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RESEARCH ARTICLE

EFFICACY OF JACOBSON'S RELAXATION TECHNIQUE IN IMPROVING AEROBIC FITNESS (VO2max) IN YOUNG ADULTS - AN EXPERIMENTAL STUDY

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ABSTRACT

Background: - Physical activity is a major risk factor of the disease which leads cardio respiratory problem, obesity etc. maximal (or peak) oxygen consumption (VO_2max) is acknowledge as the best physiological measure of cardio respiratory fitness. Aerobic exercise is associated with improvement in maximal oxygen consumption (VO_2max) and cardiovascular fitness. **Objective**: To determine the Efficacy of Jacobson's Relaxation Technique in improving the aerobic fitness ((VO_2max) in young adults. **Participants:** Total sixty subjects have been included in the study (aged 18-40 years). The subjects were randomly selected through chit method and divided into two group i.e 30 in Jacobson's Relaxation Technique Group (A) and 30 in Aerobic Exercise (brisk walking Group (B) respectively. the pre and post intervention SPO_2, Blood Pressure, Heart Rate and VO_2max were noted and compared in two exercise conditions for duration of 4 weeks. The VO_2max was measured for baseline and after 4 weeks intervention with the help of Rockport walking test. **Result:** The statistical analysis revealed significant difference in post 4 week intervention reading of maximal oxygen uptake (VO_2max) (t value = 1.928, p= 0.59), but the not significant difference of SPO_2 (t value = 0.929, p= 0.358), Diastolic Blood Pressure (t value = 1.307, p= 0.197) Systolic Blood Pressure (t value = 0.412, p= 0.082), Heart Rate (t value = 0.658, p= 0.513) respectively. Similarly, there were significant difference with in Jacobson relaxation exercise Group for pre and post 4 week intervention value of maximal oxygen uptake (VO_2max) (t value = 6.146, p= 0.00), SPO_2 (t value = 3.633, p= 0.001), Diastolic Blood Pressure (t value = 1.120, p= 0.197) Systolic Blood Pressure (t value = 2.615, p= 0.14), Heart Rate (t value = 19.630, p= 0.00) respectively. **Conclusion-** This study concluded that the Exercise interventions in form of Jacobson's Relaxation Technique and Aerobic Exercise can bring improvement in maximal oxygen uptake (vo2max) in normal young adults. It is hypothetically proved that the Jacobson's relaxation technique is more effective as compared to the aerobic exercise.

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INTRODUCTION

Physical activity means when any bodily movement is produced by contraction of skeletal muscle that substantially increases energy expenditure (Howley, 2001). Exercise is a subcategory of Leisure-time physical activity in which well planned; structured body movements are repeatedly performed for improving and maintaining one or more components of physical fitness (Blair *et al*., 2001). Regular aerobic physical activity increases exercise capacity and plays a role in prevention of cardiovascular disease (Fletcher *et al*., 1992). Extensive researches reported that physical activity in beneficial long short term effects .Lack of evidence to prove the effectiveness of physical fitness on health outcome in young age (Ortega *et al*., 2008).

Worldwide, we appraise that physical idleness causes 6% (running from 3.2% in southeast Asia to 7.8% in the eastern Mediterranean locale) of the weight of sickness from coronary illness, 7% (3.9–9.6) of sort 2 diabetes, 10% (5.6–14.1) of bosom malignancy, and 10% (5.7–13.8) of colon disease. Dormancy causes 9% (territory 5.1–12.5) of untimely mortality, or more than 5.3 million of the 57 million passing that happened worldwide in 2008. We evaluated that disposal of physical latency would build the future of the total populace by 0.68 (territory 0.41–0.95) years (Amisola *et al*., 2003; Lee *et al*., 2012). Exercise stress test is useful to measure Functional high-impact limit can be dispassionately measured with a practice push test aerobic capacity which is used to diagnose ischemic heart disease, prescribing exercise and to guide for cardiac rehabilitation (Howley *et al*., 1995; Huggett

et al., 2005). Poor classification for every age assemble speaks to the lower furthest reaches of cardio respiratory beneath which likely place an individual expanded hazard for cardiovascular disease (McArdle *et al*., 2006).Treadmill testing is the most accurate test for assessing the cardio respiratory wellness of a person (Chavda *et al*., 2013). VO_2max is predictor of mortality as well as cardiovascular disease. Over weight and VO_2max max are inversely associated with each other (Moradichaleshtori *et al*., 2008). Maximal oxygen utilization is viewed as the highest quality level of cardio-aspiratory and muscle cell fitness (Laxmi *et al*., 2014). Body mass index is used for calculation of body fat. Mortality and death occur in both overweight and underweight (Dhara *et al*., 2015). Systolic blood pressure more than 140 and diastolic blood pressure more than 90 is considered high blood as hypertension does not comes under normal these values are considered as border line between normal blood pressure and hypertension (Carretero *et al*., 2000; Shinde *et al*., 2013).According to Sir Charles Bell when a muscle contracts (tenses), volleys of neural motivations are produced and conveyed to the brain along with afferent neural pathways. At the point when volleys of neural driving forces produced by contracting muscle criticism to the cerebrum for to a great degree complex occasion comes about after which neural motivations come back to the muscle along efferent neural pathways (McGuigan *et al*., 2007; Srilekha *et al*., 2013)

