A COMPARATIVE STUDY ON EFFECTS OF AEROBIC AND ANAEROBIC EXERCISES ON BODY COMPOSITION IN COLLEGE FEMALE FRESHMAN

[1]Dr. Ketaki Kulkarni, [Dr. Payal] Jain

[1]Assistant Professor, School of Physiotherapy, Bharati Vidyapeeth, Deemed university, [2]Associate Pro, [3]Designation of 3rd Author
[1]Name of Department of 1st Author,
[1]Name of organization of 1st Author, City, Country

Abstract :

Most of the people sleep late night and are often structured around a regular routine throughout the day, as college is very curtail period, young adults leave there parental home and enter into newly acquired freedom, where they have all the freedom to make their decisions on their own.

So, new freedom allows them independence for their personal choices and habits like sleeping time, food and drinking habits. This creates a major problem specially for first semester students is weight gain. One of the most difficult decision a college student can make is how to fit physical activity into a busy lifestyle.

So, the purpose of this study is to investigate and compare the effects of aerobic and anaerobic training on BMI, WHR and Body Skinfold percentage in female college freshman.

Objective of this study was to assess and compare the effectiveness of Aerobic and anaerobic exercises on body composition in female college freshman.

Methodology

Screening was done using IPAQ and 46 participants were included according to the inclusion and exclusion criteria and were equally divided into two groups i.e., Aerobic and Anaerobic. Study was conducted for 12 weeks, 3 days in a week and each session was conducted for 50 minutes.

Results

Chi square/ Fisher Exact, dependent and independent T test has been used to study significance of study parameters. Significance was assessed at 5% significance level. At the end, observed that anaerobic exercise is more significant than aerobic exercise.

T test two tailed, independent and dependent has been carried out. A significant difference in pre – post values observed. Within same group, P value observed significant and for Inter group analysis P values are not significant. As per graph 4, within group difference is more in anaerobic exercise compared with aerobic exercise. Significance observed is 0.001 for dependent test.

Conclusion

This study concluded that twelve weeks of exercise training program has shown significant effects on parameters used to assess obesity in this study i.e., on BMI, WHR and body Skinfold percentage. When compared with pre- and post-reading of groups within and with each other.

Key words

Female Freshman, Aerobic, Anaerobic, BMI, WHR, Body Fat %

INTRODUCTION

Human behavior in everyday life indicates that most people sleep late at night and are busy throughout the day. Working time is often structured around a regular routine that begins in the morning. Busy at work, everybody puts their well-being on the downside and unconsciously encourages a sedentary lifestyle[1]. Physical activity plays a crucial role in sustaining or achieving a balanced lifestyle[2].

College is a pivotal period in the lives of young adults[3,4]. When young adults leave the parental home and undergo changes in eating habits, physical activity, sleep schedule, and fast-food intake, the transition to college has been proposed as a crucial period for the establishment of weight control behavior[5]. College students' newly acquired freedom encourages them to make decisions and choices that were previously made for them. One of the most difficult decisions a college student can face is how to fit physical activity into a busy lifestyle[6].

The greatest decline in physical activity throughout young adults' transition through high school into post-secondary years and university-age students replicate an equivalent lack of physical activity. University-age student's frequency of vigorous physical activity a minimum of thrice per week declines 6.2% for men and 7.3% for ladies throughout the initial few years of university studies[7].

Excessive weight gain is caused by a lack of physical activity and an uncontrolled diet, resulting in obesity and other metabolic disorders. People's health is adversely affected by a secondary lifestyle because it increases or deteriorates the risk of high blood pressure, obesity, muscle weakness, bodily property defects, and lean body mass. Nowadays, fitness training is often discussed in a number of ways, and many people agree that systematic fitness training is essential for maintaining health[8,9].

