

Effect of Aerobic Training versus Chair Aerobics on Body Mass Index and Quality of Life in Obese Desk Job Workers

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Abstract

Background: Obesity is defined as an excess accumulation of body fat. A sedentary lifestyle is associated with an increase in BMI over time, thus leading to obesity. Physical activity has been shown to reduce stress and anxiety traits and to improve physical self-perception and mental well-being. In desk job profession, physical activity levels at work are low while sedentary behavior is high. Aerobic exercise training using treadmill has capacity to improve the intrinsic pump capacity of the myocardium. Participation in regular aerobic exercises is now considered an essential component in any long term obesity management. Chair aerobics is a form of aerobic exercise performed while sitting in a chair, which include upper and lower body movements led by an instructor while listening to music and sitting in a straight-back chair.

Aim: To study the effect of aerobic versus chair aerobics on body mass index and quality of life in obese desk job workers.

Methodology: The materials that will be used in this study are treadmill and chair with outcome measures as Obesity Related Well-Being Questionnaire (ORWELL-97) and BMI. 38 subjects will be randomly divided into 2 groups. Group 1 (aerobic training) will be given aerobic training on treadmill for 30 minutes, 3 times per week for 2 months. Group 2 (chair aerobics) will be given Chair aerobics for 30 minutes 4 times per week for 2 months. Pre & post intervention assessments i.e. body mass index and ORWELL- 97 Questionnaire will give the final result for the given topic.

Outcome measures: Prior and after treatment both the outcome measures, Body Mass Index (BMI) and quality of life using Obesity Related Well Being Questionnaire (ORWELL-97) were measured.

Result: The result of the present study demonstrates that in group 1 there was greater reduction in body weight as compared to group 2 but there was greater improvement in quality of life in group 2 than in group 1. There was no significant effect statistically in BMI in both the groups.

Conclusion: Study was done exclusively on desk job workers to compare the effect of aerobic training versus chair aerobics on BMI and quality of life. Aerobic training using treadmill showed greater reduction in body weight as compared to chair aerobics. Chair aerobics showed greater improvement in quality of life as compared to aerobic training using treadmill.

Key words: Aerobic training, chair aerobics.

1. Introduction

Obesity is defined as an excess accumulation of body fat.¹

Obesity is disproportionate fat storage in the body that might adversely affect health. The prevalence of obesity is drastically rising globally, and it is now considered a critical public health issue.²

Obesity epidemic is the outcome of multifaceted interaction between the environmental factors, genetic susceptibility, and human behavior.²

Obesity ensues when a person's body stores abnormal amounts of fat. When energy intake exceeds expenditure over a period of time, this occurs. The obesity epidemic is caused by a complex interplay of environmental influences, genetic factors, and human behavior.²

Disorders associated with obesity: Insulin resistance, Type 2 diabetes, Hypertension, Dyslipidemia, Coronary heart disease, Premature death, Cancer, Asthma, Osteoarthritis, Stroke, Complications of pregnancy, Menstrual irregularities, Psychological distress.³

The prevalence of obesity is higher among the urban populations, high socioeconomic states and also in South India. From 1998 to 2018, the prevalence of obesity is rapidly spurting due to sedentary lifestyle and consumption of high calories food. Obesity results into various health problems which are having direct link to cardiovascular diseases.⁴

Body Mass Index : WHO criteria for screening obesity for Asian population.⁴

Body Mass Index kg/m ²	Interpretation
<18.5 kg/m ²	Underweight
18.5-22.9 kg/m ²	Normal
23.0-24.9 kg/m ²	Overweight
25.0-29.9 kg/m ²	Obesity I
>30.0 kg/m ²	Obesity II

In desk job profession, physical activity levels at work are low while sedentary behavior is high. A sedentary lifestyle is also associated with an increase in BMI over time, thus leading to obesity. Reducing sedentary behaviors could help to prevent can increase in BMI and thereby reduce occurrence of obesity. Physical activity has been shown to reduce stress and anxiety traits and to improve physical self-perception and mental well being.⁵

