

Comparative Analysis of Effect of Endurance Training on Obese Population

Shweta Singh¹, Dr. Priya Mahto², Dr. ShahiduzZafar³

1 Researcher Student, Department of Physiotherapy, SMAS, Galgotias University

2 Assistant professor, Department of Physiotherapy, SMAS, Galgotias University

3 Professor, Department of Physiotherapy, SMAS, Galgotias University

Abstract

Background: Endurance training seems to be effective in every population. But its effects on obese people are more prevalent

Purpose: This study is aimed to compare the effects of endurance training on the obese population.

Materials and methods: A sample size of 30 (n=30) subjects were from general population in Ghaziabad and they were divided into two groups Controlled (n=15) and the Experimental group (n=15). The first group, Group A was Controlled Group they did conventional training and the Second Group, Group B was Experimental Group which did endurance activities for 4 weeks.

Result: The result showed significant improvement in scores of step-ups and sit -up tests in experimental group as compared to the controlled group.

Conclusion: Endurance training showed significant improvement in experimental group as compared to the controlled group.

Keywords: -Endurance, obesity, diabetes, BMI, nutritional disease

Introduction

In the modern era, obesity has raised as a major concern for health on planet. The WHO has recognized it as the most visible and least addressed public health concern Globally according to a report 500 million people are affected by obesity, and it has been demonstrated that having a BMI more than 35kg/m² in 20 years old has a negative impact on life expectancy i.e., it reduced by 13 years [1]. It is not just a health hazard, but also a disease. Obesity has a significant impact on illness progression, and it has a high prevalence due to the high prevalence of numerous linked diseases like diabetes, which can be caused due to obesity. When it comes to mortality and morbidity, obesity is the top nutritional disease, underlining the importance of weight reduction for health and the reduction of comorbid risk factors [2]. Obesity is a chronic medical disease that is difficult to manage and has a negative impact on our health. In the last several years, we've observed an exponential increase in obesity all across the world. A study reports that obesity rates have tripled in adults, doubled in children, and increased by three times in teenagers [3]. It is the condition in which BMI is 25.0 or more than 25.0, whereas healthy is defined as having a BMI between 18.5 to 24.9[4]. Normal weight person comes under BMI ranges from 18.5 -24.9.

Obesity is gradually rising since previous decades, and it is reaching at unprecedented levels day by day. According to the findings of the study, more than 68 percent of people are overweight, with 35 percent being obese [5]. It is claimed that the increase has happened

across all ages, genders, races groups and the explanation for the massive increase in the ratio is still unknown. It increases insulin resistance and is linked to physical inactivity, making it a causal agent of type 2 diabetes. According to Khan (2017) [6], the main cause of obesity includes excessive consumption of unhealthy foods, parental responsibility, contemporary technology, and the mass media. There are a number of reasons that cause obesity in children.

Health issues such as sleep apnea, diabetes, High blood pressure and cholesterol, Osteoarthritis and Chronic Back and Knee Pain are exacerbated by being overweight or obese. Some women may also experience fertility issues [6]. Compared to Women who have a normal BMI, women having BMI in range more than normal / obese have three times more chances of suffering from infertility [7].

It is clear that it raises the risk of a variety of life-threatening diseases. The relationship between obesity and death has piqued researchers' curiosity [8]. Extreme obesity has an effect on both resting and exercise-induced respiratory physiology. Additionally, it decreases the expiratory reserve volume and lung compliance. changes in the FEV1 or VC ratio, as well as decreased maximal expiratory flow rates at low lung volumes, may also result in obstructive ventilators. Obesity is best treated via weight reduction, which reverses many of the detrimental physiological consequences on the respiratory system [9].

Endurance

Endurance is defined as the ability to engage in any sort of physical activity for an extended length of time without becoming fatigued. Aerobic endurance exercise is the most effective and recommended type of exercise for treating obesity. Aerobic endurance exercise of a moderate level that progressively raises the intensity according to the patient's health status and capacity should be 30 – 60 minutes daily by individuals of all ages, according to the European Association for the Study of Obesity (EASO) [1]. When it comes to people, data from the research shows that 150-250 minutes of moderate physical activity each week, with an average calorie burn of 1.200-2.0000 kcal, is sufficient to keep weight gain at bay. Additionally, physical activity lowers the risk of developing cardiovascular and metabolic illnesses, as well as improving physical fitness and health indicators among obese individuals who have lost only a little amount of weight [10].