Need of the study: Many studies has been done to find out effectiveness of Jacobson technique in improving blood pressure and heart rate on stress individuals but no study has been done to find out Jacobson technique on improving cardiovascular fitness and aerobic capacity. So, present study helps to compare the significant result of Jacobson technique in young healthy adults for improving cardiovascular fitness.

MATERIALS AND METHODS

Study design: Experimental Study Design

Study setting: The present study was conducted in the Uni-Hospital, Department of Physiotherapy, Lovely professional university, Phagwara, Punjab.

Populaton and sampling: 60 subjects were selected by convenient sampling (a randomized control trial) criteria and randomly assigned in to 2 groups 30 in each group.

- Group A = Jacobson relaxation technique
- Group B = Aerobic exercise (20 min walking)

Selection criteria: Subjects were included and excluded as per the following criteria.

Inclusion criteria

- Age: 20-45 years
- Anybody who are interested to improve their fitness
- Both male and females
- Persons with no h/o severe Musculoskeletal disorders
- BMI- normal and overweight (>19.0 - < 29.0).

Exclusion criteria

- Severe co morbid illness
- Person already doing aerobic training
- Any surgeries during the study
- Any traumas during the study
- Status asthmaticus
- Status epilepticus
- Orthostatic hypotension
- Intermittent claudication
- Peripheral Vascular Disorders

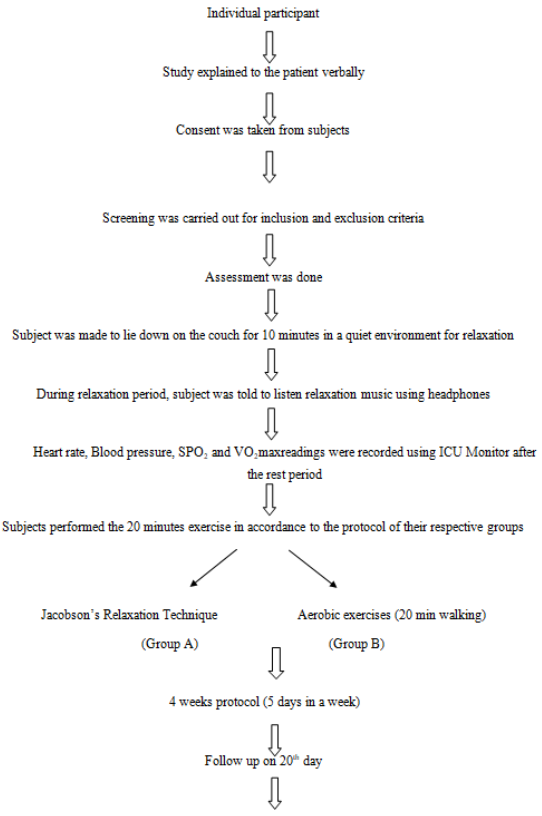
Parameters

- Heart rate
- Oxygen consumption (VO_2max)
- Blood pressure
- SPO_2

Instruments and tool

- ICU Monitor
- Stop watch
- Weight machine
- Measuring tape
- Treatment table
- Phone and headphone

Procedure: The participants were selected using convenient sampling and then subjects were allocated in two groups A and B with 30 subjects in each group.



Procedure: The subjects were asked to lie down on the couch for 10 minutes rest. In addition to this, they were asked to listen to the relaxation music using the headphones. This was done so that the subjects would be stress free and will feel relaxed. After this rest period, VO_2max, Heart rate, Blood pressure and SPO_2 readings were recorded using the ICU Monitor.

Participants were asked to report any type of discomfort or any other problem after completion of the protocol. Subjects were asked to perform the followings exercises for 20 minutes according to their respective groups.

Intervention

Group A

Jacobson's Relaxation Technique – The subjects were asked to do the isometric contraction of particular muscles with 10 seconds hold and 10 repetitions for each muscle.

