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Physical activity and weight reduction in female recreational participants

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Abstract

Twenty healthy female recreationalists between 18 and 33 years of age, who expressed their intention to reduce their percentage fat mass with weight loss, were recruited in the study. Alterations in body composition were evaluated using five key variables: body mass index (BMI), body mass (BM), percentage of fat (BF %), total muscular tissue (%MT), and percentage of water (%W). Measurements were made at three time points including the start of the study before (baseline), after the second month of intervention and at end of forth month (conclusive). Five times a week, the group worked out for 90 minutes, usually in the morning. The T-test of small dependent samples was used to evaluate the differences between initial and control measurements, between control and final measurements, and between initial and final measurements. Based on the results, it can be said that the ultimate objective a reduction in body mass index (BMI), body mass (BM) and body fat percentage (%BF) was accomplished.

Keywords: body mass index (BMI), body mass (BM), muscular tissue (%MT), percentage of fat (BF %) and percentage of water (%W)

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Introduction

Obesity has a detrimental effect on nearly all bodily functions and presents a major threat to public health (Brewer CJ, Balen AH. 2010 and Diyar Muhammed Ali. 2025). It increases the risk of different health issues such as cardiovascular disease (Singh, G.M, et al 2013 and Czernichow, et al. 2011) diabetes (Singh, G.M, et al 2013), cancer (Lauby-Secretan, B., et al 2016), musculoskeletal disorders (Anandacoomarasamy, A., et al., 2008.), and mental health problems (Anstey, K.J., et al., 2011). (Okunogbe et al., 2022) that more than 1.9 billion adults aged 18 and older were overweight, while over 600 million were categorized as obese. Around 13% of adults globally were classified as obese in 2014, consisting of 11% of men and 15% of women. In 2014, almost 40% of adults aged 18 and older were classified as overweight, with comparable percentages for both males and females. From 1980 to 2014, obesity rates worldwide more than doubled according to the (GBD 2021). It is widely understood that obesity is a result of a lack of physical activity. Genetics, energy intake, food selection, food preparation methods (baking, frying, cooking), portion size, and meal timing must also be taken into account. Based on (Viner, R.M. & Cole, T.J. 2005), the risk of adult obesity can increase by 7% for 5-year-old children with each extra hour of TV watching on weekends. (Dietz, W.H. Jr. & Gortmaker, S.L. 1985) identified a notable connection between the amount of TV watched and the incidence of obesity. (Marshall, S.J., et al. 2004) disapprove of these claims, as their research shows that media use and physical activity only explain 1% of the variation in body fatness, which is somewhat unusual. According to (Wilmore, J.H. & Costill, D.L. 2004) lack of physical activity is as significant a factor in obesity as overeating. According to (Greene as cited in Petrović, J., 1992), the main cause of obesity in 67% of obese individuals is reduced physical activity, while overeating only contributes to 3%. Everyone can engage in physical activity without negative health consequences, such as the need for medication or surgery, to decrease body fat, as stated by (Samaras, K., et al. 1999) Abdominal fat, in particular, is believed to respond better to exercise compared to fat in other areas of the body. According to (Samaras and Campbell 1997) argue that it is easier to mobilize abdominal fat during exercise compared to fat in other areas of the body. In the opinion of (McArdle,

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W.D., Katch, F.I.&Katch, V.L. 2005), engaging in physical activity is the sole method to "normalize" the raised set point level and maintain a lower body mass. Another established fact is that when energy intake is decreased, there is a noticeable decrease in muscle tissue, as the body utilizes it for energy in the absence of carbohydrates, as explained by (Bernadot, D. 2000). According to (Weinheimer., et al 2010), weight loss due solely to calorie restriction results in a decrease in fat-free mass.

Method

Subjects

The investigation was carried out at a fitness gym in Garmian, Iraq, between May 20 and July 20, 2024. The study comprised 20 female volunteers aged 18 to 33 years who all wanted to lose weight and reduce their body fat percentage. In order to monitor changes in body composition, four parameters were measured using body analysis equipment called GS6.5 B. S161118S1544. Body mass index (BMI), body mass (BM), body fat percentage (%), water percentage (%W), and muscle tissue percentage (%MT).