Physical inactivity or leading a sedentary lifestyle is one of the most major risk factors for chronic diseases such as diabetes mellitus, stroke, coronary heart disease, and obesity, all of which increase as we get older, according to the WHO. As a result, we must all engage in physical exercise since it is one of the most effective and least expensive ways to avoid the illnesses that result from leading a sedentary lifestyle. Physical activity also increases the body's ability to transfer and utilize oxygen to its greatest potential [11].

Various forms of exercise training are available; nevertheless, aerobic exercises are the most effective for achieving positive metabolic and cardiovascular benefits. Sports involving repetitive isotonic contraction of large skeletal muscle groups are referred to as endurance sports. In endurance exercise, submaximal intensity is maintained with the goal of gradually increasing the anaerobic threshold, which is the point at which anaerobic metabolism and lactate production begin, towards a greater exercise intensity [12].

Effects of endurance training

Endurance Training programs are exercise-based rehabilitation programs for individuals with cardiovascular illness, and they have been shown to have good benefits on autonomic

balance and cardiovascular outcomes in clinical trials. [12]. Endurance training has a beneficial impact on the cardiovascular system, particularly on heart rate, ejection fraction, and diastolic filling both at rest and during exercise. Our healthy inactive participants improved their aerobic and cardiac capabilities with the short and intensive endurance training program we presented [13]. Regular physical activity and the exercises throughout the lifespan can improve our life expectancy and disability adjusted life expectancy [14]. It has been demonstrated in several clinical trials and fundamental research investigations that exercise training help in reduction of heart rate, which is produced by both morphological and electrical remodeling of the cardiac muscle Heart Rate Variability, as well as heart size and heart rate, were all found to be related to endurance exercise training [15]. Regular physical exercise is viewed as a critical component of managing and preventing hypertension. Epidemiological studies indicate that increased physical activity or fitness levels are associated with lower blood pressure, and meta-analyses indicate that chronic dynamic aerobic endurance training is capable of lowering blood pressure and has beneficial effects on other cardiovascular risk factors. Additionally, Training in Aerobic Endurance has been shown to have a positive effect on blood pressure, body weight, body fat percentage, waist circumference, cholesterol levels, and insulin sensitivity. [16]. Exercise-induced Muscular Endurance (ME) is defined as the capacity to maintain repetitive muscular contractions as well as the ability to do work over an extended period of time. Endurance can be impacted by the strength of a single muscle or set of muscles, or it can be affected by the overall strength of the body.

The whole body's strength generally correlates to the heart's ability to continuously provide a constant supply of oxygen to the working muscles, and therefore this term is used for describing cardiac endurance [17]. Physical activity (PA) has a number of health benefits, particularly for women, including a lower risk of all-cause mortality, breast cancer, osteoporosis, coronary heart disease (CHD), hypertension, diabetes, and an increase in mental health and quality of life [18]

Effects of endurance Exercise on obesity

The endurance exercise was widely investigated for the treatment of obesity. It results in various health advantages and there is good proof of its positive impact on weight, glucose management and the endothelium function and the general quality of life enhancement. The long-term impacts of endurance exercise are also many, including cardiovascular. Cardiac hypertrophy results in higher stroke volumes and improved heart performance. It also increases the amount of red blood cells in your lungs and skeletal muscles and leads to capillarization in the alveoli. Increasing the oxygen sent into working muscles and removing carbon dioxide. It can benefit fat individuals throughout their daily life by providing them with a better transit system. Training enhances the aerobic capacity of lean men by 18 percent and obese men by 15 percent. In the lean and in the obese males, it also reduced the weight range to 4 percent. It demonstrates the influence of stamina on the body that both healthy and obese people improve. It also reduces the Body Mass Index, total body fat content, decreases body mass and increases long capacities. It can also help many fat people's lifestyles [19]

Methodology:

Aim and objectives

Aim: To observe impact of endurance exercises.

