throughout the HIIE session was determined and compared using the compendium of PA.

Determination of cardiorespiratory fitness

Before beginning an incremental speed-based protocol to determine maximum oxygen absorption (O2max) and the ventilatory threshold (VT), the participants were acclimatized to the motorized treadmill. After beginning with a three-minute warm-up at a pace of 4.0 km.h-1, participants then ran at a speed of 6.0 km.h-1 with 0.5 km/h increments every 30 seconds until they reached the point of volitional fatigue. This was followed by a five-minute cool-down at 4.0 km.h-1. The gradient of the treadmill was kept at 1% during the entirety of the incremental test. The heart rate was monitored constantly by a telemetry device (Polar Electro, Kempele, Finland), and the greatest heart rate reached during the incremental speed test was recorded as the HRmax value. This procedure has been utilized in the past for the purpose of assessing the maximum aerobic speed (MAS) in individuals who engage in physical activity (Laurent et al., 2014). During the cardiorespiratory

fitness test, variables related to expired gas exchange and ventilation were assessed with the use of a metabolic cart that had been properly calibrated (Cortex Metalyzer III B, Leipzig, Germany). Continuous recordings of HR responses were made with the use of a telemetry system developed by Polar Electro (Kempele, Finland). After that, the data on gas exchange and HR were divided into periods of 10 seconds and then averaged. The VT was computed by extrapolating the incremental test results into ventilatory equivalents for the generation of carbon dioxide (CO2) and oxygen (O2). The maximum 10-second average in oxygen consumption that was induced either during the incremental test or the supramaximal test was used to calculate O2max. The greatest heart rate (measured in beats per minute) and speed (measured in kilometers per hour per minute) attained during the various incremental speed tests were used to determine both the maximal HR and the MAS (HRmax).

DATA ANALYSIS

In Table 1, you'll find a presentation of the participants' descriptive features. According to the WHO Asian-BMI categories, the percentages of people in this research who were overweight (BMI = 23-24.9 kgm2) and obese (BMI 25 kgm2) were, respectively, 20.8% and 79.2%. According to the cardiorespiratory fitness criteria established by the American College of Sport Medicine (ACSM, 2018) for individuals between the ages of 20 and 29 years old, the participants' levels of fitness ranged from very low to poor (O2max: male 27.2 - 43.5 mLmin-1kg-1; female 21.7 - 33.6 mLmin-1kg-1) on average. According to the IPAQ, our participants were likewise classified as those who did not engage in sufficient levels of physical activity (P-HIIE= 518 334 MET-min/week and S-HIIE= 446 331 MET-min/week).

Table 1: Descriptive characteristics of the participants (N=20)

Groups	Variables	Pre-Test	Post-Test	P-Value	ES
P-HIIE	Age	26.7 ± 4.9	-	-	-
	Body mass (kg)	69.4 ± 9	67 ± 11	0.25	0.24
	Stature (m)	1.6 ± 0.1	-	-	-
	BMI (kg·m^2)	27.3 ± 1.3	26.1 ± 3	0.10	0.54
	Body fat (%)	34.6 ± 6.4	31.3 ± 8.5	0.09	0.44

	O_{2max} (mL·min^{-1}·kg^{-1})	**27.4 ± 6.5**	**32.9 ± 7.6**	**<0.01**	**0.78**
	HRmax	180.3 ± 10.9	180.7 ± 9.2	0.48	0.04
	MAS (km·h^{-1})	**9.5 ± 2**	**11.4 ± 2**	**<0.01**	**0.95**
S-HIIE	Age	26.6 ± 3.7	-	-	-
	Body mass (kg)	71 ± 8	68.1 ± 10	0.31	0.32
	Stature (m)	1.6 ± 0.1	-	-	-
	BMI (kg·m^2)	28.4 ± 1.1	27.3 ±2.7	0.08	0.53
	Body fat (%)	35.3 ± 7	31.7 ± 6.6	0.06	0.53
	O_{2max} (mL·min^{-1}·kg^{-1})	**26.2 ± 7**	**31.3 ± 7.4**	**<0.01**	**0.71**
	HRmax	178 ± 12.5	179 ± 10.6	0.46	0.09
	MAS (km·h^{-1})	**9.3 ± 1.1**	**11 ± 2**	**<0.01**	**1.05**

Heart rate responses

Figure 1 (a, b, and c) illustrates how the HR values from the various exercise settings over all three sessions (session 1, session 8, and session 15) compare. There was no major effect of the interactions between groups, intervals, or sessions; however, there was a significant interaction between groups and intervals when it came to HR responses.

Metabolic

the results of The diagrams below depict the changes in health markers that occurred in both groups before and after they participated in the exercise programs.