- Asked the patient to inhale gently, hold for some time and then exhale.
- Asked the patient to pull his toes slightly in upward direction toward knees. Hold it for some time and then let it go. Feel the difference
- Asked the patient to push the heel in downward direction towards the floor. Hold it for some time and then let it go.
- Asked the patient to straighten his knees and hold it for some time and then let it go.
- Asked the patient to squeeze his buttocks together. Hold it for some time and let it go.
- Asked the patient to tuck his tummy in towards the spine. Hold it for some time and then let it go. Recognize the difference.
- Asked the patient to pull the shoulders toward his ears for relieving the tension. Hold it for some time and then let it go. Feel the difference
- Asked the patient slightly press his elbow and upper arm to the side of his body. Hold it for some time and then let it go.
- Asked the patient to slightly make a fist of both hand. Hold it for some time and then let it go.
- Asked the patient to gently move his head in forward direction. Hold it for some time and then come back to the previous position.
- Asked the patient to clench his teeth together. Hold it for some time and then let your jaw sag slightly. Recognize the difference.
- Asked the patient to press his lips together. Hold it for some time and then let it go until tightly touching. Come back to the previous position. Recognize the difference.
- Asked the patient to fold or press his tongue gently under the mouth. Hold it for some time and let it -droop- loosely.
- Asked the patient to tighten his eye slightly. Hold it for some time and then let it go.
- Asked the patient to do the frowning of his forehead. Hold it for some time and the let it go.
- Now experience the relaxation and enjoying the feeling repeat it again.

Group B

Subjects were asked to do aerobic exercises i.e. brisk walking for 20 minutes using stop watch: This protocol was followed by the subjects for 4 weeks (5 days in a week). On 20th day patient came to lab again Post values of Heart rate, Blood pressure, $SPO_2$and VO2max readings were recorded through ICU Monitor after the exercise

VO_2max calculation: VO_2max formula was calculated using heart rate, weight and age.

VO_2 max ($ml\,kg^{-1}\,min^{-1}$) = 132.853 – (0.0769*weight) - (0.3877 * age) + (6.315 * gender) - (3.2649 * mile walk time) - (0.1565 * ending heart rate)

Where: Gender = 1 for male, 0 for female

Weight = pounds

Mile walk time = minutes and fractions of minute (14:30 = 14.5 min)

Note: For individuals between 18-24 years old, subtract 6 $ml\,kg^{-1}\,min^{-1}$

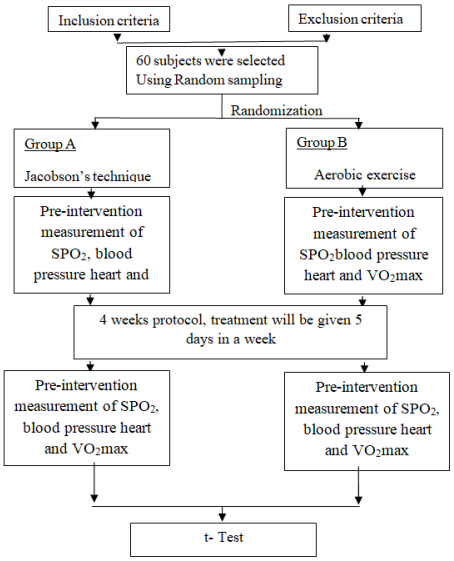


Figure 1. Subjects performing Jacobson's relaxation technique

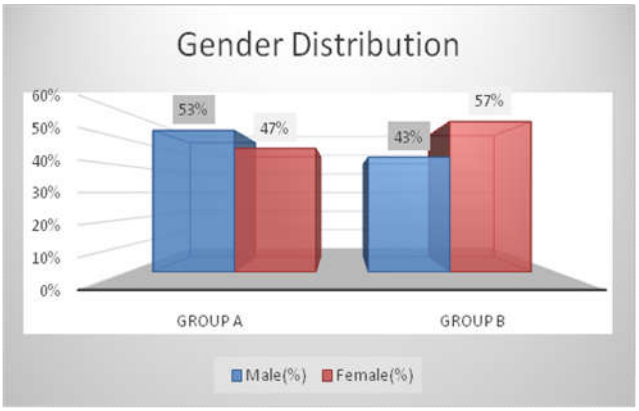
Figure 2. Subject performing Aerobic Exercise (brisk walking)

DATA ANALYSIS AND RESULT

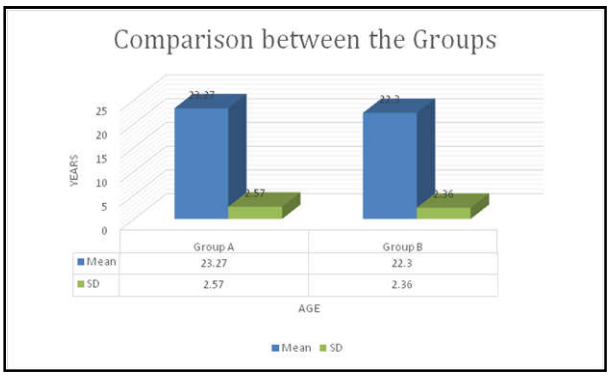
Statistics were performed using SPSS Software 20.0 Level of significance selected for the study $p<0.05$