Physical exercise is one of the most efficient ways to avoid weight gain and improve cardiovascular health. Aerobic and anaerobic exercises are two types of exercises that differ with intensity intervals and muscle fiber types involved. The World Health Organization (WHO) issued a guideline in 2010 based on three age groups: 5-17 years old, 18-64 years old, and >64 years old. Those between the ages of 18 to 64 should engage in at least 150 minutes of moderate exercise or 75 minutes of vigorous activity per week[10].

Every year, new workout plans are designed to support the promotion of physical fitness[11]. Aerobic exercise is described by the American College of Sports Medicine (ACSM) as any activity that involves a large number of muscle groups and is rhythmic in nature. This type of exercise activates muscle groups that depend on aerobic metabolism to extract energy from amino acids, carbohydrates, and fatty acids in the form of adenosine triphosphate (ATP). Cycling, dancing, long-distance running, jogging, swimming, and walking are all examples of aerobic exercise[12].

The term "aerobic" refers to physical activity that improves cardiorespiratory endurance. Aerobic exercises are rhythmic and repetitive, involving large muscle groups in the arms and legs for at least 20 minutes per session. For the last two decades, aerobic dance has provided participants with the ability to improve their fitness while also having fun and enjoying working out to music. Quick breathing for a long time is also a part of aerobic dance, as it pumps more oxygen into the bloodstream. Dance aerobics, step aerobics, low impact aerobics, high impact aerobics, water aerobics, and aerobics kickboxing are all examples of aerobics[13].

The American College of Sports Medicine (ACSM) defines anaerobic exercise as "intense physical activity of very short duration powered by the energy source within the contracting muscles and not involving the use of inhaled oxygen as an energy source." Our cells toggle to glycolysis and fermentation to make ATP when they don't have access to oxygen. Sprinting, high- intensity interval training (HITT), powerlifting, weight training, and other anaerobic exercises use fast-twitch muscles and generate considerably less ATP than their aerobic counterparts, resulting in the build-up of lactic acid[12,14].

Cross fit is an exercise program that focuses on improving health through the use of a wide range of functional movements. This CrossFit-based high-intensity interval training (HITT) has been used to enhance anaerobic fitness as an alternative to conventional endurance training. In comparison to conventional aerobic training, high-intensity power training (HIPT) can give improved aerobic fitness with less time commitment. The sustained high-power output associated with HIPT can act as a stimulant for positive changes in maximal aerobic potential and body composition[15,16,17].

Need of the Study

In day today life, most of the people sleep late night and are often structured around a regular routine throughout the day[1]. College is very curtail period as young adults leave there parental home and enter into newly acquired freedom, where they have all the freedom to make their decisions on their own which were earlier made for them by their parents, caretaker or guardian[2].

So, new freedom allows them independence for their personal choices and habits like sleeping time, food and drinking habits6. This creates a major problem specially for first semester students is weight gain. One of the most difficult decision a college student can make is how to fit physical activity into a busy lifestyle[7].

Uncontrolled Diet and lack of Physical Activity are two main causes of weight gain that can result in obesity and other metabolic disorders e.g., PCOS, Thyroid, Diabetes, Hypertension8. Frequency of vigorous physical activity a minimum of thrice per week declines 6.2% for men and 7.3% for ladies throughout the initial few years of university studies[7].

So, the purpose of this study is to investigate and compare the effects of aerobic and anaerobic training on BMI, WHR and Body Skinfold percentage in female college freshman.

Aim of the Study

Aim of the study is to compare and access the effectiveness of aerobic and anaerobic exercise on body composition in college female freshman.

Objectives of the Study

1.- To assess the effectiveness of aerobic exercises on BMI & waist to hip ratio and skinfold measurements in college female freshman.
2.- To assess the effectiveness of anaerobic exercises on BMI & waist to hip ratio and skinfold measurements in college female freshman.
3.- To compare the effectiveness of aerobic & Anaerobic exercises on BMI & waist to hip ratio and skinfold measurements in college female freshman.