Table 2 Blood glucose and lipid profile P-HIIE and S-HIIE

Groups	Variables	Pre-Test	Post-Test	P-Value	ES
P-HIIE	Blood Glucose (mmol/L)	4.1 ± 0.2	4.0 ± 0.3		0.39
(n=10)	Total Cholesterol (mmol/L)	5.2 ± 1.0	4.6 ± 1.6		0.45
	Triglycerides (mmol/L)	1.2 ± 0.7	1.1 ± 0.5	>0.37	0.16
	HDL (mmol/L)	1.3 ± 0.4	1.4 ± 0.3		0.28
	LDL (mmol/L)	3.4 ± 0.5	3.4 ± 0.8		0.00
S-HIIE	Blood Glucose (mmol/L)	4.2 ± 0.1	4.1 ± 0.2		0.63
(n=10)	Total Cholesterol (mmol/L)	5.2 ± 1.3	4.6 ± 2.2		0.33
	Triglycerides (mmol/L)	1.1 ± 0.8	1.1 ± 0.8	>0.27	0.00
	HDL (mmol/L)	1.3 ± 0.3	1.4 ± 0.3		0.33
	LDL (mmol/L)	3.4 ± 1.1	3.2 ± 1.0		0.19

The most important takeaways from this research were the following: 1) P-HIIE elicited lower affective responses (less pleasurable) across all work intervals only in session 1; 2) both the P-HIIE and S-HIIE groups generated greater post-enjoyment in sessions 8 and 15 compared to session 1; and 3) the P-HIIE group elicited greater RPE responses across all work intervals in session 1 compared to sessions 8 and 15. Whereas the S-HIIE group evoked larger RPE responses during work interval 4 and the end work interval during session 1, in comparison to sessions 8 and 15; and

4) Following a period of 5 weeks of exercise training, both the P-HIIE group and the S-HIIE group showed improvements in their body fat percentage, aerobic capacity, and maximum aerobic speed. The HIIE procedure that was used in this research design was well tolerated by all of the participants in both groups; as a result, it may have some practical implications for health initiatives in groups of people who are overweight or obese.

Affective reactions during self-selected running HIIE have been shown to be dependent on the intensity of the work interval in previous HIIE-based investigations (Mohd-Liza et al., 2022). In the current study, it appears that the pacing strategies adopted by the participants with overweight and obesity (i.e., selection of lower running speed at the initial work interval) may be attributed to the greater pleasurable feelings for the entire S-HIIE work intervals compared to P-HIIE in session 1. In addition, we discovered that the decrease in emotional responses was much more pronounced during the P-HIIE (FS = -3) compared to the S-HIIE (FS = -1.8). However, these observations only take place during session 1 (the acute effect of HIIE). They do not take place between sessions 8 (week 3) and 15 (week 5), which suggests that a comparable affective response pattern emerges after a few HIIE sessions independent of the HIIE circumstances. The cumulative exercise experience and familiarity to HIIE procedures may be one feasible reason for this outcome. This hypothesis is similar with the findings of a prior HIIE research in adults.

This noteworthy discovery may imply that an individual's previous experience with PA or exercise may play a crucial role when evaluating affective reactions to HIIE. In point of fact, the results of a systematic review that was carried out suggested that active people or experienced exercisers may be able to draw upon their entire physical activity experiences rather than relying exclusively on emotional reactions as an indicator of their competence and motivation to stick to or sustain future physical activity behavior. Therefore, it appears logical to infer that the association between exercise intensity and emotional reactions may be negated following a few sessions of HIIE in people who were overweight or obese for the purpose of this study. The backdrop of the investigation was a look at adults who were overweight or obese. In the current study, participants in the P-HIIE and S-HIIE groups reported experiencing a post-enjoyment that was comparable across all HIIE sessions. This conclusion is consistent with that of other research based on HIIE in adults, which discovered comparable postexercise pleasure responses to HIIE regardless of the amount of effort involved. The P-HIIE and SHIIE groups, however, generated increased post-exercise enjoyment in session 8 and session 15 compared to session 1, demonstrating an improvement in enjoyment responses following a few exercise sessions of HIIE independent of the HIIE groups. This was seen in session 8 and session 15.

CONCLUSION

It was shown that high intensity interval training (HIIT) is an effective and well-tolerated exercise technique for increasing cardiorespiratory fitness, lowering metabolic risk factors, and maximizing fat burning and weight loss in inactive persons who are overweight or obese. Increasing the body's rate of fat oxidation is a viable path towards accomplishing the dual goals of a negative energy balance and lower body fat, which are the core components of any weight control strategy that is effective. It has been demonstrated that an increase in fat oxidation has the ability to induce a

negative energy balance and reduce body fat. This finding has major implications for public health programs that attempt to reduce obesity.

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