Table 1. Demographic characteristic of the participants of Group A and Group B

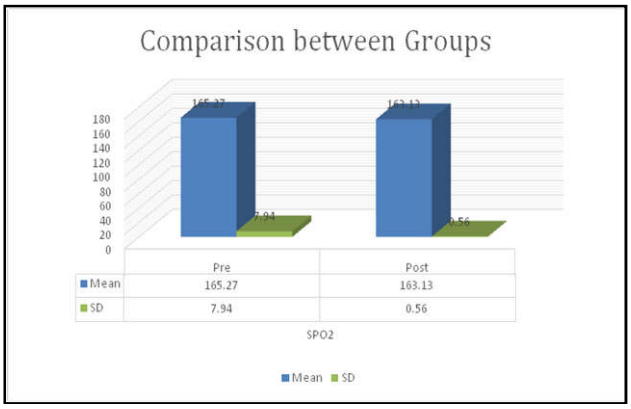
Group	Group A	Group B
Male(f)	16	13
Female(f)	14	17
Group	Group A	Group B
Male (%)	53%	43%
Female (%)	47%	57%



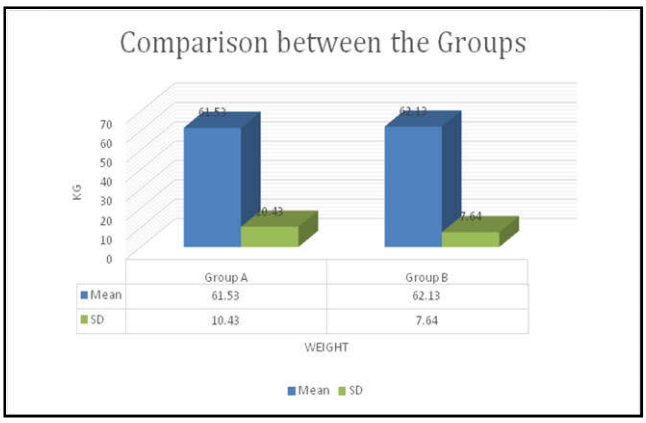
Graph 1. Percentage of Male and Female in Group A and Group B



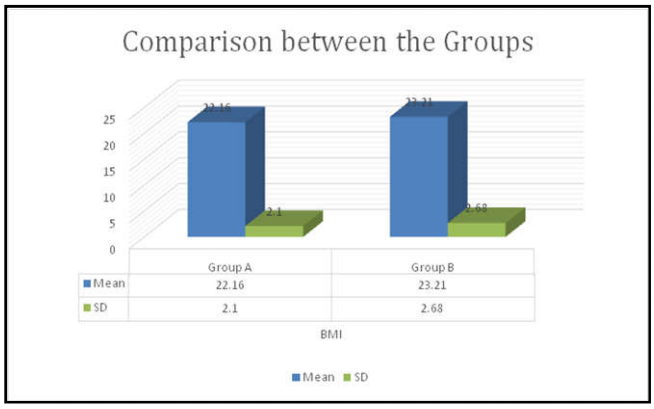
Graph 2. Comparison of Mean and SD of age between Group A and Group B



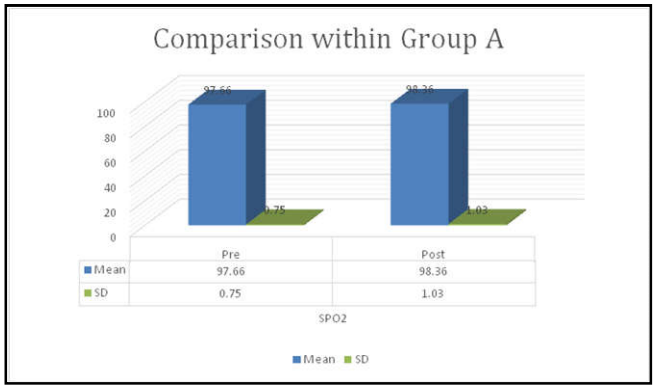
Graph 3. Comparison of Mean and SD of age between Group A and Group B



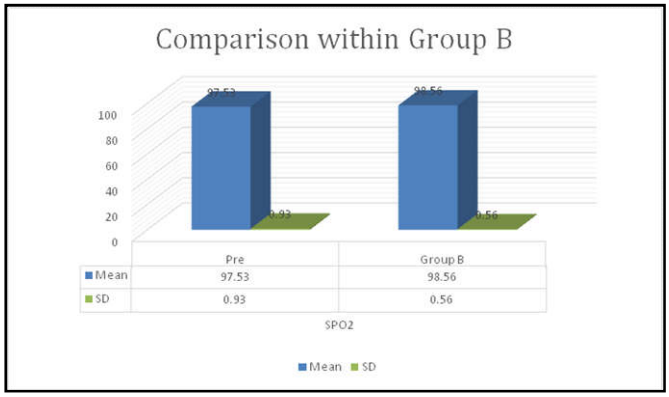
Graph 4. Comparison of Mean and SD of Weight between Group A and Group B