Methodology and Procedure- The study was conducted at Garden City University, Bangalore, involving female freshmen from the School of Health Sciences. A total of 46 participants, aged between 18 and 24 years with a BMI of 25 or above and a waist-to-hip ratio (WHR) over 0.8, were selected using convenient sampling. The study excluded individuals with cardiorespiratory, neurological, or musculoskeletal disorders, as well as those with hormonal imbalances. After screening for low physical activity levels using the International Physical Activity Questionnaire (IPAQ), eligible participants were randomly assigned into two groups of 23 using a lottery method. Baseline data, including age, height, weight, WHR, BMI, and body fat percentage (via skinfold measurements), were recorded after informed consent was obtained. Participants underwent a familiarization week with either aerobic or anaerobic training, depending on their group. The intervention lasted 12 weeks, with 50-minute training sessions conducted three times per week. Assessments were carried out at the beginning and end of the study using IPAQ, BMI, WHR, and skinfold measurements.

Exercise intervention

Aerobic training sessions: Group A

Warm-up 10 minutes

Alternative running 20 minutes (Side by side, step touch, sit up, side lunge, single hamstring walk, heel touch,v step, pivot turn, cha cha cha, mambo rock, diamond step, push up, walking). Abdominal exercises 10 minutes
Cool down / static stretching 10 minutes

Anaerobic training sessions: Group B

Warm-up 10 minutes

Full body, body weight exercises 30 minutes (spot marching, knee-up, modified push up, burpees exercises, side forearem, plank forearm plank, abdominal crunches, bilateral leg raises, pelvic bridging, squats, reverse plank, jumping jack)
Cool down / static stretching 10 minutes

Result Analysis
DATA ANALYSIS AND GRAPH Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. The following assumptions on data is made, Assumptions: 1. Dependent variables should be normally distributed, 2. Samples drawn from the population should be random, Cases of the samples should be independent. The paired t-test is used to test the null hypothesis that the average of the differences between a series of paired observations is zero. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups

Table 1: Age distribution in two groups of patients studied

Age in Yrs	AEROBICS EXERCISE	ANAEROBICS EXERCISE	Total
18	16(69.6%)	18(78.3%)	34(73.9%)
19	7(30.4%)	5(21.7%)	12(26.1%)
Total	23(100%)	23(100%)	46(100%)

P=0.502, Not Significant, Chi-Square Test

Results of age distribution in two groups of patients studied that there were 16(69.6%) participants in Aerobic Group and 18(78.3%) in Anaerobic Group for the age group of 18; 7(30.4%) participants are in Aerobic group and 5(21.7%) are in Anaerobic group for the age group of 19. Total number of sample size was n=46(100%) and in each group there were n=23(100%) number of participants.

Table 2: Height cm- distribution in two groups of patients studied

Height cm	AEROBICS EXERCISE	ANAEROBICS EXERCISE	Total
≤155	8(34.8%)	12(52.2%)	20(43.5%)
>155	15(65.2%)	11(47.8%)	26(56.5%)
Total	23(100%)	23(100%)	46(100%)

P=0.234, Not Significant, Chi-Square Test

Results of age distribution in two groups of patients studied that there were 8(34.8%) participants in Aerobic Group and 12(52.2%) in Anaerobic Group for the age group of height ≤155 mm; 15(65.2%) participants are in Aerobic group and 11(47.8%) are in Anaerobic group for the age group of height >155 mm. Total number of sample size was n=46(100%) and in each group there were n=23(100%) number of participants.

Table 3: Comparison of Age and Height (cm) in two groups of patients studied

Variables	AEROBICS EXERCISE	ANAEROBICS EXERCISE	Total	P Value
Age in Yrs	18.30±0.47	18.21±0.42	18.26±0.44	0.513
Height cm	157.34±3.18	156.65±3.88	157.00±3.52	0.510

Results of comparison of Age and Height in two groups of patients studied. Values mentioned are in mean and ± SD. As the P value is 00.513 for age and 0.510 for height, the comparison is not observed significant.