Aerobic fitness also helps to reduce stress responses and improves an individual's capacity for coping with stress.⁵

Aerobic exercise training using treadmill has capacity to improve the intrinsic pump capacity of the myocardium. The constant stress of aerobic exercise forces the heart to gradually enlarge, thus further exercise eventually requires less effort to continue. Participation in regular aerobic exercises is now considered an essential component in any long term obesity management strategy because of its

potential to provide metabolic benefits and assist in the maintenance of energy balance. Epidemiological and clinical studies have demonstrated that the regular practice of aerobic exercise is an important factor for prevention and treatment of obesity.⁶

Chair aerobics is a form of aerobic exercise performed while sitting in a chair, which includes upper and lower body movements led by an instructor while listening to music and sitting in a straight-back chair. Chair-based exercises have specific benefits as a training method as they stabilize the lower spine by providing a fixed base, and they facilitate a greater range of motion by providing points of leverage and support; they minimize load bearing and reduce balance problems in those with particularly poor mobility. Chair-based exercises have been shown to have a beneficial effect on maintaining or promoting independence and mobility in older people and also in patients with post CABG.⁵

The Obesity Related Well Being (ORWELL-97) Questionnaire (reliability=.92) is used to measure obesity-related quality of life.⁷

The items were developed in such a way that they could be applied to a wide population of obese patients, regardless of age, sex, familial status, occupation, or education level. The total ORWELL 97 score is obtained as the sum of the scores of individual items. Higher ORWELL 97 scores mean a lower quality of life.

2. Materials:

- Weighing machine
- Height measuring scale (wall mounted stature meter)
- Sphygmomanometer
- Stethoscope
- Pulse oximeter
- Treadmill
- Chair
- Stopwatch

3. Methodology

- Type of study: Comparative study
- Study design: Experimental
- Study duration: 6 months
- Type of sampling: simple random sampling.
- Sample size: 36
- Study setting: Wanless Hospital, Miraj Medical Centre

4. Abbreviations

BMI	Body Mass Index
QOL	Quality of Life
ORWELL-97	Obesity Related Well Being Questionnaire
MET	Metabolic Equivalent of Task

OSPAQ	Occupational Sitting and Physical Activity Questionnaire
ACSM	American College of Sports Medicine
HRmax	Maximum Heart Rate
HR	Heart Rate
BP	Blood Pressure
rHR	Resting Heart Rate

Outcome measures:

1. Obesity Related Well-Being Questionnaire (ORWELL-97) for quality of life assessment.
2. Body Mass Index: WHO criteria for screening obesity for Asian population.

INTERVENTION:

GROUP A: Aerobic Training
 The program includes: A] warm-up for 5 minutes of stretching exercises, B] treadmill walking= 30 minutes at 50-75% of maximum heart rate, C] cool-down phase for 5 minutes of stretching, -for three times a week for 2 months.

- HR, BP=measure before and after exercise in sitting position and measure recovery heart rate rHR at third minute of post exercise session. Maximum heart rate was calculated by using this formula:
 $HR_{max} = 220 - \text{Age}$.

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- In 2001 published a position stand that recommended a minimum of 150 min week(-1) of moderate intensity physical activity for overweight and obese adults.

GROUP B: Chair Aerobics.

The program include:

Chair aerobics as a group to all the subjects. The following exercises were given:

- free neck exercises, shoulder and elbow rotation, wrist curls and rotations, ankle toe movements, spine flexion and extension, spinal side rotation.

Initially, 5 sets of each exercise were given, gradually increasing it to 10 sets. Total time duration of warm up phase was 5 minutes.

