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EFFECTIVENESS OF PILATES VERSUS RESISTED AEROBIC EXERCISES ON BODY COMPOSITION, ENDURANCE, FUNCTIONAL TEST AND HIP WAIST RATIO ON OBESE MALE

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ABSTRACT

Title: Effectiveness of Pilates Versus Resisted Aerobic Exercises on Body Composition, Endurance, Functional Test and Hip Waist Ratio on Obese Male

Background: Obesity is a major health concern that negatively impacts body composition, strength, endurance, and functional ability. Both Pilates and resisted aerobic exercises are considered effective strategies to improve these parameters, but direct comparisons between the two approaches remain limited.

Objective: To compare the effectiveness of Pilates and resisted aerobic exercises on body composition, muscle strength, endurance, functional ability, and waist-to-hip ratio in obese males.

Methods: This experimental study included 58 obese males (aged 20–40 years; BMI > 25 kg/m²) with no structured physical activity in the previous year. Participants were randomly divided into two groups: Group A (Pilates) and Group B (Resisted Aerobic Exercises). Both

groups completed supervised exercise programs three times per week for eight weeks. Outcome measures included BMI, waist-to-hip ratio, muscle strength (sit-to-stand test), endurance (stair test), and functional ability.

Results: Both interventions led to significant improvements in body composition, muscle strength, endurance, and functional ability. However, no significant differences were found between the two groups across measured outcomes.

Conclusion: Pilates and resisted aerobic exercises were equally effective in improving physical health parameters in obese males. Either modality can be recommended as a viable intervention to enhance body composition, strength, endurance, and overall functional ability.

Keywords: Pilates, resisted aerobic exercise, body composition, endurance, waist-to-hip ratio, obese males

INTRODUCTION

Obesity represents a critical global public health challenge, characterized by excessive adiposity that increases the risk of numerous chronic diseases. According to the World Health Organization (WHO), over 1.9 billion adults were overweight in 2016, with more than 650 million classified as obese, a prevalence that continues to rise worldwide **[1]**. This trend is alarming, as obesity is a well-established risk factor for a spectrum of comorbid conditions, including type 2 diabetes, coronary heart disease, hypertension, certain cancers, and musculoskeletal disorders, leading to reduced quality of life and increased mortality **[2, 3]**.

The fundamental pathophysiological mechanism of obesity is an imbalance between energy intake and expenditure, often driven by a combination of poor dietary habits and physical inactivity **[4]**. While multifactorial in origin, the modifiable nature of physical activity makes it a cornerstone of non-pharmacological management. Regular exercise is crucial for improving body composition, not only by increasing energy expenditure but also by enhancing metabolic health, muscular strength, and functional capacity **[5]**.

Body Mass Index (BMI) and Waist-to-Hip Ratio (WHR) are key anthropometric measures used to classify obesity and assess associated health risks. A BMI greater than 25 kg/m² defines overweight, while a BMI exceeding 30 kg/m² indicates obesity **[6]**. WHR provides additional insight into central adiposity, a pattern of fat distribution strongly linked to cardio metabolic complications **[7]**.

Various exercise modalities are employed in weight management, each with distinct theoretical benefits. Pilates is a mind-body exercise system focusing on core strength, flexibility, postural alignment, and

controlled movement. It is proposed to enhance proprioception, muscle endurance, and functional ability, which may be particularly beneficial for obese individuals seeking to improve movement efficiency and reduce discomfort **[8, 9]**. In contrast, resisted aerobic exercise combines cardiovascular training with muscular resistance. This modality simultaneously targets cardiorespiratory fitness and muscular strength, potentially leading to greater improvements in metabolic rate and body composition through increased lean mass and fat oxidation **[10]**.

METHOD

Study design: An Experimental study

Study setting: Gym lounge, Prehab studio

Sample Size: 58 male

Sample design: Simple random sampling

Inclusion criteria are male with the age of 20-40 years. BMI :> 25kg/m^2. Have not engaged in any structured physical activity or exercise regimen over past year **[22, 23]**.