Participants worked out for 75 minutes five days a week, mostly in the mornings, to increase their metabolic rate. Heart rate was determined manually using the formula 220 - age = maximal heart rate, as indicated by Medved et al. (1987), which is still used as a standard reference. After calculating the maximum heart rate, it was concluded that exercising at 30% of that current would be beneficial, as it is commonly understood that fat is processed aerobically. Heart rates were obtained at the end of each workout session. The majority of the training sessions consisted of aerobic activities and the usage of cardiovascular equipment. The program began with a brief warm-up, The procedure involved beginning with a brief warm-up followed by 10 minutes on a treadmill for cardiovascular exercise before moving on to the next exercises. The participants exercised for 30 minutes on a treadmill under the same conditions (30% of maximum heart rate), followed by workouts targeting the chest, biceps, triceps, back, legs, and abdomen. 30% of the weight is utilized in exercises for major muscle groups such as chest, back, and legs, while exercises for smaller muscle groups like biceps, triceps, are done using 25-30% of the maximum number of repetitions.

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Nutrition

They received guidance to modify their daily dietary habits by opting for various food items and cooking techniques. It was recommended that individuals refrain from consuming juices during the day and instead opt for water, unsweetened tea, and soups, while also including fresh fruits and vegetables in their meals.

Breakfast	Snack	Lunch	Snack	Dinner
At 7-8:30 Am	At 10 -10:30am	At 12 – 12:30 pm	At 2 -3pm	At 5:00 – 7:30pm
Egg Dark Bread Oatmeal Yogurt Avocado Toast Walnuts Almond Peanuts Milk Coffee Green Tea Black Tea Berry Banana Tomato Cucumber Lettuce	Any Fruits The Best One Is: Kiwi Carrot Pears Apricot Green Apple Berry Avocado Grape Fruit	Meat, Soup, 8 Tbsp. Of Rice or Soup With Half Bread and Salad or Fish With Salad Twice Week or Grill Chicken with Salad 3 Times A Week or Red Meat with Salad Twice Week	2 Glass of Water with 5 Almond	Any Soup with Half Bread and Salad or Chicken With Salad or 4 Boiling Eggs with Salad and Half Bread or At 8 Pm Until Bed Time, You Don't Have to Eat Anything Except Water You Have to Drink 4 - 5 Glass of Water till Bed Times Before Bed You Have to Drink One Cup of Green Tea Without Sugar

Statistical analysis

This study considered five factors: body mass index (BMI) body mass (BM), percentage of body fat (% BF), and water percentage (% W). To determine when the changes

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occurred, the participants were assessed three times: before the exploration began (initial measurement), at the end of the second month (control measurement), and at the end of the third month (final measurement). Descriptive statistics and a T-test for small dependent samples were used to analyze the differences between the initial and control measurements, control and final measurements, and initial and final measurements. The outcomes are displayed in tables and charts.

Research purpose

The purpose of the research was to see if the workout routine designed for female recreational participants would result in a reduction in body mass (BM) and body fat percentage (%BF), and additionally an increase in muscle tissue percentage (%MT) and water percentage. Furthermore, we attempted to determine the period of time required to see changes in body composition, which is equally important.

Results

The outcomes of the research are illustrated in three tables and one graph. It can be inferred that both weight and body fat percentages are consistently decreasing, whereas the percentages of water and muscle mass are on the rise. A T-test for small dependent samples was employed to assess statistical significance and the timing of these changes. Table 1 presents a T-test comparing initial and control measures, Table 2 compares control and final measurements, and Table 3 contrasts initial and final measurements.

Table 1 changes mean between the initial and control groups, female weight-loss (n=20).

		initial		control				
	Variables	X	SD	X	SD	R	T-test	sig
1	BMI	27.32	3.45	24.8	6.78	0.65	7.43	.01
2	BM	61.21	7.54	60.11	7.43	0.58	4.37	.00
3	BF%	31.76	8.12	28.43	9.54	0.83	2.1	.57
4	MT%	40.35	5.32	39.87	2.65	0.99	0.79	.98
5	W%	43.33	1.89	47.61	0.98	0.64	-3.38	.00