- Exercises included in the aerobic session: begin with 8 repetitions
- marching with arm movement in standing,
- alternate hand and leg movements in standing,
- alternate arm and leg raise in sitting,

-knee to chest in sitting,

-v step in standing,

-claps on head in sitting,

-marching in standing,

-hamstring curls in standing,

-leg swings in standing,

-lunges in standing,

-knee to chest in standing.

- Initially, low intensity exercises will be performed, gradually increasing the speed of movements and thus their intensity. Total time duration of chair aerobics= 30minutes.
- Cool down session:neck stretch, forearm stretch, triceps stretch, pectoral stretch, quadriceps stretch, hamstring and tendon achilles stretch

(all the stretches-sustained stretch from 10 seconds up to 30 seconds, total time duration for cool down phase=5 minutes).

Individuals should carry out chair aerobics for 4 days per week for 8 weeks.

4. Results, Figures and Tables.

Statistical analysis was done using paired t-test and independent t-test.

Intragroup Analysis: For BMI , Weight and Quality of Life Pre and Post test-

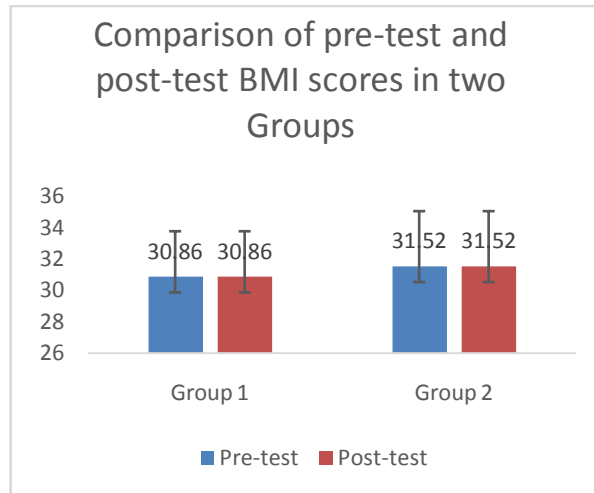
1] BMI

Table 1: Intragroup analysis for BMI

Groups	Times	Mean	SD	Mean Dif f.	SD D i f f .	Effect siz e	t-value	p-value
Group 1	Pre-test	30.86	2.90	NA	NA	NA	NA	NA
	Post-test	30.86	2.90					
Group 2	Pre-test	31.52	3.52	NA	NA	NA	NA	NA
	Post-test	31.52	3.52					

Interpretation: The BMI mean value in group 1 indicated no changes post treatment and values are recorded for post treatment outcome are same. There is no significant changes as the values have not shown any changes. The BMI mean value in group 2 indicated no changes post treatment and values are recorded for post treatment outcome are same. There is no significant changes as the values have not shown any changes.

Graph1: Intragroup analysis for BMI



2] Weight

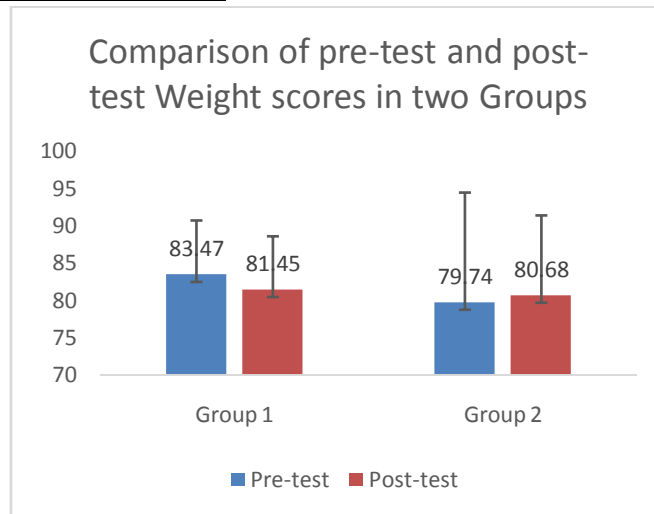
Table 2: Intragroup analysis for Weight

Groups	Times	Mean	SD	Mean Dif f.	SD D i f f .	Effect siz e	t-value	p-value
Group 1	Pre-test	83.47	7.24	2.02	0.56	3.64	15.863	0.001
	Post-test	81.45	7.14					
Group 2	Pre-test	79.74	14.71	0.94	11.11	0.08	0.370	0.716
	Post-test	80.68	10.71					

