CHAPTER 3: JOURNAL MANUSCRIPT
The effects of interval training and modest calorie restriction
in the treatment of obesity

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ABSTRACT

Moderate intensity exercise (MIT) was compared to high intensity interval exercise (HIIT) as part of a nine week treatment strategy for 13 obese men. Both groups exercised three days per week beginning at 45% VO$_2$max. The MIT protocol progressed to 65% VO$_2$max by week eight. The HIIT protocol consisting of 16 short (30 s), 8 medium (90 s), and 4 long (180 s) intervals progressed to 110% VO$_2$max, 100% VO$_2$max, and 90% VO$_2$max, respectively, by week nine with low intensity intervals at 40% VO$_2$max. Exercise duration of the MIT group was adjusted to allow for energy expenditure equal to that of the HIIT group. Modest dietary restriction and weekly group nutrition education sessions were part of the treatment. Weight decreased similarly by 2.4% in the MIT group and 2.8% in the HIIT group (p<0.05). For the groups combined, exercise resulted in a 7% decrease in body fat percent (%BF), and a 9% decrease in fat mass (FM) (p<0.05). There was no difference in the change in %BF or FM for either group. There were no changes in fat free mass (FFM) over the treatment or between groups. Waist circumference decreased 2.8% overall with no differences between the two groups (p<0.05). There were no differences in waist-to-hip ratio (WHR) or waist-to-thigh ratio (WTR) due to the intervention. The activity of vastus lateralis 3-hydroxyacyl CoA dehydrogenase (HADH) increased 37% and 97% (p<0.05) for the MIT and HIIT groups respectively with a trend for differences between the two groups (p=0.055). The results show that an exercise program of moderate or high intensity is effective to cause weight reduction. The data suggest that HIIT may be more effective over a longer treatment period if the observed trend for greater capacity for muscle fat oxidation translates into improved body fat loss.

Keywords: exercise, body fat, 3-hydroxyacyl CoA dehydrogenase, fat oxidation
INTRODUCTION

Physical inactivity is potentially the underlying cause of 17 if not more unhealthy conditions resulting in approximately one trillion health care dollars spent annually (4). One unhealthy condition related to physical inactivity, obesity has resulted in $238 billion in annual health care costs alone (4). Additionally, obesity-related diseases such as type 2 diabetes, hypertension and coronary heart disease (CHD) have resulted in an additional $384.5 billion being spent for health care (4). Considering the amount spent on health care for obesity and that over 50% of adults are overweight while another 25% are considered obese (28), it can be stated that there is a health care crisis related to obesity in the United States.

Aside from diet modification, physical activity is an area of treatment and prevention that has great promise to decrease the risk of obesity development (4). The ideal exercise prescription for achieving weight loss and thereby decreasing body fat for the obese has not yet been identified. Previously, moderate intensity (MIT) has been recommended as the primary exercise method for weight and body fat loss (2). This was recommended because fat is utilized as the primary source of energy when exercising at low (17,24) and moderate intensities (18,24) while carbohydrate becomes the primary source of energy with high intensity exercise (HIE) (5). In agreement with this, several studies have demonstrated favorable alterations in body weight and body composition in normal weight (7) and obese individuals exercising at moderate intensities (8,13,19).

However, it is possible that HIE with and without intervals may be more beneficial to promoting weight loss and decreases in body fat (6,27). A survey of 2500 men and women by Tremblay et al. (25) demonstrated that those who reported participating in more regular vigorous activities maintained lower body fat, and a lower waist-to-hip ratio (WHR) than their
counterparts participating in lower intensity activities. To follow-up on this finding, Tremblay et al. (27) did an intervention study with a group of healthy men and women performing either MIT or HIIT. They found that HIIT was more beneficial in decreasing body fat when expressed per calorie expended. Additionally, HIIT elicited a greater increase in the activity of 3-hydroxyacyl CoA dehydrogenase (HADH, a marker of beta-oxidation) than MIT, suggesting an increased fatty acid oxidation potential within the muscle that may have contributed to the greater decrease in %BF (27). Bryner et al. (6) compared normal weight females performing low intensity exercise (LIT) and HIE and found that those who performed HIE had a decrease in %BF whereas those performing LIT had no such change. These studies indicate that exercise of higher intensities may be more beneficial than moderate or low intensity exercises in promoting weight and body fat loss.