Exclusion criteria are Subject wont under hormone replacement care protocol and absent of supplementary intake. Have any cardiovascular disease, hypertension and diabetes. Have any musculoskeletal disorder and unrestricted mobility. Participants who experienced cardiovascular events during the exercise assessments **[22, 23]**.

Outcome measures:

Body Mass Index (BMI) **[18]**

Waist-Hip Ratio **[19]**

Sit-to-Stand Test **[20]**

Stair Test **[21]**

PROCEDURE:

Every participant was evaluated according to the evaluation format. Each participant gave written, informed consent. The participants were then split up into two groups for the preliminary evaluation. In addition to interviewing the subjects, baseline results for the BMI, waist-hip ratio, stair test, and sit-to-stand test were documented.

A total of 56 men were selected for the study. Two groups of 28 individuals each were formed from the chosen males who gave their approval to participate. Every male trial participant had three therapy sessions per week for eight weeks. In Group A- Pilates mat exercises and in Group B- Aerobic resisted exercises were given.

Group A: Pilates mat exercises [22]

Week 1 to 4

- 3 to 5 repetitions of leg circles, leg stretches, double leg stretches, spine stretches, saws and sidekicks.
- 4 to 6 repetitions of the single leg kick, double leg kick and spine twist.

Reformer Program:

- Footwork, pelvic lift, tendon stretch, and 5–10 repetitions of running.

Cadillac Program:

- 3 to 5 repetitions of roll-down bar, breathing exercises, chest expansion, and thigh stretch.
- 3 to 5 push-through while seated in front and spread eagle.
- 3 to 5 repetitions of arm and leg spring series in the supine position.

Chair-Based Program:

- 5 to 10 repetitions of double leg pumps, single leg pumps and standing leg pumps in front, side and crossover.
- Flat frog, flat single-leg pump, and Achilles stretch with 5–10 repetitions.

Program with 1 kg Dumbbells:

- Wall exercises: 3 to 5 repetitions of circles, sliding, and rolling down.
- Exercises include the bug, boxing, lunges, arm circles, triceps extension and biceps curls (I, II), zip-up, chest expansion and head shaving with 5 to 10 repetitions.
- Incorporate the Magic Circle: 5 to 10 repetitions of arm, leg, and head exercises.

Week 5 to 8

- Single leg circles, single leg and double leg stretches, spine stretches, saws and sidekicks, 3 to 5 repetitions
- 4 to 6 repetitions of the single leg kick, double leg kick, and spine twist.
- 5 to 10 repetitions of crisscross single straight leg stretches.
- 3 to 6 repetitions of Shoulder Bridge and leg pull front.

Reformer Program:

- Footwork, pelvic lift, tendon stretch, and 5–10 repetitions of running.
- 3 to 5 repetitions of the short box series: round, flat back, and twist.
- Long stretch series: front, elephant, down stretch, 5 to 8 repetitions.
- Knee stretch series: round and arched back, 5 to 8 repetitions.
- Long box series: pulling straps, T 5 to 8 repetitions.
- 5 to 8 repetitions of exercises such as chest expansion kneeling, reverse chest expansion, splits side, stomach massage, flat back, reach and twist.

Cadillac Program:

- 3 to 5 repetitions of roll-down bar, breathing exercises, chest expansion, and thigh stretch.
- 3 to 5 push-through while seated in front and spread eagle.
- 3 to 5 repetitions of arm and leg spring series in the supine position.
- 5 to 10 repetitions of the side-lying series.

- Punching, saluting, hugging a tree and butterflying while standing on the ground, 3 to 6 repetitions.

Chair-Based Program:

- 5 to 10 repetitions of double leg pumps, single leg pumps and standing leg pumps in front, side and crossover.
- Flat frog, one leg pump in a flat position, and 5 to 10 repetitions of Achilles stretch.
- Washer woman, seated mermaid, and swan front, 3 to 5 repetitions.