Interpretation: The weight mean value in group 1 indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level(i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

The weight mean value in group 2 indicated changes post treatment and higher values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. Based on the results of the test analysis at 5% significance level, there is no significant statistical reliable difference between the pre & post treatment values with p-value is more than the 5% significance level(i.e. $0.716 > 0.05$) in the study and therefore it justifies the non-improvements in health outcome post intervention.

Graph 2: Intragroup analysis for Weight



3] Quality of Life

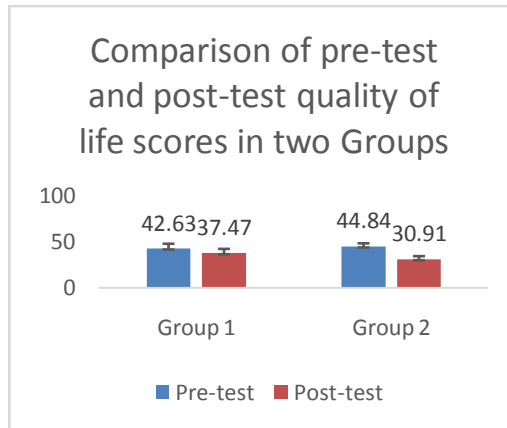
Table 3: Intragroup analysis for Quality of Life

Groups	Times	Mean	SD	Mean Dif f.	SD Dif f.	Effect size	t-value	p-value
Group A	Pre-test	42.63	5.34	5.16	1.30	3.96	17.264	0.001
	Post-test	37.47	4.89					
Group B	Pre-test	44.84	3.61	13.94	2.98	4.68	20.400	0.001
	Post-test	30.91	3.53					

Interpretation: The quality of life mean value in group 1 indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

The quality of life mean value in group 2 indicated changes post treatment and lower values are recorded for post treatment outcome and also the standard deviation shows the consistency with post treatment value which is less than pre value. The effect size or Cohen’s D indicates 4.68 value which is assumed to be very high in effect size as per the standard parameters of reference. Based on the results of the test analysis at 5% significance level, there is a significant statistical reliable difference between the pre & post treatment values with p-value is less than the 5% significance level (i.e. $0.001 < 0.05$) in the study and therefore it justifies the improvements in health outcome post intervention.

Graph 3: Intragroup analysis for Quality of Life



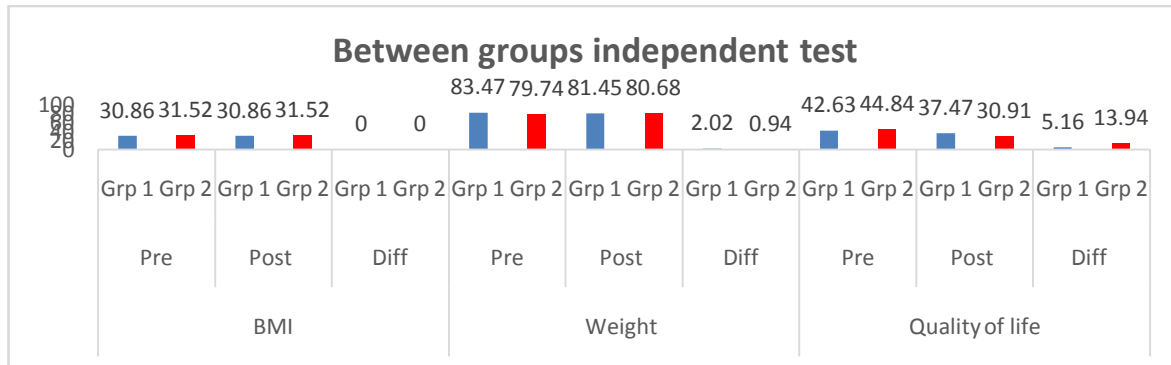
Intergroup Analysis:

