ISSN: 2321-5690
IJOPT
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
editor.ijopt@gmail.com

COMPARISON BETWEEN THE EFFECT OF EXERGAMING AEROBICS ANDTRADITIONAL AEROBICS EXERCISE PROGRAM ON BODY MASS INDEX,RATE OF PERCEIVED EXERTION, WAIST HIP RATIO AND TOTAL FAT % INGRADE 1 OBESE POPULATION

Dr Bulbul Bhajikhaye[1*], Dr Shilpa Parab[2]

[1*]PT resident, India
[2*] Principal, Professor, Head of Department of Cardiovascular & Respiratory Physiotherapy, CMF's College of Physiotherapy), India

***Corresponding Author:** bbhajikhaye7@gmail.com
DOI: https://doi.org/10.63299/ijopt.070192

ABSTRACT

Background: Rising obesity rates are strongly linked to sedentary lifestyles and low physical activity (PA). Overweight and obese adolescents are typically less active than their normal-weight peers and participate less in PA programs. Regular physical activity is one of the most effective ways to prevent obesity, cardiovascular disease, and other health issues while improving quality of life and independence. Therefore, creative and enjoyable approaches are needed to motivate obese teens to be more active. One such promising method is active video games, or "exergaming," which use interactive gaming to promote physical fitness and health in youth.

Aim: To compare the effect of 4week Exergaming Aerobics with Traditional Aerobic program (treadmill) on Body Mass index (BMI), Rate of Perceived Exertion (RPE), Waist hip ratio (WHR), and Total Fat % in grade 1 obese population.

Methods: A comparative study was conducted on 48 participants with grade 1 obesity, randomly assigned into two groups:Group A(n=24) exergaming aerobic and group B(n=24) traditional treadmill aerobic exercise programme. Body Mass index (BMI), Rate of Perceived Exertion (RPE), Waist hip ratio (WHR), and Total Fat % in grade 1 obese population was measured.Data was analyzed using appropriate statistical tests, with significance set at $p < 0.05$.

Results: Both Group A and Group B showed highly significant changes within their groups for Body Mass Index, Rate of Perceived Exertion, Waist–Hip Ratio, and Total Fat Percentage (BMI, RPE, and fat %: $p = 0.0001$; WHR: $p = 0.0004$). In contrast, the comparison between the two groups revealed no significant differences for BMI ($p = 0.1120$), RPE ($p = 0.8683$), WHR ($p = 0.6856$), or total fat percentage ($p = 0.1677$).

Conclusion: This study concluded that both exergaming aerobics and traditional treadmill aerobics were equally effective in improving Body Mass Index, Waist–Hip Ratio, Total Fat Percentage, and Rate of Perceived Exertion in individuals with Grade 1 obesity. Both forms of aerobic exercise supported fat loss, enhanced metabolic activity, and improved overall body composition.

Key Words: Grade 1 obesity, physical activity, exergaming, active video games, treadmill.

INTRODUCTION:

India currently ranks third globally in obesity burden, following China and the United States(1).The prevalence of overweight and obesity has steadily increased over the years, and more than 135 million individuals in India are affected(2). Worldwide, over 1.9 billion adults are overweight and millions are obese, contributing to millions of deaths annually(3). Obesity is a multifactorial condition influenced by genetic, metabolic, psychological, environmental, and socio-cultural factors, and it carries significant physical, mental, and economic consequences(4). It is defined as excessive fat accumulation, commonly assessed using Body Mass Index (BMI), which categorizes individuals as underweight, normal, overweight, or obese(4,5). Although BMI is widely used, it does not account for differences in body composition due to age, gender, or ethnicity(6,7).

Therefore, additional measures like waist circumference, waist-to-hip ratio, and body fat percentage are often used, as central fat is more strongly linked with chronic disease risk((7,8,9). Body fat analysis tools offer a simple, reliable, and non-invasive method to assess body composition, making them suitable even for vulnerable populations such as children and obese individuals(10,11,12). Obesity typically results from excessive caloric intake and insufficient physical activity, leading to comorbidities such as cardiovascular disease, diabetes, and certain cancers. Sedentary lifestyles significantly contribute to rising obesity rates.(13,14,15,) Aerobic physical activity plays a crucial role in preventing and managing obesity by improving cardiovascular health and promoting weight loss(16,17,18). Despite established recommendations for moderate to vigorous aerobic activity, many adults and young adults fail to meet these guidelines due to lack of time, low motivation, or the perception that exercise is not enjoyable(19,20,21). Physical inactivity often begins in adolescence and continues into adulthood, with many young adults remaining inactive or not meeting recommended activity levels(22). Obese individuals also tend to experience higher perceived exertion during exercise, reducing exercise tolerance.(23,24,25)