Objectives: To find out the effects of endurance training on obese population.

Study design

This is Experimental study in which we try to find out the impact of endurance exercises on obese population. do not have to be defined. Do not use abbreviations in the title or heads unless they are unavoidable.

Sample method

Use A Total Number of 30 subjects aged 18- 50yrs were selected. They were distributed into two groups (Fifteen participants in each group).

- Group A: Controlled Group
- Group B: Experimental Group

Duration of the study

4 weeks

Inclusion criteria

1. Written informed consent of the subject for participation in the study.
2. 18-50 years age group in both populations.
3. Obese Population.
4. People with sedentary lifestyle.

Exclusion criteria

1. Pregnant and lactating females.
2. Subject with associated pathology (OA, RA, injury).
3. Subject with mental disorder.
4. Subject with Suicidal Behavior
5. Subject with Severe Personality Disorder
6. Subjects involved in fitness Activity.

Data analysis

The Data Analysis was done with the help of social science packaging software (SPSS) [20] and the graphical representation is done by using MS EXCEL 2019.

Results

TABLE 1 shows the comparison of pre sit up and post sit up scores of groups 1 and group2 and it also shows the comparison of pre and post step up tests in both groups. It is clearly stated in the table that the p value of sit up test and step-up test is not lesser than 0.005 in group 1. Thus, we will reject the null hypothesis and accept the alternate hypothesis which

states that group 2 shows significant improvement in sit up and step-up test as compare to group 1.

TABLE 1: Comparison of pre sit up and post sit up scores and pre and post step up scores of Groups 1 and Group 2

VARIABLES	GROUP 1			GROUP 2		
	MEAN	S.D.	P-VALUE	MEAN	S.D.	P-VALUE
Pre-Sit-ups	3.87	1.060		1.80	.676	
Post Sit-ups	4.00	1.069	.433	3.93	.704	.002
pre step up	3.40	.828		1.60	.632	
post step up	3.00	.756	.005	3.67	.488	.004