Graph 1: Weight (Kg)

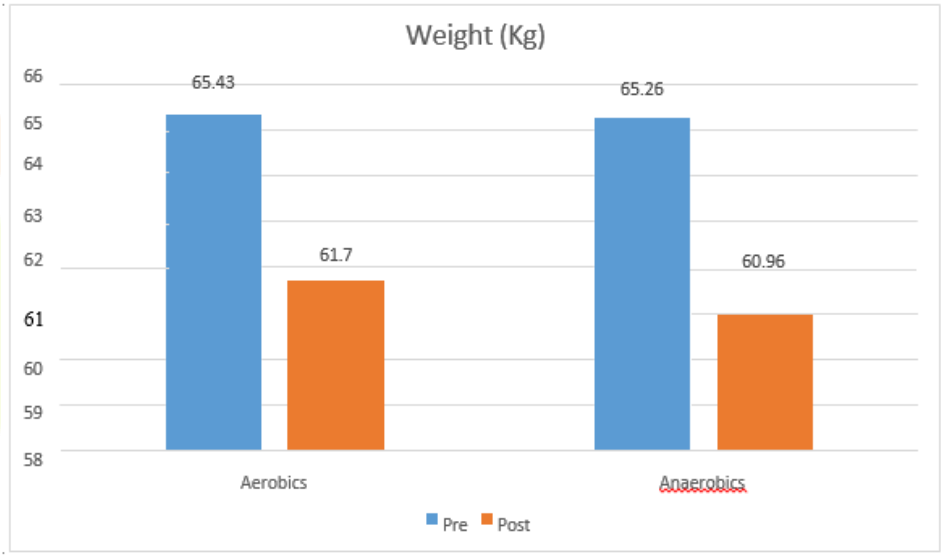

Table 4: Comparison of Clinical variables in two groups of patients studied

Variables	AEROBICS EXERCISE	ANAEROBICS EXERCISE	Total	P Value
Weight Kg				
Pre	65.43±2.98	65.26±3.82	65.35±3.39	0.864
Post	61.7±2.49	60.96±3.48	61.33±3.02	0.412

Difference	3.73	4.30	4.02	-
P value	<0.001**	<0.001**	<0.001**	-

For the graph 1 and table 4 - t test two tailed, independent and dependent has been carried out. As per the table 4, a significant difference in pre – post values observed. Within group, P value observed significant and for Inter group analysis P values are not significant. As per graph 1, within group difference is more in anaerobic exercise compared with aerobic exercise. So, anaerobic exercise is more significant than aerobic exercise for comparison of weight variables in two groups.