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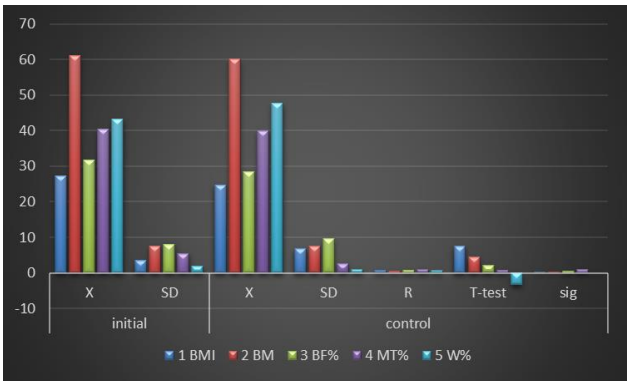
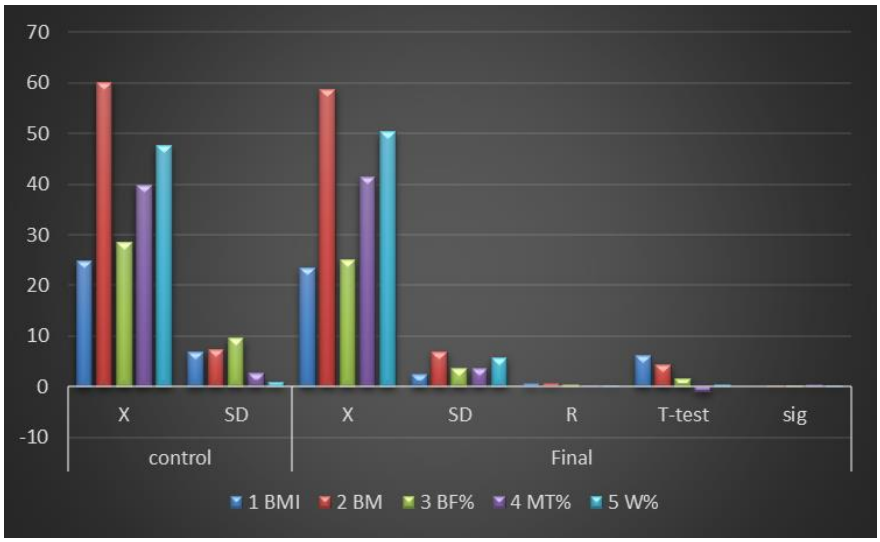


Graphic 1. Results in initial, control at the group of females that want to lose weight

Table 2 change means between control and final within a female weight-loss (n=20).

		control		Final				
	Variables	X	SD	X	SD	R	T-test	sig
1	BMI	24.8	6.78	23.5	2.43	0.60	6.11	.00
2	BM	60.11	7.43	58.76	6.91	0.65	4.37	.01
3	BF%	28.43	9.54	25.09	3.54	0.42	1.65	.23
4	MT%	39.87	2.65	41.34	3.65	0.26	-0.96	.38
5	W%	47.61	0.98	50.31	5.72	0.11	0.42	.16

Graphic 2. Results in control and final at the group of females that want to lose weight



Based on the data, it can be assumed that there were considerable changes in body mass index (BMI), body mass (BM) and water percentage (%W) at a level of .00 to .01 between the first and control measurements (see table 1). In particular, the average water percentage has risen

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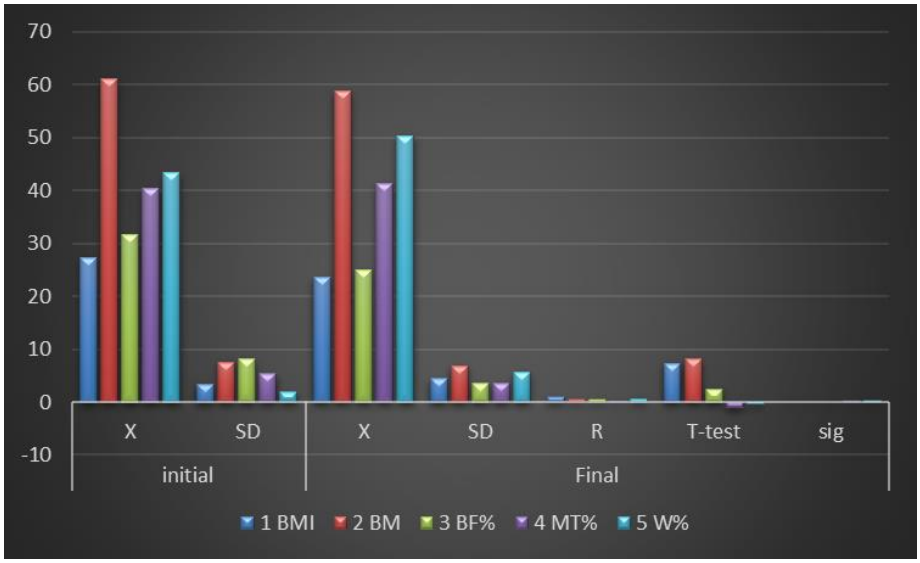
from 43.33% to 47.61%, although the average (BMI) decreased from 27.32 kg/m^2 to 24.8 kg/m^2, although body mass has dropped from 61.21 kg to 60.11 kg. The importance of the variations found using the arithmetic method in the control and final measurements is shown in Table 2. The findings show that just two variables, body mass index (BMI), body fat percentage (%BF) exhibits significant variations at the.00 to .01 level. Moreover, increased in muscle tissue with body water percentage are two additional variables that show beneficial effects.