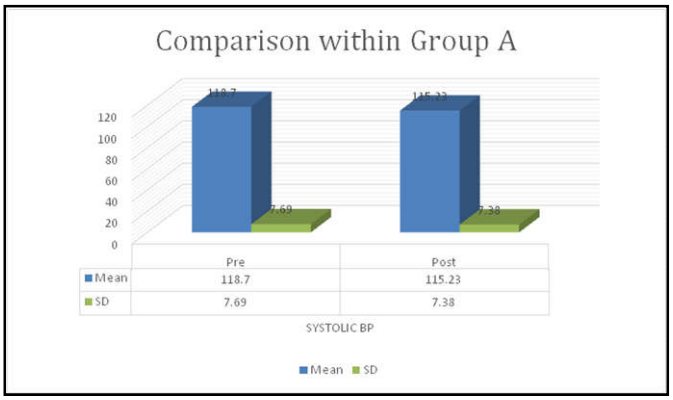
Graph 5. Comparison of Mean and SD of BMI between Group A and Group B



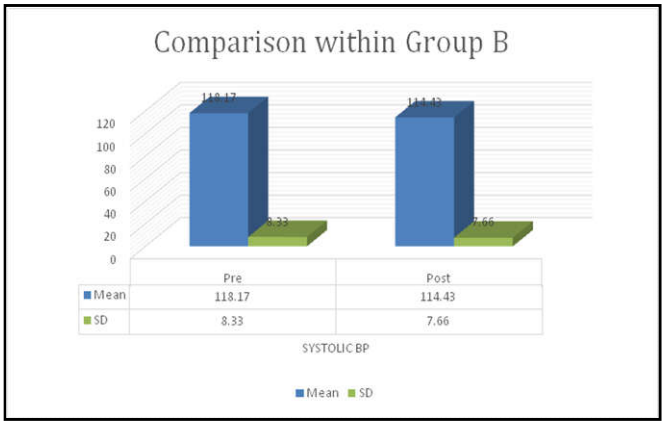
Graph 6. Comparison of Mean and SD of variable SPO2 Group A



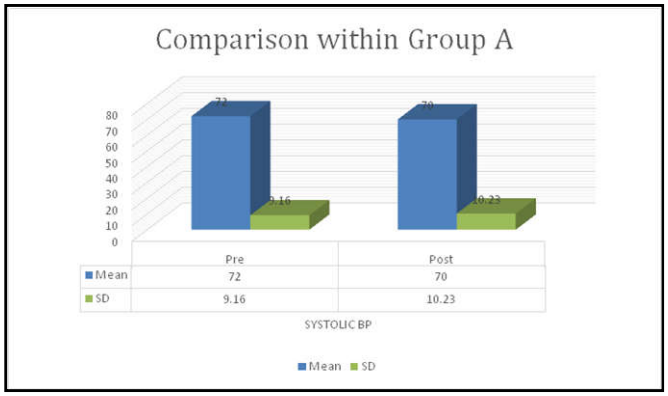
Graph 7. Comparison of Mean and SD of variable SPO2 Group B



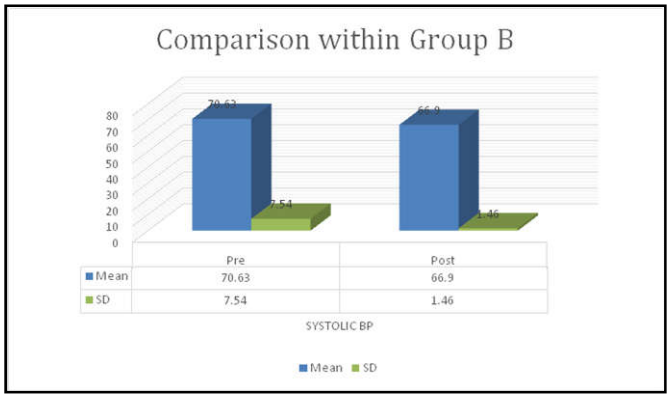
Graph 8. Comparison of Mean and SD of variable Systolic Blood Pressure Group A