Table 4: Intergroup analysis of Group A and Group B for BMI, Weight and Quality of Life

Variable	Time	Group	Mean	SD	t-value	p-value
BMI	Pre	Grp 1	30.86	2.90	0.628	0.534
		Grp 2	31.52	3.52		
	Post	Grp 1	30.86	2.90	0.628	0.534
		Grp 2	31.52	3.52		
	Diff	Grp 1	0.00	0.00	NA	NA
		Grp 2	0.00	0.00		
Weight	Pre	Grp 1	83.47	7.24	0.993	0.327
		Grp 2	79.74	14.71		
	Post	Grp 1	81.45	7.14	0.262	0.795
		Grp 2	80.68	10.71		
	Diff	Grp 1	2.02	0.56	1.161	0.253
		Grp 2	0.94	11.11		
Quality of life	Pre	Grp 1	42.63	5.34	1.496	0.143
		Grp 2	44.84	3.61		
	Post	Grp 1	37.47	4.89	4.745	0.000
		Grp 2	30.91	3.53		
	Diff	Grp 1	5.16	1.30	11.774	0.000
		Grp 2	13.94	2.98		

Interpretation: From the above table it is observed that between groups analysis is non-significant for BMI and Weight variable across all time frames at 5% level significance as the p-value is more than 5%. It shows non-significant differences between the groups. From the above table it is observed that between groups analysis is significant for Quality of life variable across post & difference time frames at 5% level significance as the p-value is less than 5%. It shows significant reliable differences between the groups in post & difference time frames.

Graph 4: Intergroup analysis of Group A and Group B for BMI, Weight and Quality of Life



5. Discussion

This study was conducted to evaluate the effects of two different exercise program i.e. aerobic training and chair aerobics on BMI and quality of life in obese desk job workers. A sedentary lifestyle is associated with various types of disorders. M. Castillo-Retamal and E.A. Hinckson (2011) suggest that nowadays a sedentary activity level in the workplace is high due to a change in the nature of modern job functions, and thus physical activity in the workplace should be measured and intervention should be made to reduce the ill-effects of a sedentary lifestyle (a study by Jonathan A. Mitchell suggests that a sedentary lifestyle is associated with an increase in BMI over time and thus, an increase in BMI is associated with occurrence of various morbid health conditions).

Aerobic exercise training using treadmill has capacity to improve the intrinsic pump capacity of the myocardium. The constant stress of aerobic exercise forces the heart to gradually enlarge, thus further exercise eventually requires less effort to continue. Participation in regular aerobic exercises is now considered an essential component in any long term obesity management strategy because of its potential to provide metabolic benefits and assist in the maintenance of energy balance. Epidemiological and clinical studies have demonstrated that the regular practice of aerobic exercise is important factor for prevention and treatment of obesity.

Chair aerobics is a form of aerobic exercise performed while sitting in a chair or with the help of a chair, which includes rhythmic upper and lower body movements matching the beats of music. Chair aerobics is a low to medium intensity exercise in which the spine is stabilized by a fixed base of support compared to that of standing or dynamic exercises, which require a lot of stability (also chair aerobics facilitate a greater range of movement by providing points of leverage and support, it also minimizes load-bearing on joints while some postural muscles are relaxed; it also reduces balance problems in those with poor mobility and makes a great form of exercise while sitting). The main aim of the study was to compare the effectiveness of aerobic training and chair aerobics on BMI and quality of life in obese desk job workers. The objectives of the study were to improve the physical fitness and quality of life in individuals with a sedentary working environment, to improve their energy levels by reducing fatigue levels in these individuals. 38 individuals participated in the study on the basis of inclusion criteria, they were divided into two groups and were participated in the study for 8 weeks. Subjects were

screened by measuring their BMI and by measuring the hours they sit by Occupational Sitting and Physical Activity Questionnaire (OSPAQ) to rule out their sedentary nature of work. The aerobic training and chair aerobics sessions were carried out 4 days per week for 8 weeks. Post-intervention BMI and Quality of Life was assessed using ORWELL-97 Questionnaire.