Graph 2: BMI

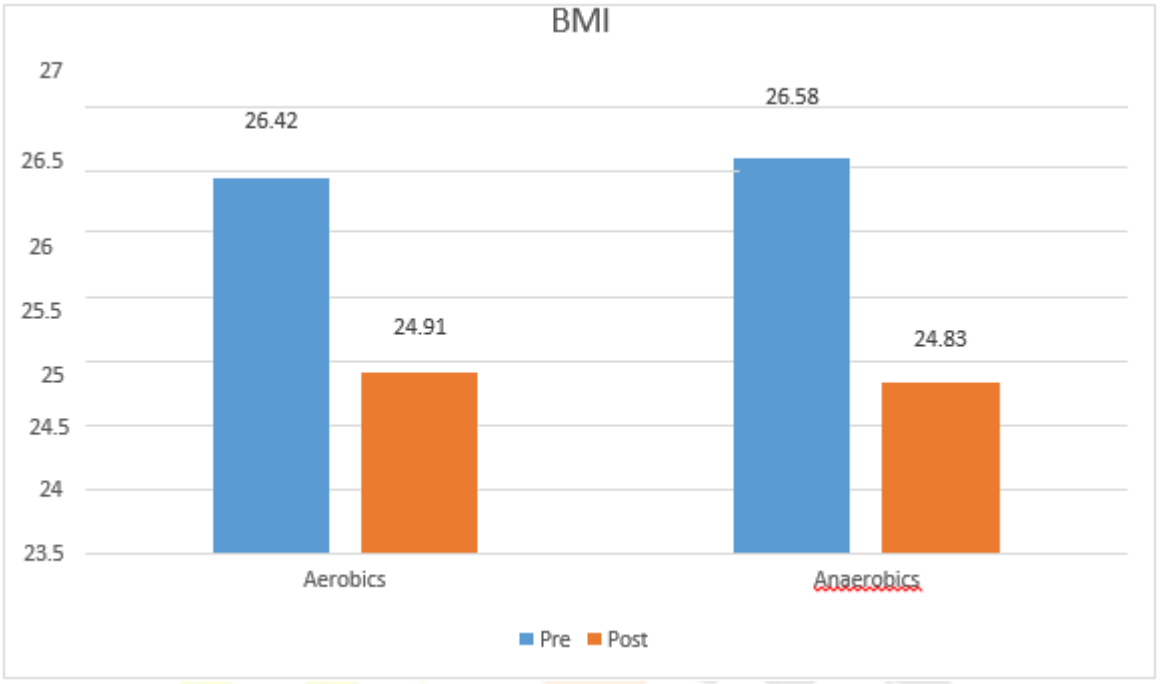

Table 5: Comparison of Clinical variables in two groups of patients studied

Variables	AEROBICS EXERCISE	ANAEROBICS EXERCISE	Total	P Value
		BMI		
Pre	26.42±0.65	26.58±0.88	26.5±0.77	0.497
Post	24.91±0.66	24.83±0.91	24.87±0.79	0.726
Difference	1.51	1.75	1.63	-
P value	<0.001**	<0.001**	<0.001**	-

Comparison of Clinical variables in two groups of patients studied for BMI, mean value was 65.43 with the standard deviation of 2.98 for pre-test recordings of Aerobic group and for post- test recordings mean value was 61.7 with the standard deviation of 2.49, which showed difference of 3.73 with a p value of <0.001 which says that aerobic Exercise training is highly significant on BMI in college female freshman. Similarly, it was done for Anaerobic group, mean value was 65.26 with the standard deviation of 3.82for pre-test recordings and for post- test recordings mean value was 60.96 with the standard deviation of 3.48, which showed difference of 4.30 with a p value of <0.001 which says that Anaerobic Exercise training is highly significant on BMI in college female freshman.