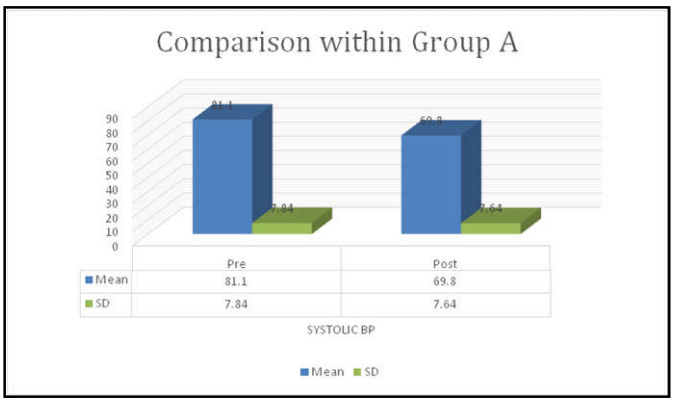
Graph 9: Comparison of Mean and SD of variable Systolic Blood Pressure Group B



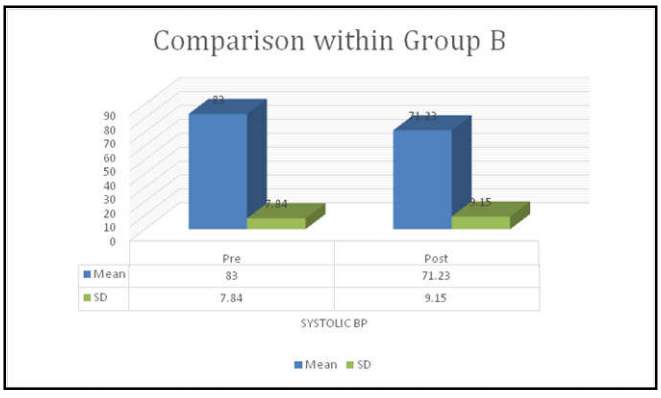
Graph 10. Comparison of Mean and SD of variable Diastolic Blood Pressure Group A



Graph 11. Comparison of Mean and SD of variable Diastolic Blood Pressure Group B



Graph 12. Comparison of Mean and SD of variable Heart Rate Group A



Graph 13. Comparison of Mean and SD of variable Heart Rate Group B

Table 2. Comparison of mean and sd of age, height, weight (kg and pounds) and bmi between of group A & B

	Group A	Group B	Mean difference	T	P Value
Age Mean ± SD	23.27 ± 2.57	22.30 ± 2.36	0.97	1.507	0.148
Height Mean ± SD	165.27 ± 7.94	163.13 ± 8.13	2.13	1.028	0.3.84
Weight kg Mean ± SD	61.53 ± 10.43	62.13 ± 7.64	0.60	1.187	0.7840
Weight pounds Mean ± SD	135.58 ± 23.04	136.83 ± 21.08	6.84	1.199	0.7950
BMI Mean ± SD	22.16 ± 2.10	23.21 ± 2.68	1.15	1.921	0.0670

Table 3. Paired t –test for the variable spo_2 with in group A & B

	Pre Mean ± SD	Post Mean ± SD	Mean difference	P value	T
Group A	97.66 ± 0.75	98.36 ± 1.03	0.70	.001	3.633
Group B	97.53 ± 0.93	98.56 ± 0.56	1.03	.000	5.477

Table 4. Paired t –test for the variable systolic blood pressure with in group A & B

	Pre Mean ± SD	Post Mean ± SD	Mean difference	P value	T
Group A	118.70± 7.69	115.23± 7.38	3.47	.012	2.666
Group B	118.17±8.33	114.43± 7.66	3.73	.014	2.615

Table 5. Paired t –test for the variable distolic blood pressure with in group A & B

	Pre Mean ± SD	Post Mean ± SD	Mean difference	P value	T
Group A	72.00 ± 9.16	70.00 ± 10.23	2.00	0.27	1.12
Group B	70.63 ± 7.54	66.90 ± 1.46	3.73	0.12	2.68

Table 6. Paired t –test for the variable heart rate with in group A & B

	Pre Mean ± SD	Post Mean ± SD	Mean difference	P value	T
Group A	81.10 ± 7.84	69.80 ±7.64	1.130	.000	19.630
Group B	83.00 ± 7.84	71.23 ± 9.15	1.176	.000	8.981

Table 7. Paired t –test for the variable vo2max with in group A & B

	Pre Mean ± SD	Post Mean ± SD	Mean difference	P value	T
Group A	34.48 ± 3.36	36.34 ± 3.78	1.86	.000	6.146
Group B	32.37 ± 4.34	34.18 ± 4.82	1.00	.000	8.632

Table 8. Unpaired t-test for the variable pre and post values of spo_2between group A & B