Ladder Barrel Program:

- 3 horseback repetitions.
- Short box series: twist, flat back, and round, 3 to 5 repetitions.

Program with 1 kg Dumbbells:

- Wall exercises: rolling down, sliding, and circles, 3 to 5 repetitions.
- Exercises include the bug, boxing, lunges, arm circles, triceps extension, biceps curls (I, II), zip-up, chest expansion, and head shaving, 5 to 10 repetitions.
- Incorporate the Magic Circle: 5 to 10 repetitions of arm, leg, and head exercises.

GROUP B: AEROBIC RESISTED EXERCISES [23]

Aerobic training: Participants will be told to work out for 15 minutes at a maximum heart rate of 50 to85% using a leg cycle ergometer.

Resistant training: Exercises for a wide range of muscles in the upper and lower body will be performed at six stations.

- Extension of the legs
- Abduction of the hips
- Flexion of the abdomen
- The chest press
- Flexion of the elbow
- Extension of the elbow

75–80% of a single repetition maximum and two to three sets of ten repetitions.

RESULTS

Demographic profile

Table 1: Mean and SD of age distribution in Pilate's group and aerobic group.

	Group A	Group B
Number	28	28
Mean	30.18	29.07
SD	6.68	6.60

Table 2: Within-group analysis in group A

Outcome measure		MEAN	SD	SE	t value	p value
BMI	Pre	28.15	1.54	0.11	10.91	0.001
	Post	26.94	1.51	0.11	10.91	
HWR	Pre	0.98	0.02	0.39	19.71	0.001
	Post	0.97	0.03	0.39	19.71	
Stair test time	Pre	26.48	2.39	0.41	15.68	0.001
	Post	20.10	3.04	0.41	15.68	
Sit and stand test time	Pre	24.67	2.19	0.001	3.07	0.001
	Post	17.05	3.08	0.001	3.07	

Chart 1: Comparison of pre-post values of group-A

Post-test values are consistently higher than pre-test values, indicating enhanced body composition, endurance, functional capacity and waist hip ratio after the intervention.

Table 3: Within-group analysis in group B

Outcome measure		MEAN	SD	SE	t value	p value
BMI	Pre	29.14	1.58	0.06	20.87	0.001
	Post	26.81	1.54	0.06	20.87	
HWR	Pre	0.99	0.02	0.12	38.50	0.001
	Post	0.98	0.02	0.12	38.50	
Stair test time	Pre	26.61	2.34	0.21	10.92	0.001
	Post	24.28	2.79	0.21	10.92	
Sit and stand test time	Pre	25.68	2.19	0.001	5.47	0.001
	Post	20.18	2.50	0.001	5.47	

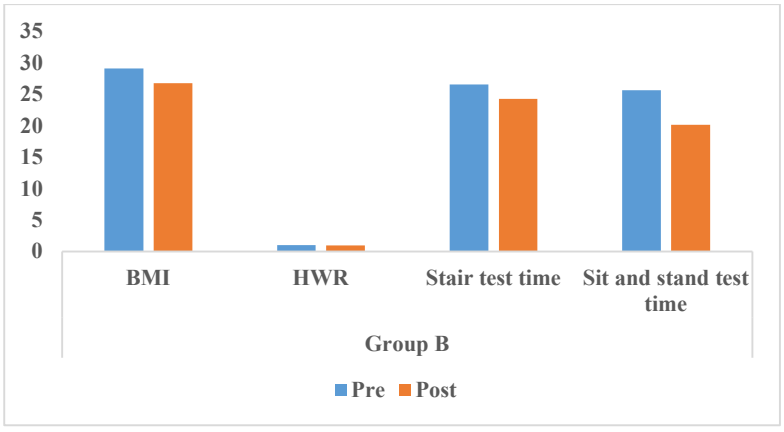

Chart 2: Comparison of pre-post values of group-B

This chart provides a graphical representation of the pre- and post-test values of BMI, Hip waist ratio, Stair test time and Sit to stand time following aerobic resistance exercises. The chart visually highlights the improvement on all outcome measures.