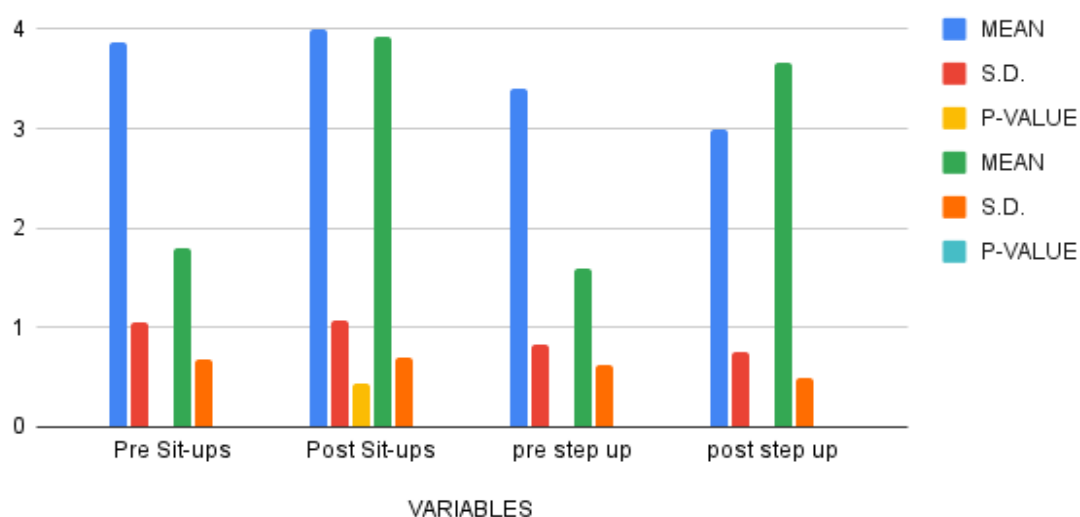
P-value is assumed to be <0.005

Graph 1

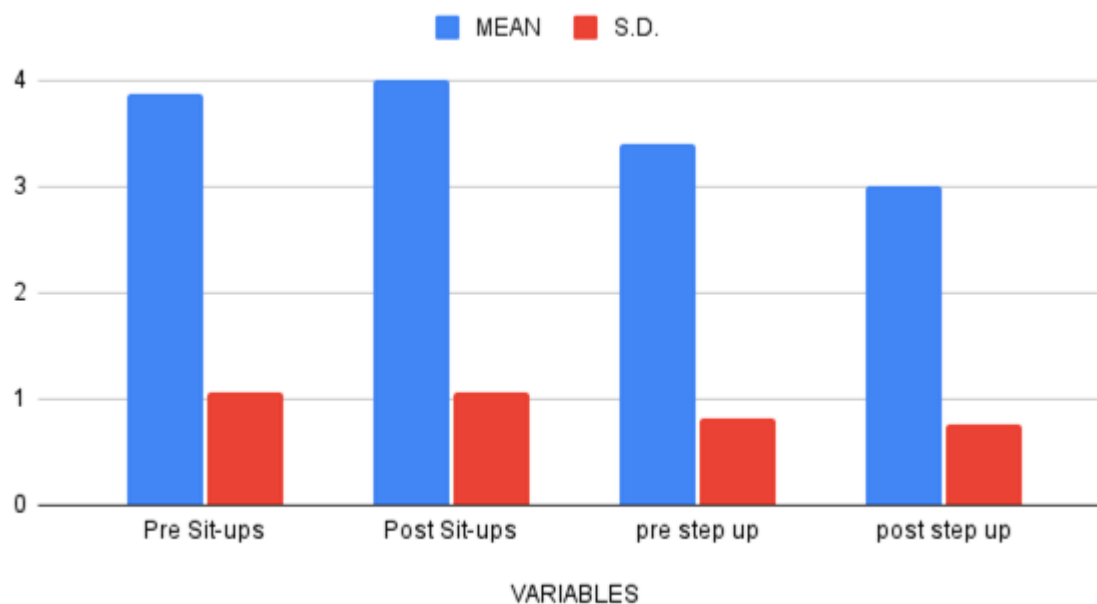
Graph 1: is depicting the mean, standard deviation and P- value of pre- sit-up scores and post-sit up score, pre and post step up scores of both the groups. Mean of pre-sit up score for group 1 is 3.87 and its standard deviations is 1.069 along with p-value 0.433 whereas mean of post sit-ups of group 2 is 3.93 and its standard deviation is 0.704 along with p-value 0.002.

Mean of Pre-step-up of group 1 is 3.40 with standard deviation 0.828 whereas Pre-step-up of group 2 is 1.60 with standard deviation 0.632. Mean of post-step-up score of groups 1 is 3.00 with standard deviation 0.756 along with p-value 0.005 whereas mean of post-step-up score of groups 2 is 3.67 with standard deviation 0.488 along with p-value 0.004.

GRAPH 2: pre sit up and post sit up scores and pre and post step up scores of groups 1



Pre-sit-up mean and standard deviations are 3.87 and 1.060 respectively while post sit-up means and standard deviation is 4.00 and 1.069 respectively. Mean and standard deviations of Pre-step-up score of groups 1 is 3.40 and 0.828 respectively whereas post-step-up mean and standard deviation are 3.00 and 7.56 respectively.



Graph 3: is indicates pre and post sit up scores and pre and post step up scores of groups 2. Pre- Sit up mean and standard deviation are 1.80 and 0.676 respectively while post SIT-UPS mean and standard deviation is 3.93 and 0.704 respectively.