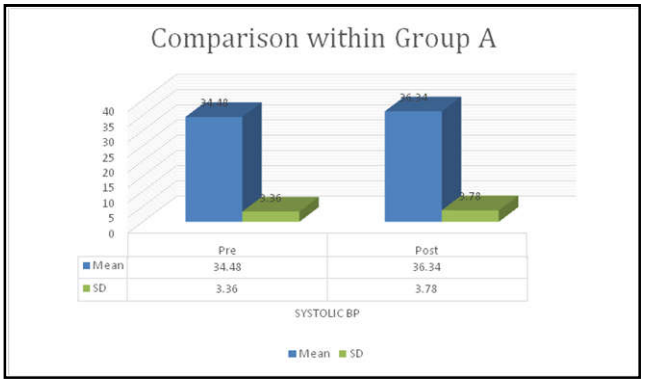
Spo2		Mean ± SD	t- value	P value
PRE Value	Group A	97.67 ± 7.58	.606	
	Group B	97.53 ± .937	.	.547
POST Value	Group A	98.37 ± 1.03		
	Group B	98.57 ± .568	.929	.358

Table 9. Unpaired t-test for the variable pre and post values of systolic blood pressure between group A & B

BP (S)		Mean ± SD	t- value	P value
PRE Value	Group A	118.70 ± 7.68		
	Group B	118.17 ± 8.33	.258	.797
POST Value	Group A	115.23 ± 7.38		
	Group B	114.43 ± 7.66	.412	.682

Table 10. Unpaired t-test for the variable pre and post values of distolic blood pressure between group A AND B

BP(D)		Mean ± SD	t- value	P value
PRE Value	Group A	72.00 ± 9.16	.631	0.531
	Group B	70.63 ± 7.53		
POST Value	Group A	70.00 ± 10.23	1.367	0.197
	Group B	66.99 ± 7.99		



Graph 14. Comparison of Mean and SD of variable VO2max Group A

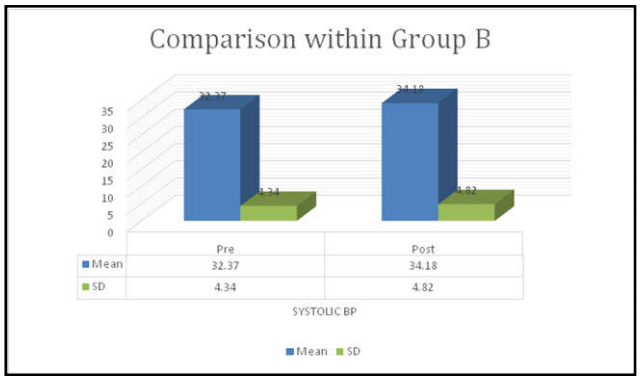
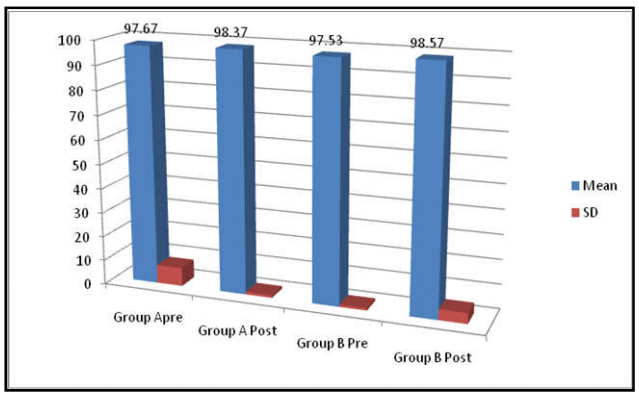
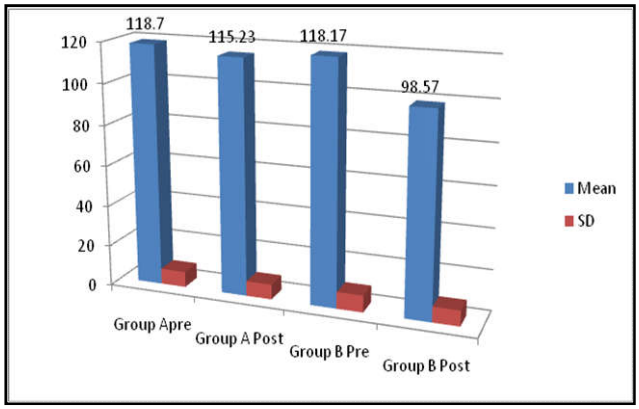


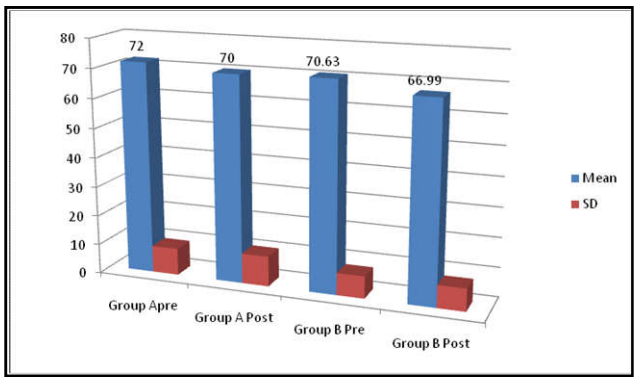
Figure 15. Comparison of Mean and SD of variable VO2max group B