Contrary to the results found by Tremblay et al.(27) and Bryner et al. (6), Grediagin et al. (11) studied slightly overweight women performing HIE or LIT and found that both groups lost equal amounts of body fat. Ballor et al. (3) also studied overweight women who performed LIT or HIE and found no differences between the groups in the amount of weight or body fat lost.

Aside from the study by Tremblay et al. (27), the aforementioned studies comparing exercises of varying intensities did not examine the possible effects on markers of fat oxidation. MacDougall et al. (14) found slight increases in HADH activity in lean physically males undergoing vigorous sprint-interval training. Phillips et al. (18) found a significant increase in HADH in lean untrained males performing MIT. These results on fat oxidation potential as well as those reported on body weight and body fat provide conflicting information as to the ideal exercise program for the treatment of obesity.
The current study was designed to compare the effects of MIT versus HIIT along with modest dietary alterations to determine which is more effective in decreasing body weight and body fat. We hypothesized that HIIT would be more beneficial than MIT in a weight loss program for obese males.

METHODS

Subjects: Fourteen sedentary overweight males aged 18-40 years with a BMI between 26 kg/m$^2$ and 44 kg/m$^2$ were selected as subjects. Subjects were recruited from students, faculty, and staff at Virginia Polytechnic Institute and State University. The potential subjects were screened to rule out those with previously diagnosed health risks such as hypertension, diabetes, and heart disease. Those interested in participating were required to receive a doctor’s approval and complete an informed consent form prior to initiation of the study. The study was approved by the Virginia Polytechnic Institute and State University Internal Review Board.

Overall Study Design: The subjects were pair matched according to their initial %BF and divided into two groups of seven. The subjects participated in a nine-week exercise training program consisting of either MIT or HIIT on a cycle ergometer three times per week. The week prior to beginning and the week following the exercise training period the subjects were weighed and had their body composition determined through the hydrostatic weighing technique. Body fat distribution was assessed through WHR, waist-to-thigh (WTR), and waist circumference. A resting muscle biopsy was taken pre- and post-treatment to determine HADH activity. The subjects in both groups received identical diet counseling by attending weekly group nutrition education sessions and were also placed on a modest energy restricted diet.

Nutrition Education: Weekly nutrition sessions were held to educate the participants in various aspects of nutrition and health. The sessions were discussion based, and the subjects
were also educated through demonstrations and activities. The session topics were: Introduction to the program and how to accurately keep a food record; Food Guide Pyramid and reading food labels; Fat facts; Fast food eating and eating on the go; Recipe modification; What happens to the food I eat? Exercise and weight loss; Weight maintenance; Popular diets.

*Diet Modification:* Based on the initial age, height, and weight of the subjects, individual basal energy expenditure (BEE) was determined by the Harris Benedict Equation. The estimated total energy expenditure (TEE) was determined by multiplying the BEE by an activity factor of 1.5, which is representative of lightly active individuals (19). The subjects denied participation in any type of physical activity other than that required to perform activities of daily living prior to the intervention, making the activity factor of 1.5 appropriate. The subjects were then provided with either an 1800, 2000, 2200, 2500, or 2800 calorie diet based on the estimated TEE to provide a deficit of 500 calories per day.

Dietary treatment consisted of limiting fat intake to 25% of total calories, protein to 15-20% of total calories, and carbohydrates (CHO) to 55-60% of total calories. The subjects were provided with the recommended number of servings from each of the food groups included in the Food Guide Pyramid for their individual diet. The estimated serving sizes were based on the food exchange system.

The subjects kept three-day diet records during weeks 1, 4, 7, and 9 of the study. The record kept during week 1 was used as the baseline dietary intake, since the diets were not assigned to the subjects until week 2. The diets were analyzed using Nutritionist III nutrient analysis software program (First Data Bank, Inc.). Upon completion of the nutrient analysis of each food record the subjects were provided a written evaluation of their diet, (macronutrients, micronutrients, sodium, fiber, and cholesterol) and recommendations for change.
Moderate Intensity Exercise Protocol: The subjects cycled on a Monark cycle ergometer in our laboratory under supervision beginning at 20 minutes per session during week one and two and increasing to 30 minutes during week two. The exercise duration for the subsequent weeks was 30-40 minutes to allow for energy expenditure equal to that of the HIIT group. The intensity began at 45% VO$_{2\text{max}}$ for week one, increased to 50% VO$_{2\text{max}}$ during week two, 55% VO$_{2\text{max}}$ during weeks three and four, to 60% VO$_{2\text{max}}$ for weeks five, six, and seven, and to 65% VO$_{2\text{max}}$ that was maintained for weeks eight and nine. The subjects cycled at 60 revolutions per minute (rpm). There was a five minute warm-up and warm-down at 50% VO$_{2\text{max}}$ before and after each exercise session. Heart rate was monitored during the sessions to validate exercise intensity.