Graph 3: WTH Ratio

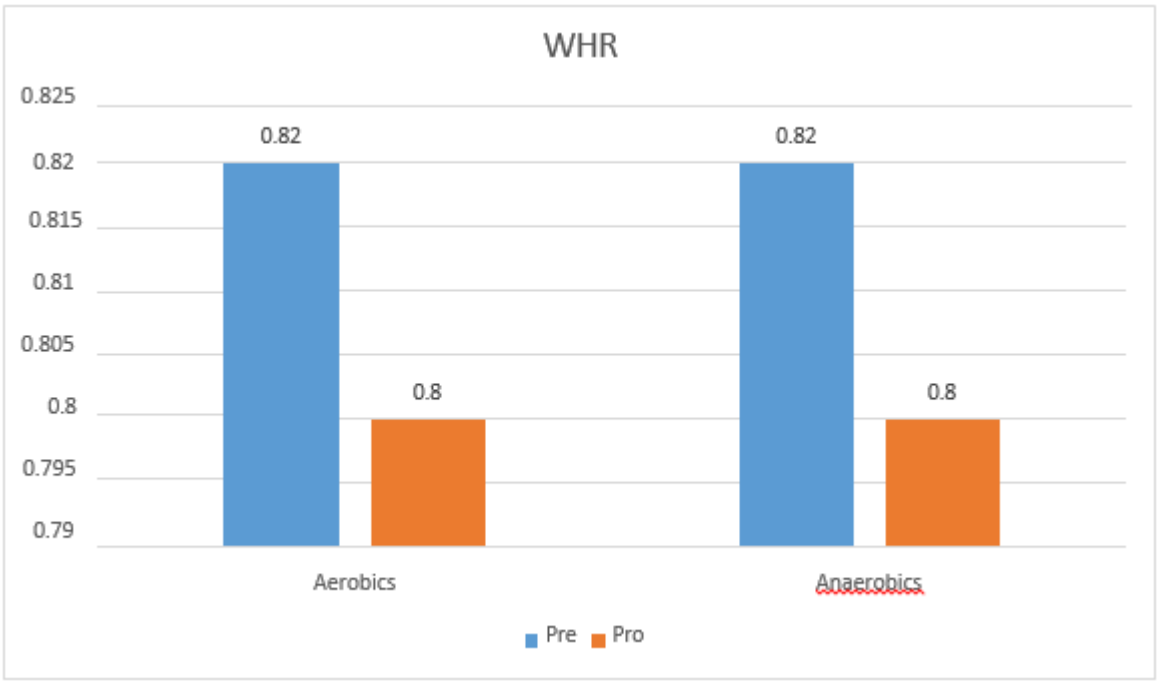

Table 6: Comparison of Clinical variables in two groups of patients studied

Variables	AEROBICS EXERCISE	ANAEROBICS EXERCISE	Total	P Value
WTH ratio				
Pre	0.82±0.01	0.82±0.01	0.82±0.01	0.474
Post	0.8±0.01	0.8±0.01	0.8±0.01	0.736
Difference	0.015	0.071	0.016	-
P value	<0.001**	<0.001**	<0.001**	-

Comparison of Clinical variables in two groups of patients studied for WHR, mean value was 0.82with the standard deviation of 0.01for pre-test recordings of Aerobic group and for post- test recordings mean value was 0.8 with the standard deviation of 0.01, which showed difference of 0.015with a p value of <0.001 which says that aerobic Exercise training is highly significant on WHR in college female freshman.

Similarly, it was done for Anaerobic group, mean value was 0.82 with the standard deviation of 0.01for pre-test recordings and for post-test recordings mean value was 0.8 with the standard deviation of 0.01, which showed difference of 0.071with a p value of <0.001 which says that Anaerobic Exercise training is highly significant on WHR in college female freshman.

Graph 4: Comparison of pre-test and post-test Body Fat % for both the groups.