Table 3 demonstrates the significance of the differences in the arithmetic method between the initial and final measurements. According to the data, they are three variables—(BMI), (BM) and the percentage of fat tissue (% BF) at the 00 levels exhibit notable differences. While there are enhancements in the other two variables (the percentage of water (%W), and the percentage of muscle tissue (%MT), these changes are not statistically significant.

Table 3: initial and final among the female group members who wished to reduce their body weight

		initial		Final				
	Variables	X	SD	X	SD	R	T-test	sig
1	BMI	27.32	3.45	23.5	4.43	0.94	7.37	.00
2	BM	61.21	7.54	58.76	6.91	0.57	8.09	.00
3	BF%	31.76	8.12	25.09	3.54	0.50	2.43	.00
4	MT%	40.35	5.32	41.34	3.65	0.20	-1.04	.24
5	W%	43.33	1.89	50.31	5.72	0.68	-0.42	.31

Graphic 3. Results in initial and final at the group of females that want to lose weight



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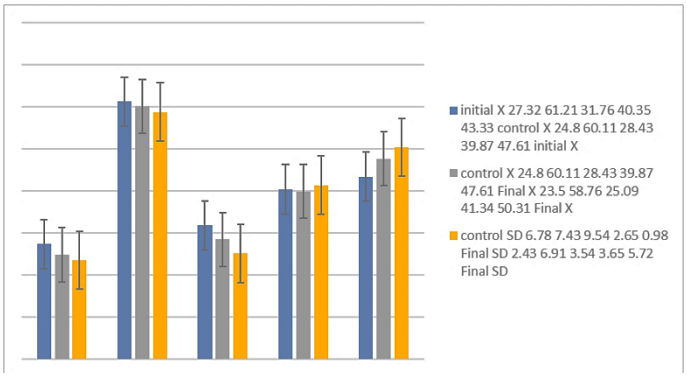
The alterations in all five variables are also visually represented in Graphic 4, where the changes are immediately apparent. All five variables are depicted on the X-axis, alongside three measurements (initial, control, and final). The Y-axis illustrates the values of all five variables in addition to the values from the three measurements (initial, control, and final).



Graphic 1. The results in initial, control and final measurements groups of females they want to lose weight

Discussion

This study used the body analysis equipment GS6.5 B. S161118S1544 to measure five variables: body mass index (BMI), body mass (BM), body fat percentage (%), water percentage (%W), and muscle tissue percentage (%MT) in order to track changes in body composition. The results of this study suggest that, when comparing initial and final measurements after four months of physical activity, statistically significant differences are only seen in three parameters: body mass index (BMI), body mass (BM), and body fat percentage (%BF) at significance levels of.00. On the other hand, the two other metrics (the percentage of muscle tissue (%MT-1.04) and the percentage of water (%W-0.42) exhibit improvements, but they fall short of the threshold for statistical significance. For four months, the participants worked out to begin with things in the morning to speed up their metabolic system all through the day. After a month, the control estimation appears to be the primary sign of weight reduce. Concurring with Venables, M.C., et al. (2008), four weeks of workouts (three times a week) at an escalated rise to their personal fat-max, or zone in which their fat oxidation is at its greatest, is required to progress fat oxidation (and affront affectability),a 12-week program is recommended Christiansen et al. (2010). Divergent views exist not only about the length of time needed to lose weight but also regarding the amount of time spent exercising daily and weekly, as well as the level of intensity. The Institute of Medicine (2002) suggests engaging in moderate-intensity physical activity for 60 minutes each day. However, independently, Saris, W.H., Blair, S.N. & Van Baak, M.A. (2003) and Weinsier, R.L. et al. (2002) asserted that maintaining body weight and achieving long-term weight loss required 60 to 90 minutes of brisk walking per day. According to Bouchard, C., Despres, J.P., & Trembluy,