Table 4: Comparison between group-A and group-B

Outcome measures		MEAN	SD	t value	p value
BMI	Pilates	26.94	1.51	0.29	0.89
	Aerobic resistance	26.81	1.54	0.29	
HWR	Pilates	0.97	0.03	0.53	0.67
	Aerobic resistance	0.98	0.02	0.53	
Stair test time	Pilates	20.1	3.04	-0.11	0.64
	Aerobic resistance	24.28	2.79	-0.11	
Sit and stand time	Pilates	17.05	3.08	-4.17	0.69
	Aerobic resistance	20.18	2.50	-4.17	

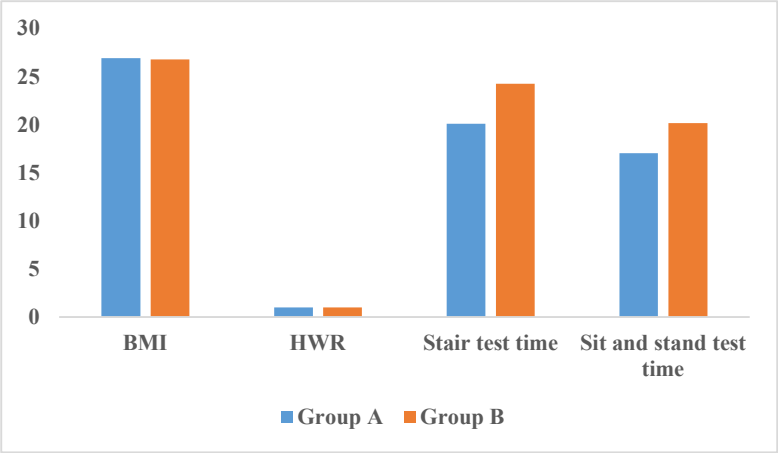

Chart 3: Between outcomes of group-A and group-B

This chart illustrates between-group analysis of all outcome measures values comparing Pilates and aerobic resistance exercises.

DISCUSSION

Excess body weight, fat, and obesity are associated with several chronic illnesses and increased risk of early mortality **[11]**. Obesity and overweight are well-established risk factors for cardiovascular diseases **[12]**. While physical exercise provides many health benefits, it alone is unlikely to cause significant weight loss, as it creates a smaller energy deficit compared to dietary restriction **[13]**.

This study was conducted with 56 male participants aged 20–40 years. Using lottery-style random sampling, they were divided into two groups: Group A received Pilates, while Group B received aerobic resistance training, three times a week for eight weeks. Outcome measures included BMI, waist-hip ratio, stair test, and sit-to-stand test, assessed at baseline, day one, and after eight weeks.

Statistical analysis showed significant improvements within both groups ($p < 0.05$), but no significant difference between them ($p > 0.05$), indicating that both interventions had a comparable effect on obesity. Pilates, designed to build strength and flexibility under the principle of mind-body control **[14]**, has been shown to improve motor skills, psychological well-

being, and physiological parameters **[15]**. However, evidence on its direct impact on body weight and fat percentage remains limited. Ansai *et al*. found that after 16 weeks of training, which incorporated aerobic, strength, and balance exercises, there were no noticeable improvements in the executive functions of older adults **[16]**. Aerobic resistance training, on the other hand, is well-established in improving cardiovascular endurance, VO_2 max, muscular strength, and body composition. It also supports weight management, independence in older adults, and reduces the risk of coronary heart disease **[17]**. Prior studies have confirmed its positive impact on weight, fat mass, and aerobic capacity, with strength training helping preserve muscle mass.

CONCLUSION

Both Pilates and aerobic resistance training significantly improved functional ability, body composition, and endurance. However, there were no significant differences between the two methods. Thus, both can be recommended as effective interventions for managing obesity and enhancing overall health.

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