High Intensity Interval Training Exercise Protocol: The first two weeks of training of the HIIT group were the same as the first two weeks of the MIT group. The HIIT began during the third week with each of the three days of exercise during the week denoted as a short, medium, or long interval. The initial week of the interval session consisted of exercising for 30 seconds at 80% VO$_{2\text{max}}$ followed by a recovery period of 60 seconds at 40% VO$_{2\text{max}}$ for the short interval. The high intensity interval was repeated 16 times. The high intensity interval increased to 90% VO$_{2\text{max}}$ during week four, and by 5% each week to reach a maximum of 110% VO$_{2\text{max}}$ by week nine. The medium interval began at 70% VO$_{2\text{max}}$ for 90 seconds increasing to 100% VO$_{2\text{max}}$ by week nine. There were two minutes of cycling at 40% VO$_{2\text{max}}$ between each interval, and a total of eight intervals in the exercise session. The long interval consisted of cycling at 65% VO$_{2\text{max}}$ for three minutes increasing to 95% VO$_{2\text{max}}$ with three minutes of recovery at 40% VO$_{2\text{max}}$. The long interval cycle was repeated four times within the session. There was a five minute warm-up and warm-down at 50% VO$_{2\text{max}}$ before and after
each exercise session. The subjects’ heart rate was monitored to validate exercise intensity. The estimated exercise energy expenditure for the two exercise protocols ranged from 250 and 350 kilocalories per session.

_Body Weight, Distribution, and Composition: _Body weight was measured to the nearest 0.1 kg on a balance beam scale. Body composition was determined via the hydrostatic weighing technique. The subjects were seated on a chair suspended within a water tank (Novel Products, Rockton, IL). The chair was attached to a load cell which was connected to a computer. Upon maximal exhalation and submersion underwater, the computer calculated the underwater weight based on output from the load cell. Residual lung volume was measured using the oxygen dilution technique previously described by Wilmore et al. (29). Body fat was then determined according to Siri et al. (22). Waist circumference, WHR, and WTR were used to assess the distribution of body fat. A non-elastic measuring tape was used for the measurements. The waist measurement was taken at the narrowest part of the torso below the xiphoid process and above the umbilicus. The hip circumference was measured around the buttocks at the point where the buttocks are at maximal extension above the gluteal fold (1). The maximal circumference of the thigh below the gluteal fold was measured (1).

_Muscle Biopsy: _A resting muscle biopsy was obtained from the vastus lateralis of the left leg using the percutaneous needle biopsy technique. After cleansing, a local anesthetic, lidocaine was administered to the area to be biopsied. A one-centimeter wide and deep incision was made. The biopsy needle was inserted and application of suction allowed for the muscle sample to be obtained. The muscle was immediately frozen in liquid nitrogen and stored at -80°C for later analysis.
Biochemical Analysis: The (10-20 mg) muscle was homogenized in 50 volumes of a phosphate-based buffer according to the procedures described by Passonneau and Lowry (16). The homogenization was performed manually in a glass homogenizer on ice. Prior to analysis the sample was diluted an additional 50 volumes with the Lowry diluting media (16) to make the final volume equal to 100 volumes. The activity of HADH was determined spectrophotometrically. The assay was modified from that previously described by Passonneau and Lowry (16), and was performed in a reagent consisting of 1 M tris-HCl, 200 mM EDTA, and 5 mM NADH, 10% triton and 5mM acetoacetyl CoA. Each sample was analyzed in triplicate. The coefficient of variation (CV) of the assay was 25% which is in agreement with that of Simoneau et al. (21).

Statistical Analysis: Data was analyzed statistically with Sigma Stat (Version 2.03, SPSS software ? 1992-1997). A two-way analysis of variance with repeated measures and a significance level of 0.05 was used to determine a difference between groups over time in the dependent measures.