Discussions

This study is done on obese population DR. Roland T JUNG in his study he said that Obesity is not just associated with overeating and reduced will power but it is associated with genetic etiology which is influenced by the environment [2]. Jagriti Upadhyay et al., they also concluded in 2017 prevalence of obesity is associated with cardiovascular endurance [3]. Same conclusion is made in this study by Alamgir Khan et al., in 2017 in which it was stated that obesity may be associated with reduced quality of life [5]. Christopher J Brewer et al., said that in study obesity impairs reproductive outcomes significantly it has effects on endometrial development, oocyte maturation, implantation and Miscarriage. So, losing weight by exercises and the diet is the first choice for obese women suffering from fertility treatment [7]. The epidemic of the obesity is not limited to the US but also has been documented in several reasons of the worldwide with the prevalence of obesity rising in most countries concluded by Dang M. Nguyen et al., in 2009 [21]. Age - group of this study is similar to the Age - group is chosen by Amudha Poobalan et al., in their study which is conducted in 2016 in which it was observed that individuals belong to age group of 18-25 years are more prone to overweight and obesity in both developed and developing country [22].

This research was done to analyze impact of endurance exercises on obese population. This study was performed on two groups, The first group was a controlled group and they did conventional training while the second group was an experimental group and performed endurance training for 4 weeks and it is observed in the study that subjects who performed

endurance training showed significant improvement in the step ups and sit ups tests. Thus, the endurance of the participants of the experimental group has increased.

In this study it is shown that endurance is improved in the participants who performed endurance training which is similar to the study done by Damian Skrypnik et al., in 2015 [1] in which comparable and favorable effects of endurance training was observed in obese population. This study is supported by the study done by Ahmed Ebrahim Elerian et al., in 2019 [8] in which it was concluded that endurance exercises are more efficient than strengthening exercises because endurance exercises show more improvement in plasma lipid profile as compared to the strengthening exercises. Sedentary obese people is included in this study and it observed that their endurance level is low which is similar to the study done by Mr. ILAYARAJA A. et al., in 2016 [11] in their study it was observed that cardiorespiratory endurance declines in individuals who lead a sedentary lifestyle. Gisele P. Pickering et al., 1997 in their study have observed that short but individualized exercises periods have positive impact on exercise capacity and maximal expiratory ventilation. It also enhances the Vo₂max, improves the resting systolic function of the heart in healthy subjects which improved cardiac contractility is correlated with the exercise induced Blood volume expansion. Aerobic endurance training has reduced B.P by reducing vascular resistance which is associated with sympathetic nervous system appears to be involved and affects concomitant risk factors related to cardiovascular system said by Veronique A. Cornelissen and H. Fagard in 2005 [16].

Many studies have made earlier to observe the benefits of endurance training and also there are many studies to show that there is prevalence of low level of endurance in obese population, but in this study effects of performing endurance training in obese population are observed by comparing their resultant endurance level with the controlled group which did not receive any particular exercise protocol.

Conclusion

This study was performed to analyze the impact of endurance exercises on obese population. Two groups underwent this study, the first group was a controlled group and did conventional training while the second group was an experimental group and performed endurance training for 4 weeks and it is observed in this study that subjects of the experimental group who performed endurance training showed significant improvement in the scores of step-up tests and sit up test. Thus, the endurance of the experimental group who underwent endurance training showed significant improvement in endurance.

Reference

1. Skrypnik D, Bogdański P, Mądry E, Karolkiewicz J, Ratajczak M, Kryściak J, Pupek-Musialik D, Walkowiak J. Effects of Endurance and Endurance Strength Training on Body Composition and Physical Capacity in Women with Abdominal Obesity. *The European Journal Of Obesity*. 2021.2015;8:175–187.
2. Jung R. Obesity as a disease. *British Medical Bulletin*. 1997;53(2):307-321.
3. Upadhyay J, Farr O, Perakakis N, Ghaly W, Mantzoros C. Obesity as a Disease. *Medical Clinics of North America*. 2018;102(1):13-33.