Traditional management of obesity includes diet modification, increased physical activity, and reduced sedentary behaviour(26). Treadmill training is commonly used to improve cardiopulmonary fitness and support weight loss(27,28). Exercise offers multiple benefits beyond weight control, such as improved muscle strength, better sleep, enhanced mood, and reduced chronic disease risk. Newer approaches like mind-body fitness—Pilates, yoga, Tai Chi, and Qigong—have also shown benefits in improving flexibility, balance, pain, stress, and overall physical function in obese individuals(29,30,31)

Active video gaming (exergaming) has emerged as a popular and innovative approach to increase physical activity(32). These interactive games require players to engage in full-body movements such as jumping, kicking, or running, making exercise more enjoyable, especially for children and those who find traditional exercise less engaging(33,34). Although video games were once associated with increased sedentary behaviour, exergaming has transformed gaming into a tool that encourages physical fitness(35). Studies have shown that exergaming platforms like Wii Fit can serve as feasible alternatives to traditional aerobic exercise and may help individuals meet recommended physical activity levels. As a result, exergaming provides a fun, accessible, and effective way to increase activity levels, particularly in obese children, adolescents, and adults.

OBJECTIVE

1.To study the effect of 4 weeks of Exergaming Aerobics program on Body Mass Index (BMI), Rate of Perceived Exertion (RPE), waist hip ratio (WHR) and total fat %. in grade 1 obese population.
2.To study the effect of 4 weeks of Traditional Aerobic program (treadmill) on Body Mass Index (BMI), Rate of Perceived Exertion (RPE), waist hip ratio (WHR) and total fat %.in grade 1 obese population.
3.To study the comparative effect of 4 weeks of Exergaming Aerobics and Traditional Aerobic program (treadmill) on Body Mass Index (BMI), Rate of Perceived Exertion (RPE), waist hip ratio (WHR) and total fat %.in grade 1 obese population.

METHODOLOGY

1. Study design: Experimental study
2. Study type: Comparative

3. Study setting: Urban
4. Target population: Grade 1 obese population.
5. Study duration: 1 year
6. Sampling method: Randomized chit method
7. Sampling technique: Convenient sampling
8. Sample size: 48

Formula used: n= (σ1 2 + σ2 2 / κ) (z 1-α/2 + z 1-β/2) 2
Δ 2

SELECTION CRITERIA

Inclusion criteria

1. Age criteria- 18 to 25 years 5
2. Both males and females
3. BMI grade 1 (30 – 34.9kg/m 2) 2
4. Person with good hearing and visual capabilities
5. Subjects with good proprioception
6. Baseline selected value will be 3 MET on both platforms, and will be progressed to 5 MET.

Exclusion criteria

1. Individual suffering from-cardiopulmonary conditions including asthma within the last 6 months
2. Individual having respiratory conditions
3. Individual with major musculoskeletal injuries over the last 6 months (affecting Lower Limb mobility)
4. Other health issues that would interfere with a subject's safety during exercise.

PROCEDURE

Ethical committee clearance was taken from the institutional committee. Screening of participants was done using inclusion and exclusion criteria. Included subjects were given a written informed consent in the best language understood by them. The participants were divided into two groups. That is Group A and Group B. Random allocation was done. Group A was given exergaming protocol and group B was given treadmill program.Pre and Post intervention on Body Mass Index, Rate of Perceived Exertion, Waist Hip Ratio.Total body Fat % was taken. The protocol was given thrice a week for four weeks for both the groups.

OUTCOME MEASURES

1.BODY MASS INDEX (BMI)

Body mass (BMI) will be taken without shoes or belts and in light clothing, and recorded to the nearest 0.05 kg with a portable digital scale. Height will be measured with a standing stadiometer and recorded with a precision of 1cm. BMI will be calculated as body weight divided by height squared (kg/m2).

2.RATING OF PERCEIVED EXERTION (RPE)

Modified Borg scale- Subjects will be seated and asked to mark the level of exertion, before and after exercise program.

3.WAIST HIP RATIO (WHR)

Waist and hip girths (cm) were measured with an anthropometric tape over light clothing. Waist girth was measured at the minimum circumference between the iliac crest and the rib cage and hip girth at the maximum width over the greater trochanters. WHR was then calculated waist circumference / hip circumference.