Within the intragroup comparison, the BMI of both the groups was same (pre and post intervention), i.e. there was statistically no significant change in BMI. But while intragroup comparison of body weight the p-value for Group A (Aerobic training) was $p=0.001$ (i.e. $0.001 < 0.05$) the value is statistically significant; and for Group B (Chair aerobics) $p=0.716$ (i.e. $0.716 > 0.05$) the value is statistically non significant. Intragroup group comparison of Quality of Life the p-value for Group A (Aerobic training) and Group B (Chair aerobics) was same, i.e. $p=0.001$ the value is statistically significant.

In the inter group comparison BMI and weight for both groups showed statistically non-significant results. Quality of Life has showed statistically significant results in both the groups (p-value is less than 5).

Clinical presentation showed significant weight reduction in Group A (aerobic training), while more significant results for Quality of life was seen in Group B (chair aerobics). We conclude by saying that while comparing the effect of aerobic training and chair aerobics on BMI and Quality of life in obese desk job workers; aerobic training has showed better results in weight reduction while chair aerobics has showed better results for quality of life. Incorporating exercise in the workplace will address the stress and anxiety issues faced by employees. Presently, there is a lack of exercise and physical activity in various professions due to the digital and sedentary nature of our work. Perhaps, incorporating chair aerobics as a group or by using ear-phones by an individual can serve to fill that void of physical activity and help to enhance the benefits of physical activity and exercise in the workplace.

So to conclude we say that, Group A (aerobic training) has shown better results for BMI and weight reduction clinically also improvements in quality of life clinically and statistically has been seen in this group; Group B (chair aerobics) has shown better results for quality of life clinically and statistically also reduction in weight and BMI clinically has been noted.

6. Conclusion

Hence the study was done exclusively on desk job workers to compare the effect of aerobic training versus chair aerobics on body mass index and quality of life.

Results of the study indicated that there was significant difference in BMI (clinically) and Quality of Life (statistically and clinically) within each group.

Aerobic training using treadmill i.e. Group A showed greater reduction in BMI and body weight clinically as compared to chair aerobics. Chair aerobics i.e. Group B showed greater improvement in quality of life (ORWELL-97 Questionnaire) clinically and statistically as compared to aerobic training using treadmill.

Drawbacks:

There was no such drawback found in the study. But initially individuals of both the groups found it difficult to switch from their sedentary routine to active lifestyle.

Limitations:

- The study duration was short and limited to a small sample size.
- Subjects found difficulty in performing chair aerobics during their working hours.

Suggestions:

- Further studies can be carried for longer duration to get more significant reduction in BMI and body weight.
- Further studies can be done with larger sample size.

7. Acknowledgement

I take this wonderful opportunity to thank all the “HANDS” which have joined together to make this project a SUCCESS. It’s my great pleasure and privilege to express my deep-felt gratitude to our respected Principal and Guide **Dr. Aakanksha Joshi (PT)** who immensely helped me and rendered their advice, precious time, constant encouragement, knowledge and relevant information regarding my study, and whose suggestion and guidance has enlightened me on this subject. I express my sincere thanks to **all the teaching & nonteaching staff** of the Miraj Medical Centre, College of Physiotherapy. Above all, I would like to thank my parents for their blessings, love, constant support, affection and encouragement. Praise and Glory to the God Almighty who is the source of strength, foundation of my knowledge and the source of inspiration in every walk of life.

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