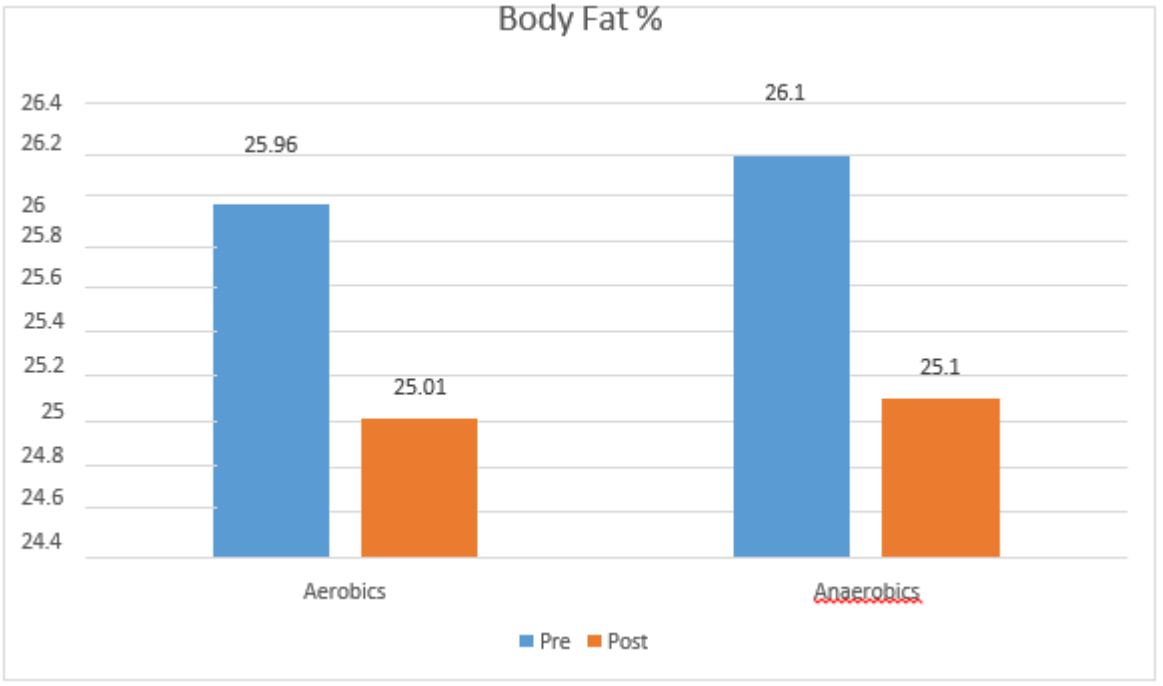

Table 7: Comparison of 3 Skin Fold Measurements and other outcome variables in two groups of patients studied

Variables	AEROBICS EXERCISE	ANAEROBICS EXERCISE	Total	P Value
Sum of 3 SkinFold				
Pre	68.11±3.25	68.89±3.19	68.5±3.21	0.416
Post	65.1±3.09	65.38±3.3	65.24±3.16	0.766
Difference	3.00	3.50	3.25	-
P value	<0.001**	<0.001**	<0.001**	-
BF%				
Pre	25.96±0.99	26.19±0.99	26.08±0.99	0.423
Post	25.01±0.96	25.1±1.04	25.06±0.99	0.773
Difference	0.94	1.09	1.01	-
P value	<0.001**	<0.001**	<0.001**	-

Comparison of Clinical variables in two groups of patients studied for Body Fat %, mean value was 25.96 with the standard deviation of 0.99 for pre-test recordings of Aerobic group and for post-test recordings mean value was 25.01 with the standard deviation of 0.96, which showed difference of 0.94 with a p value of <0.001 which says that aerobic Exercise training is highly significant on Body Fat % in college female freshman.

Similarly, it was done for Anaerobic group, mean value was 26.19 with the standard deviation of 0.99 for pre-test recordings and for post-test recordings mean value was 25.1 with the standard deviation of 1.04, which showed difference of 1.09 with a p value of <0.001 which says that Anaerobic Exercise training is highly significant on BMI in college female freshman.

For the graph 4 and table 7 - t test two tailed, independent and dependent has been carried out. As per the table 7, a significant difference in pre – post values observed. Within group, P value observed significant and for Inter group analysis P values are not significant. As per graph 4, within group difference is more in anaerobic exercise compared with aerobic exercise. So, anaerobic exercise is more significant than aerobic exercise for comparison of weight variables in two groups.

So, overall observation was, anaerobic exercise is more significant than aerobic exercise. T test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Leven`s test for homogeneity of variance has been performed to assess the homogeneity of variance. A t- test is a statistical test that is used to compare the means of two groups. It is often used in hypothesis testing to determine whether a process or treatment actually has an effect on the population of interest, or whether two groups are different from one another with the null hypothesis (H0) is that the true difference between these group means is zero and the alternate hypothesis (Ha) is that the true difference is different from zero.

The paired t-test is used to test the null hypothesis that the average of the differences between a series of paired observations is zero. Student t test (two tailed, dependent) has been used to find the significance of study parameters on continuous scale with in each group.

Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups, Non-parametric setting for Qualitative data analysis. Fisher Exact test used when cell samples are very small.