4.TOTAL BODY FAT %

Calculated by TANITA Inner scan body composition monitor. Subject has to stand on the machine ten readings will be displayed and mentioned accordingly.

STATISTICAL ANALYSIS:

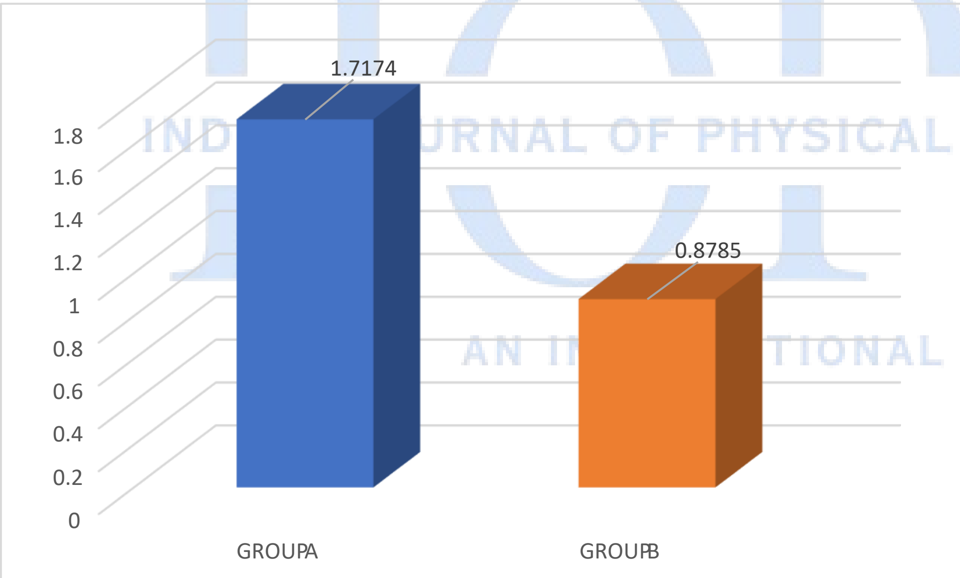
Data for the outcome measures—including body mass index, rate of perceived exertion, waist-hip ratio, and total fat percentage—were collected and entered into Microsoft Excel 2022 for organization and further analyzed using Winpepi version 11.65 and GraphPad Instat version 3.05. Continuous variables were presented as mean and standard deviation. The data were first examined to determine normality. For data that were not normally distributed, the Wilcoxon Signed-Rank test was used for within-group analysis, and the Mann–Whitney U test was applied for inter-group comparisons. For normally distributed data, the paired t-test was used to assess pre- and postintervention changes within the group, while the unpaired t-test evaluated differences between the two groups. A p-value of less than 0.05 was considered statistically significant for all tests.

RESULTS

Table 1: Comparison between group A and group B for Body mass index (BMI)

	GROUP A	GROUP B
Mean	1.7174	0.8785
SD	0.8700	0.7456
p value	0.1120	

Graph 1: Comparison between group A and group B for Body mass index (BMI)



Inference

When Inter group Comparison of Body mass index (BMI) was done between group A (exergaming aerobics programme) and group B (traditional aerobics programme). The data shows difference in mean was not statistically significant with p value of (0.1120).

Table no 2: Comparison between group A and group B for Rate of perceived exertion (RPE)

	GROUP A	GROUP B
Mean	1.667	1.417

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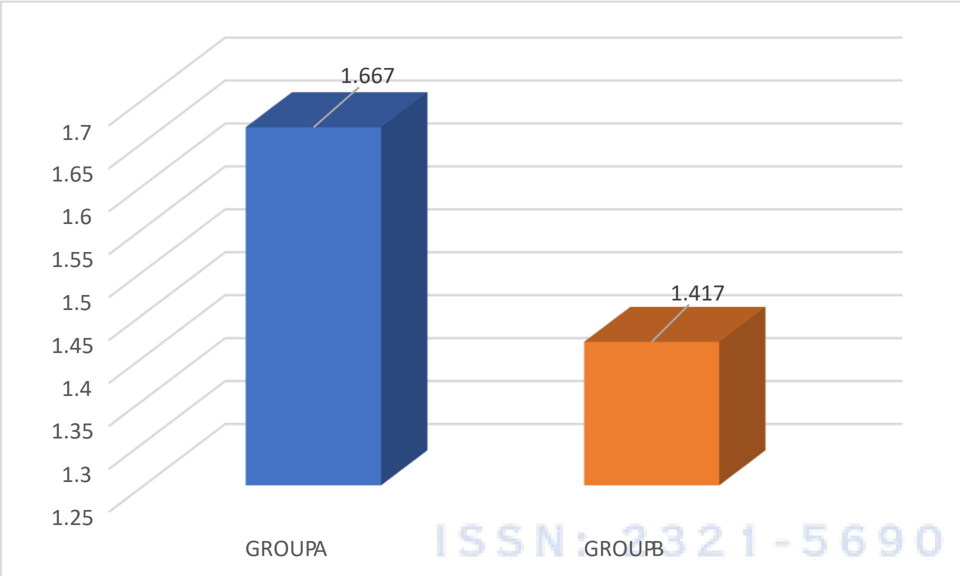
SD	0.6370	0.9743
p value	0.8683	