RESULTS

Thirteen subjects completed the nine week study, six in the MIT group and seven in the HIIT group. There were no differences in subject characteristics between the HIIT and MIT groups at the beginning of the study (Table 1). All subjects completed all of the exercise sessions at the scheduled time, or during a make-up session. Data for 12 subjects (five in the MIT group and seven in the HIIT group) were obtained for the body composition measurements; one subject was too large to fit into the weighing tank. Two subjects failed to turn in complete food records; one subject in MIT group did not turn in records three and four, and one subject in the HIIT group did not turn in record four. To compensate for the missing diet records, the
average intake for the week for the remaining subjects was used in place of the missing values prior to statistical analysis. Seven muscle biopsies were utilized for pre and post treatment HADH analysis, four in MIT and three in HIIT. One subject in the MIT group decided against having either biopsy taken and two subjects in the HIIT group decided to not have the post-treatment biopsy taken. Three subjects’ muscle biopsy samples, two in the HIIT group and one in the MIT group were not suitable for analysis because of inadequate muscle quantity.

Dietary Analysis: The estimated nutrient intake for each of the food records for the HIIT and MIT groups can be found in tables 2 and 3 respectively. There were no significant changes in energy intake, %CHO, %fat, or %protein between week one and any of the subsequent weeks. A numerical difference in energy intake from week one to week four was evident, however this change was not statistically significant (p=0.216). There were no differences between the two groups for any of the dietary parameters during any of the weeks the records were recorded.

Body Weight and Body Mass Index: The diet and exercise treatment elicited a similar significant 2.4% and 2.8% decrease in body weight in the MIT and HIIT groups (Figure 1). Additionally, there was a significant decrease in BMI in the combined group (33.6 ± 1.45 kg/m² to 32.7 ± 1.54 kg/m²) over the treatment period (Figure 2). However, no differences in the changes in weight or BMI between the MIT and HIIT groups occurred.

Body Composition: Nine weeks of diet and either exercise treatment decreased %BF by 7% and FM by 9% for the groups combined. However, there was no difference between the groups in the decreases observed. FFM was not altered over the course of the nine week treatment program for either group or the groups combined.
Body Fat Distribution: Waist circumference decreased 2.8% for all subjects combined from 108 ± 3.26 cm to 105 ± 3.56 cm as a result of training. There were no differences between the groups for any of the waist circumference values. There were no changes in WHR or WTR for either group over the course of the treatment period (Table 3).

HADH Activity: There were no significant differences in the pre-treatment values between the two groups for HADH activity. Diet and exercise treatment elicited an increase in the activity of HADH (Figure 3). The increase in HADH activity in the MIT and HIIT groups was 37% and 97%, respectively. There was a trend for a difference in the changes in HADH activity between the two groups (p=0.055).

DISCUSSION

The results from the present study indicate that a weight loss program for overweight men consisting of either MIT or HIIT and diet treatment for nine weeks resulted in significant decreases in body weight, body fat and waist circumference. Increases in HADH activity occurred in both groups with a trend for HIIT elevating HADH activity to a greater extent than MIT.

Although subject compliance to the treatment was satisfactory, the total subject number was small. This small number of subjects may have adversely affected the statistical analysis of the data through a low level of power. It is probable that the analysis of dietary intake and body composition were affected because of a large amount of variability between subjects.

Exercise and Obesity Treatment: Others have demonstrated similar findings that exercise and dietary modification can decrease body weight, body fat, and waist circumference. Tremblay et al. (26) found a 12% decrease in body weight and a 16% decrease in %BF in a group of obese women performing only low to moderate intensity exercise for 15 months.
followed by the same exercise regimen combined with a low fat diet for an additional 14 months. Geliebter et al. (10) found that eight weeks of a low energy diet (1250 kcal) or the combination of diet and either resistance or moderate intensity exercise in overweight men and women elicited an average decrease of 9% in body weight and 17% in body fat with no differences between the treatments. Lastly, Despres et al. (8) found that 14 months of moderate intensity exercise decreased body weight 4%, %BF by 7%, and abdominal adipose tissue 9.5% in obese women.