4. Dr. P. Puska, Dr. C. N Nishida, Mr. D.Porter, Obesity and Overweight. WORLD HEALTH ORGANIZATION, GLOBAL STRATEGY ON DIET, PHYSICAL ACTIVITY AND HEALTH;2003
5. Khan A, Khan S, Marwat M, Zia-Ul-Islam S, Khan M, Shah A. Causes and Complication of Obesity among the Children. Acta Scientific Nutritional Health [Internet]. 2017 [cited 2021 Dec 8];1(1). Available from: <https://actascientific.com/ASNH/pdf/ASNH-01-0010.pdf>
6. Obesity in Men vs. Women [Internet]. Uhhospitals.org. 2021 [cited 2021 Dec 8]. Available from: <https://www.uhhospitals.org/Healthy-at-UH/articles/2018/08/obesity-in-men-versus-women>
7. Brewer C, Balen A. The adverse effects of obesity on conception and implantation. REPRODUCTION. 2010;140(3):347-364.
8. Elerian A, Ali M, Ali N. Comparison between the Effect of Endurance and Strengthening Exercises on Plasma Lipoprotein in Central Obese Female Subjects. Research Journal of Pharmaceutical, Biological and Chemical Sciences. 2016;7(3):1613- 1622.
9. Sood A. Altered Resting and Exercise Respiratory Physiology in Obesity. Clinics in Chest Medicine. 2009;30(3):445-454.
10. de Lade C, Andreazzi A, Bolotari M, Costa V, Peters V, Guerra M. Effects of moderate intensity endurance training vs. high intensity interval training on weight gain, cardiorespiratory capacity, and metabolic profile in postnatal overfed rats. Diabetology & Metabolic Syndrome. 2018;10(1).
11. ALAGIATHIRUVENKADAM I, KAJAMOHIDEEN S, NEDUNCHEZHIAN A, Rajendran K. COMPARISON OF CARDIOVASCULAR ENDURANCE LEVEL BETWEEN SEDENTARY NORMAL AND SEDENTARY OVERWEIGHT YOUNG FEMALES: AN EXPLORATORY STUDY. International Journal of Therapies and Rehabilitation Research. 2016;5(3):11.
12. Morici G, Gruttad'Auria C, Baiamonte P, Mazzuca E, Castrogiovanni A, Bonsignore M. Endurance training: is it bad for you?. Breathe. 2016;12(2):140-147.
13. 3. Pickering G, Fellmann N, Morio B, Ritz P, Amonchot A, Vermorel M, Coudert J. Effects of endurance training on the cardiovascular system and water compartments in elderly subjects. Journal of Applied Physiology. 1997;83(4):1300-1306.
14. Reimers A, Knapp G, Reimers C. Effects of Exercise on the Resting Heart Rate: A Systematic Review and Meta-Analysis of Interventional Studies. Journal of Clinical Medicine. 2018;7(12):503.
15. Herzig D, Asatryan B, Brugger N, Eser P, Wilhelm M. The Association Between Endurance Training and Heart Rate Variability: The Confounding Role of Heart Rate. Frontiers in Physiology. 2018;9.
16. Herzig D, Asatryan B, Brugger N, Eser P, Wilhelm M. The Association Between Endurance Training and Heart Rate Variability: The Confounding Role of Heart Rate. Frontiers in Physiology. 2018;9.
17. Hasan N, Kamal H, Hussein Z. Relation between body mass index percentile and muscle strength and endurance. Egyptian Journal of Medical Human Genetics. 2016;17(4):367-372.
18. Serwe K, Swartz A, Hart T, Strath S. Effectiveness of Long and Short Bout Walking on Increasing Physical Activity in Women. Journal of Women's Health. 2011;20(2):247-253.

19. Endurance Training | Obesity: The Benefits of Exercise [Internet]. Blogs.brighton.ac.uk. 2021 [cited 2021 Dec 8]. Available from: <https://blogs.brighton.ac.uk/by262obesity/endurance/>
20. Kumar R, Kumari S, Bharti P, Sharma D. Nomophobia: A rising concern among Indian students. *Industrial Psychiatry Journal*. 2021;30(2):230. https://doi.org/10.4103/ipj.ipj_134_21
21. Nguyen D, El-Serag H. The Epidemiology of Obesity. *Gastroenterology Clinics of North America*. 2010;39(1):1-7.
22. Poobalan A, Aucott L. Obesity Among Young Adults in Developing Countries: A Systematic Overview. *Current Obesity Reports*. 2016;5(1):2-1