Graph 2: Comparison between group A and group B for Rate of perceived exertion (RPE)



Inference

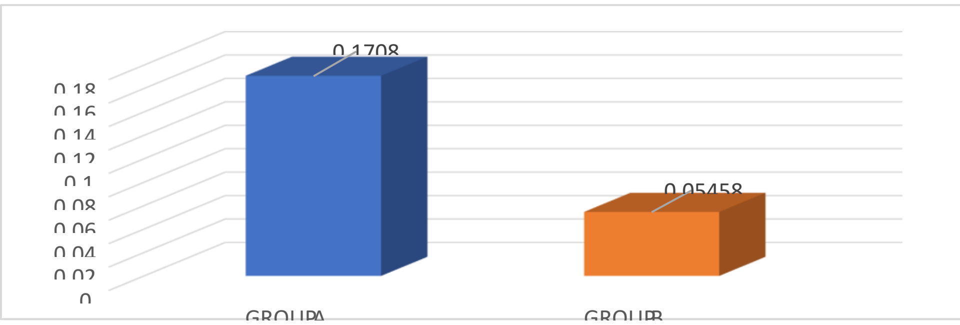
When Inter group Comparison of Rate of perceived exertion (RPE) was done between group A (exergaming aerobics programme) and group B (traditional aerobics programme). The data shows difference in mean was not statistically significant with p value of (0.8683).

Table no 8: Comparison between group A and group B for Waist hip ratio (WHR)

Table no 22: Comparison between group A and group B for Waist hip ratio (WHR)

	GROUP A	GROUP B
Mean	0.1708	0.05458
SD	0.01756	0.2020
p value	0.6856	

Graph no 3: Comparison between group A and group B for Waist hip ratio (WHR)



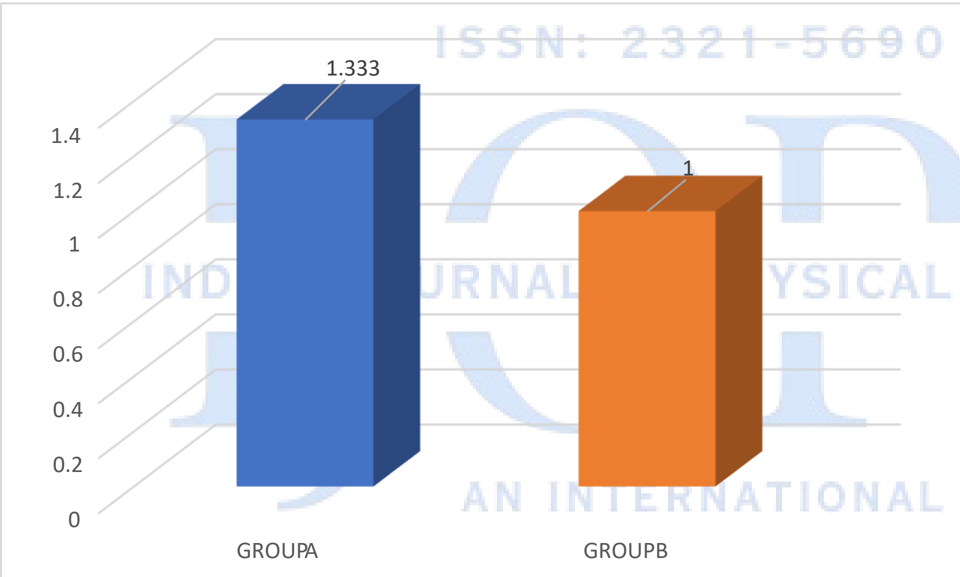
Inference:

When Inter group Comparison of Waist hip ration (WHR) was done between group A (exergaming aerobics programme) and group B (traditional aerobics programme). The data shows difference in mean was not statistically significant with p value of (0.6856).