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A. (1993), exercising for at least an hour per day is essential for effective weight loss. Because fat is digested in aerobic settings, the subjects in our study practiced for 90 minutes, five times a week, primarily performing aerobic exercises and cardio gadgetry activities. Because "fat is burning on the fire of carbs," they periodically created gadget exercises using modest weights (30% of their weight) and more repetitions. According to Petrović, J. (1992), engaging in physical activity while trying to lose weight has two benefits: first, it makes it easier to mobilize fatty acids from fat reserves because fat cells are more sensitive to lipolytic stimuli; second, it lowers insulin levels, which eliminates its effect on lipogenesis. When Katch, F.I., and McArdle, W.D. (1993) assessed the fat cell width, they found that it had decreased by 18% after six months of running five times a week compared to the inactive period.As anticipated, exercise has a greater impact and increases fat oxidation the longer it lasts. Schutz, Y., et al (2014) have shown that energy consumption rose considerably ($p < 0.01$) as the amount of time spent walking prescribed increased. Overall energy expenditure increased by 3% (30-min prescription), 6% (60-min prescription), and 9% (90-min prescription) on average when walking was prescribed. Achten, J. & Jeukendrup, A. E. (2003) discovered that moderate exercise intensity (62–63% of VO2max or 70–75% of HRmax) was the ideal intensity for fat oxidation in a group of trained individuals, while Jeukendrup, A.E. & Wallis, G.A. (2005) found that it was approximately 50% of VO2max for less trained individuals. According to Skrypnik, D., et al (2015), 2 groups of obese women engaged in endurance and endurance strength training did not differ statistically significantly in terms of body composition. These results contradict previous research by Willis, L.H., et al. (2012) and Marzolini, S., Oh PI & Brooks, D. (2012), which found that mixed endurance strength exercises were more effective than endurance exercises in terms of body mass and body fat percentage. Body mass index (BMI) and body mass (BM) decreases consistently from initial to final measurements, with statistical significance at levels of .01,.00, .00,.01 and.00, respectively. The variable percentage of body fat (%BF) shows a consistent decrease, which is statistically significant even after 4 months at a level of .00. Shukova-Stojmanovska, D., Dimeski, F., & Protić-Gava, B. (2014) found that increases in body fat percentage occur earlier, at the control measurement (after 2 months). According to Christiansen et al. (2010), there are no gender differences in weight loss. However, Petrović J (1992) found that females can mobilize fat tissue for energy more effectively, which is supported by our research. Venables, M.C., Achten, J., & Jeukendrup, A.E. (2005) found that women have a higher rate of fat oxidation at higher intensities than men, which is surprising given that men tend to use carbohydrates as energy at that intensity. Women consume somewhat more energy from fat oxidation during the day than males. Carmichael, H.E., Swinburn, B.A., & Wilson, M.R. (1998) recommended that obese women lose weight by reducing fat intake and increasing physical activity for three months. Reducing fat consumption from 36% to 22% resulted in a drop in body mass. Women

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who reduced their fat consumption by 40 grams per day lost the highest body mass over the three-month study. Participants were informed that, according to Wilmore, J.H. and Costill, D.L. (2004), adequate water intake is necessary for effective weight loss. The percentage of water (%W) increased from initial to control measurements, which was statistically significant at the.00 level (see table 1). After the second month, there is a plateau when the values from control to final measurement are similar but not statistically significant.

Although not statistically significant, there are improvements in the percentage of muscle tissue (%MT) between the initial and final measurements. Table 2 shows that over the first two months, there was a slight decline in the proportion of muscle tissue (on the control measurement). Although this variable has increased in the second half (final measurement), it is still not statistically significant. According to Chomentowski, P., et al. (2009), those who restrict their energy intake may see a drop in the proportion of muscular tissue since their body will use it as energy if they don't get enough carbohydrates. According to Weinheimer, E.M., et al. (2010), strength workouts are recommended to prevent the loss of muscle tissue since they increase muscular strength, power, and endurance and ultimately increase muscle mass, as demonstrated by this study. It is possible to draw the conclusion that the situation occurred because the body was still shocked by the restricted energy intake in the first half. The individuals become accustomed to the energy level after four months, which explains the final increase in that variable (%MT).

conclusion

Regular exercise, five times a week, causes a decrease in body mass index, body mass and body fat percentage. According to the findings and description of this study (table 1), there was a statistically significant improvement in the percentage of water (%W) at a level of.00 and a decrease in body mass index (BMI) and body mass (BM) at a level of.01 and .00 respectively from the initial control measurement. they are body mass index (BMI), and body mass (BM), fell statistically significantly (.00, .01) respectively between control and final measurements (table 2), while (BMI), (BM) and the percentage of body fat (%BF) reduced between starting and final measurements (table 3) at statistically significant levels of (.00, .00, and.01) (table 3).

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