Significant figures:

+ Suggestive significance (P value: 0.05<P<0.10)

* Moderately significant (P value:0.01<P≤ 0.05)

** Strongly significant (P value: P≤0.01)

Statistical software: The Statistical software namely SPSS 22.0, and R environment ver.3.2.2 were used for the analysis of the data and Microsoft word and Excel have been used to generate graphs, tables etc

Discussion

This study aimed to investigate and compare the effects of aerobic and anaerobic exercises on body composition of college going female freshman. As female freshman leaves home to attend college, this transitional period of high school to college life and new independence is a critical for intervening on life-long healthy habits[21].

Problem for most of the students during the freshman year, specially the first semester is weight gain. There are various studies which has examined first semester weight changes in college freshman[22]. This study was conducted on college female freshman, who stayed away from their home for studies, and they were included as participants after six months from joining the college. The best way to mobilize body fat is to follow the approach in which physical activity are systematically planned[23]. Genetics, food gender, and health related factors influencing the reduction of fat including various forms of physical activity (Aerobic or Anaerobic), which is considered useful in delaying excess body fat, support the use of exercise as a weight loss intervention[24,25]. Various studies had shown significant results on the effects of various types of physical activities on body composition in young, middle age, older women in terms of body weight, body fat percent, and visceral fat or waist to hip ratio[26].

First objective of this study was to assess the effectiveness of aerobic (dance aerobics) exercise on body composition in college female freshman. Which revealed that there is significant ($p < 0.05$) improvement in BMI, WHR, and body Skinfold percentage for girls performing within group A. There are various studies which supported this intervention. As transition to college allows them freedom to make their own decisions which is the major reason behind ignorance to physical activity into their daily routine[27]. Thus, into a sedentary life intervention of dance aerobics in the form of Aerobic exercises turned out to be an effective, systematic and fun-loving fitness training program for weight loss[28].

Second objective of this study found that there is significant ($p > 0.05$) improvement in body composition of college going female freshman on participants of group B i.e., Anaerobic group, by performing Anaerobic form of exercise with the variant of HITT (High Intensity Interval Training). There are various studies done with this form of exercise and showed significant results. Thus, HITT not only improves Aerobic fitness but is equally effective on Parameters used to evaluate obesity in this study i.e., BMI, WHR and Body Skinfold percentage[29].

Finally, comparison was done between participants of group A and group B and results came out as Anaerobic form of exercise is more effective on all the parameters used to calculated obesity in this study. This was third objective of this study.

As a result of twelve week Aerobic and Anaerobic training Program, both the groups showed significant improvement when compared individually within there groups with pre-test and post- test readings. And Anaerobic form of exercise turned out to be the most effective among both of them in college female freshman.

Thus, adding the component of physical activity into daily routine can help maintaining and improving flexibility, cardiorespiratory endurance, musculoskeletal endurance, muscular strength and promotes fat loss. Physical activity can be one of those components which helps to prevent health related issues and promotes a healthy lifestyle. Then it can be in any of either form of Aerobic or Anaerobic.

Conclusion

This study concluded that twelve weeks of exercise training program has shown significant effects on parameters used to assess obesity in this study i.e., on BMI, WHR and body Skinfold percentage.

Intervention of Aerobic training program performed for twelve weeks on college female freshman was significantly effective on body composition.

Intervention of Anaerobic training program performed for twelve weeks on college female freshman was significantly effective on body composition.

Intervention of Aerobic and Anaerobic training program performed for twelve weeks on college female freshman, when compared with each-other we found that Anaerobic training program stood out to be the most effective form of fitness training program.

Limitations of the Study

1. Only fitness component was involved.
2. Only healthy female freshers were included.

Recommendations

1. Study can be further done by taking large sample size.
2. Along with fitness training dietary component can also be added for more effective results. As diet also plays an important role in weight loss.
3. Both the genders can be included.
4. Study can be done with female freshman having specific health issues i.e., hypothyroid, hyperthyroid, PCOS etc.

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