Table no 23: Comparison between group A and group B for total fat %

	GROUP A	GROUP B
Mean	1.333	1.0000
SD	0.9168	2.980
p value	0.1677	

Graph 4: Comparison between group A and group B for total fat %



Inference

When Inter group Comparison of total fat % was done between group A (exergaming aerobics programme) and group B (traditional aerobics programme). The data shows difference in mean was not statistically significant with p value of (0.1677).

DISCUSSION

This study investigated the comparative effectiveness of exergaming aerobics and traditional treadmill-based aerobic training in individuals with grade 1 obesity. A total of 48 participants were randomly allocated into two groups: Group A (exergaming aerobics) and Group B (traditional treadmill aerobics), with 24 participants each. Both groups underwent four weeks of intervention, and outcomes were assessed using BMI, Rate of Perceived Exertion (RPE), Waist–Hip Ratio (WHR), and total body fat percentage.

Demographic data displayed similar baseline characteristics, with mean ages of 21 years in Group A and 21.5 years in Group B. Post-intervention comparisons showed significant within-group improvements in both groups across BMI, RPE, WHR, and total fat percentage.

In Group A, exergaming produced a significant reduction in BMI ($p = 0.0001$), consistent with findings from Staiano et al. and Maddison et al., who reported meaningful weight loss and improvements in cardiometabolic risk markers following exergame training. Mechanistically, the improvement is attributed to increased ATP turnover, enhanced glycolytic enzyme activity, and elevated basal metabolic rates associated with interactive physical engagement.

Similarly, Group B demonstrated significant BMI reduction ($p = 0.0001$), aligning with research by Lee HS and Shehata et al., which highlighted treadmill exercise as an effective modality for inducing lipolysis, improving fat oxidation, and enhancing total-body caloric expenditure through adjustable training intensities. RPE findings showed significant reductions within both groups ($p < 0.0001$), indicating improved exercise tolerance. Exergaming-induced reductions in perceived exertion correspond to literature by Gao et al., suggesting that immersive gameplay diverts attention from physical fatigue. Treadmill training similarly reduced RPE, which is supported by studies such as those by Sutaria et al. and McDonough et al., noting that predictable, modifiable treadmill settings promote better exertion management.

WHR improvements were also significant within both groups. Exergaming-related reductions in central adiposity align with conclusions from Anneke van Biljon and Armstrong et al., who reported that elevated energy expenditure and enhanced adherence contribute to improved body composition. Treadmill exercise outcomes are supported by findings from Fauza Alfin, where HIIT treadmill protocols significantly reduced abdominal fat through heightened EPOC, improved fat oxidation, and metabolic upregulation.

Total body fat percentage decreased significantly in both groups ($p = 0.0001$). Exergaming benefits parallel results from Joo et al., where interactive programs enhanced metabolic rate, muscle activation, and adherence. Treadmill effects align with Maillard et al., who documented reductions in body fat and waist circumference through sustained aerobic training.

However, inter-group comparisons revealed no statistically significant differences between exergaming and treadmill training for BMI ($p = 0.1120$), RPE ($p = 0.8683$), WHR ($p = 0.6856$), or total fat percentage ($p = 0.1677$). These findings support previous literature by Silva LM, Jo EA, Park J, Leininger et al., and Lyons et al., which collectively demonstrate that exergaming can elicit physiological responses comparable to traditional aerobic exercise when performed at similar intensities and durations.

Overall, the results indicate that both exergaming and traditional treadmill aerobics are equally effective in improving BMI, perceived exertion, waist–hip ratio, and total fat percentage in individuals with grade 1 obesity over four weeks. Since no significant differences were found between the two interventions, the null hypothesis is accepted. Thus, exergaming aerobics can be considered a viable alternative to traditional treadmill exercise, offering comparable physiological benefits with potentially greater enjoyment and adherence.

CONCLUSION

This study concluded that both exergaming aerobics and traditional aerobics are equally effective in reducing Body Mass Index, Waist Hip Ratio, total fat % and improving the Rate of Perceived Exertion in grade 1 obese population.

LIMITATION

Dietary habits were not monitored.

FUTURE SCOPE

- Long term follow-up intervention can be done.
- This study can be done on other population.
- Grade 2 & 3 obese population can also be considered.

CLINICAL IMPLICATION

Health professionals must be aware of all new exercise programs that will increase physical activity in this population. The emergence of exergaming has created a new trend in exercise.
The Nintendo Wii Fit is advertised as a way to exercise in the comforts of your own home.

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