The studies by Tremblay et al. (26), Geliebter et al. (10) elicited a greater decrease in body weight and body fat than the present study. This may be explained by a longer training period as was observed by Tremblay et al. (26) or a greater dietary energy restriction as was implemented by Geliebter et al. (10). The study by Despres et al. (8) elicited greater decreases in body weight and abdominal adipose tissue than the present study, possibly due to a longer treatment period. However, the total amount of body fat lost was equal to that of the present study. The subjects in the present study undergoing both diet and exercise treatment may explain this similar decrease in body fat over two different time periods.

The information gained from the present study as well as that from the previously mentioned studies suggests that any type of exercise with or without dietary modification will result in reductions in body weight, body fat, and waist circumference when performed regularly. An increase in energy expenditure and/or a decrease in energy intake as well as an increased reliance on fat as a fuel source that occurs with exercise training (5) may have attributed to the observed anthropometric alterations. Although exercise in general is beneficial in obesity treatment, it is important to determine whether one type of exercise is better than another.
**HIIT versus MIT**

*Body Weight:* The amount of weight lost was similar between the MIT and HIIT groups. Tremblay et al. (27) found no differences in body weight change in the subjects performing MIT or HIIT training. The exercise energy expenditure in the study by Tremblay et al. was less than the expenditure of the present study, which may explain why the subjects in the present study had a decrease in body weight and those studied by Tremblay et al. did not. Ballor et al. (3) found that eight weeks of caloric restriction and exercise training produced similar significant decreases in body weight of obese women in LIT and HIE groups, 7.2% and 7.5%, respectively. The percent weight lost by the subjects in the study by Ballor et al. (3) exceeds that of the present study. However, Ballor et al. (3) placed the subjects on a more restrictive diet, 1200 kilocalories per day, likely explaining the more robust weight loss. Our data is in agreement with that of Ballor et al. (3) in that both exercise intensities were equally effective in promoting weight loss.

*Body Composition:* Surprisingly, alterations in body composition were observed only for the groups combined, not for either group individually. These data are inconsistent with data obtained by Tremblay et al. (27) who found that HIIT decreased body fat whereas MIT did not. Additionally, Bryner et al. (6) compared HIE and LIT and found that only those subjects performing HIE demonstrated a significant reduction in %BF. The previously mentioned studies both made these observations in non-obese individuals. Several studies that have examined exercise training of different intensities in overweight and obese individuals found that utilizing LIT and HIE training protocols produced similar decreases in %BF and FM (3,11). Ballor et al. (3) observed a 10% decrease in %BF and a 16% decrease in FM after an eight week training period. Grediagin et al. (11) found a three percent decrease in %BF and a five pound decrease in FM in overweight women who trained for 12 weeks. Absolute energy deficit rather than
exercise intensity may be more important for body weight and fat loss in the obese.
Alternatively, it may be that our intervention was not long enough to detect significant
differences between exercise groups.

All the previously mentioned studies trained subjects for a minimum of 12 weeks except
for Ballor et al. (3) who trained their subjects for eight weeks. The percent change in body fat
from pre to post training in the present study is similar in magnitude to Ballor et al., seven
percent in our study and 10% in the study by Ballor et al. (3). This suggests that larger decreases
in %BF require the duration of the training program to be 12 weeks or greater. Therefore, it is
unclear if the two training intensities would have shown different effectiveness had the program
been longer.

Body Fat Distribution: Glucose intolerance, insulin resistance, hypertension,
hypercholesterolemia, and hyperlipidemia are associated with android obesity and increase an
individual’s likelihood of developing coronary heart disease (CHD) and type 2 diabetes (8).
Therefore, assessment of the distribution of body fat and potential treatments for decreasing
abdominal fat are important. This is the first study to directly examine potential changes that
may occur in body fat distribution when individuals undergo MIT or HIIT exercise training.
Tremblay et al. (25) found in a survey type study, that those individuals who reported engaging
in high intensity activities had a lower waist circumference than their counterparts who
participated in lower intensity activities. Additionally, in a similar study Nindl et al. (15) found
that men who regularly exercise at high intensities exhibited less abdominal fat than those who
performed more low intensity type exercises.

The present study demonstrates that HIIT and MIT are equally effective in decreasing
waist circumference in obese men. This is possibly due to the mobilization of both subcutaneous
and visceral adipose tissue from the abdominal region (19). It is possible that an exercise program of a longer duration may result in one exercise intensity being more effective in decreasing waist circumference.

**HADH Activity:** Both training protocols significantly increased muscle HADH activity. This contradicts previously published data by Tremblay et al. (27), who found a significant 60% increase in HADH activity after HIIT training and no change in HADH activity after MIT training. MacDougall et al. (14) studied enzymatic adaptations to maximal effort sprint interval training in young physically active male subjects and found no differences in HADH activity. However, Phillips et al. (18) found that MIT training in untrained but otherwise healthy male subjects significantly increased HADH activity 24%. By examining the published literature it is apparent that the magnitude of change in HADH activity after exercise training is extremely variable. Simoneau and Bouchard (21), suggest that this may be due to a large amount of interindividual variability (i.e. coefficient of variation >30%) in HADH activity from human biopsies. This suggests that assays used to determine HADH activity are variable and may account for some of the differences which occur between studies.

Increases in HADH activity suggest an increased fatty acid oxidation potential within the muscle. Because of the possible relationship between HADH activity and fat oxidation, a decrease in body fat is expected when HADH activity increases (31). This appears to be the case in the present study when both groups are combined. A trend for HIIT to increase HADH activity greater than MIT is not matched with HIIT decreasing body fat to a greater extent than MIT. This suggests that other factors involved in the lipolysis, mobilization, and uptake of fatty acids may have influenced fat oxidation in these obese subjects.
Although HIE is typically thought to utilize only CHO as a fuel, research has shown an increased reliance on oxidative metabolism as the number of intervals and duration of the high intensity interval increases. Gaitanos et al. (9) studied intermittent maximal exercise and found that ATP produced anaerobically during the tenth and final sprint was 35.6% of the amount used during the first sprint. Additionally, the power output of the last sprint was 73% of that in the first sprint. Based on this information, Gaitanos et al. (9) proposed that during the latter part of the exercise there was an increased reliance on oxidative metabolism for ATP production. Although it was not examined by Gaitanos et al. (9), it is possible that fat oxidation was a major source of energy provided aerobically. Serresse et al. (20) and Yamamoto and Kanehisa (30) identified that repeated maximal effort cycling sprints increasingly rely on oxidative metabolism as a source of fuel after 60 seconds of exercise. These studies provide evidence for the importance of fat as a fuel source during HIIT with longer duration high intensity intervals and with an increasing number of intervals. Because of the importance of fat as an energy source, it is possible that longer training period, would decrease body fat in the HIIT group more than the MIT group.

Kiens and Richter (12) studied exhaustive exercise performed at 75% VO$_2$max for 20 minutes with the remainder of the exercise consisting of two minute bouts at 90% VO$_2$max and 50% VO$_2$max. It was found that intramuscular triglycerides were oxidized up to 30 hours upon completion of the exercise bout. It is possible that the utilization of fat in the post-exercise period plays an important role decreasing body fat.

It is important to note that the subjects in the present study were able to tolerate and perform HIIT without difficulty. This provides insight that obese but otherwise healthy
individuals are capable of exercising at intensities once thought to be reserved for healthy normal weight individuals.

In conclusion, both MIT and HIIT are beneficial in decreasing body weight, body fat, and waist circumference in a group of obese men. However, a trend for a greater increase in HADH activity suggests that HIIT has the potential to decrease body fat to a greater extent than MIT in weight loss programs. Additional research is necessary to fully understand the differences in fatty acid mobilization and utilization in obese men performing either MIT or HIIT to determine the most effective protocol for inclusion into weight loss programs.
ACKNOWLEDGEMENTS

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REFERENCES


Table 1. Pre-treatment subject characteristics.

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<thead>
<tr>
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<th>HIIT (n=7)</th>
<th>MIT (n=6)</th>
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<tr>
<td><strong>Age (yr)</strong></td>
<td>30.00 ± 2.39</td>
<td>25.50 ± 1.45</td>
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<tr>
<td><strong>Weight (kg)</strong></td>
<td>107.90 ± 8.07</td>
<td>117.23 ± 10.29</td>
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<tr>
<td><strong>Height (m)</strong></td>
<td>1.82 ± 0.02</td>
<td>1.825 ± 0.05</td>
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<tr>
<td><strong>BMI (kg/m2)</strong></td>
<td>32.44 ± 1.87</td>
<td>36.91 ± 1.57</td>
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Values are presented as mean ± SEM.