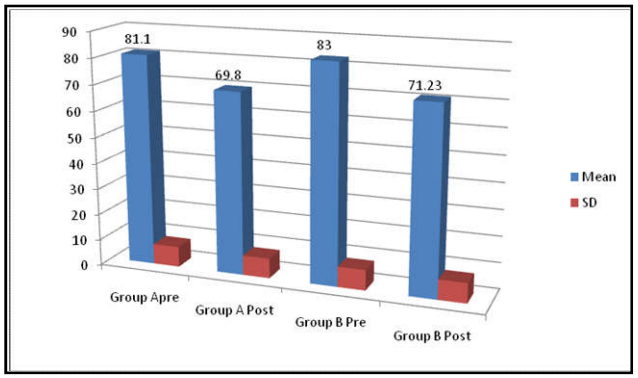
Graph 16. Comparison of mean and SD of variable pre and post values of SPO_2 between group A and B.



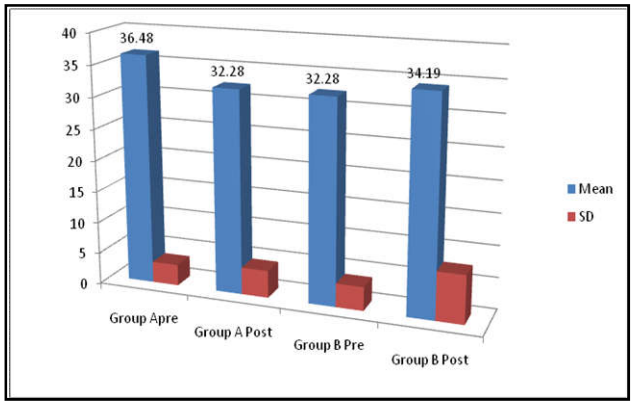
Graph 17. Comparison of mean and SD of variable pre and post values of Systolic Blood Pressure between group A and B.



Graph 18. Comparison of mean and SD of variable pre and post values of Diastolic Blood Pressure between group A and B.



Graph 19. Comparison of mean and SD of variable pre and post values of Heart Rate between group A and B



Graph 20. Comparison of mean and SD of variable pre and post values of VO_2max between group A and B.

There was no significant difference in mean age between the two groups. There was no significant difference in height between the two groups. There was no significant difference in weight (kg) between the two groups. There was no significant difference in age between the two groups. There was no significant difference in BMI between the two groups.

DISCUSSION

The result of the present study supported that the Jacobson relaxation technique as well as isotonic aerobic exercises, both have the significant effect in improving VO_2max, heart rate, SPo_2 and blood pressure. Jacobson is the more effective for improving VO_2max as compared to the aerobic exercises on the bases of Mean ± SD differences between the Group A and Group B i.e Pre value of VO_2max for Group A and Group B were 36.48 ± 3.36 (Mean ± SD) and 32.28 ± 4.34 respectively.

Table 11. Unpaired t-test for the variable pre and post values of heart rate between group A and B

		Mean ± SD	t- value	P value
PRE Value	Group A	81.10 ± 7.84	.929	.352
	Group B	83.00 ± 7.84		
POST Value	Group A	69.80 ± 7.64	.658	.513
	Group B	71.23 ± 9.15		

Table 12. Unpaired t-test for the variable pre and post values vo_2max between group A and B

		Mean ± SD	t- value	P value
PRE Value	Group A	36.48 ± 3.36	2.096	.041
	Group B	32.28 ± 4.34		
POST Value	Group A	36.34 ± 3.78	1.928	.059
	Group B	34.19 ± 4.82		

Post intervention value of VO_2max for Group A and Group B were 36.34 ± 3.78 and 34.19 ± 4.82 respectively. The mean difference of Group A is more as compared to Group B which shows that Group A is more effective. After analyzing within the both group we found that we had the significant improvement in all the parameters independently. On the other hand we have no significant improvement result between the both groups on parameters Heart Rate, SPo_2 and Blood Pressure except VO_2max.

The main purpose of the present study was to check the effectiveness of VO_2max before and after the Jacobson Relaxation Technique. The present study was done on healthy individuals using Jacobson Relaxation Technique in spite of the conventional ways of measuring VO_2max. After analyzing the statistical result of, blood pressure and Heart Rate variable, there were significant improvement within the group but after comparing the pre and post value of, blood pressure and Heart Rate between the groups, there were no significant difference in, blood pressure and Heart Rate. The previous study done on the immediate effect of the Jacobson's progressive muscular Relaxation in hypertension for improving blood pressure, and heart rate found positive result. The value of the variable recorded pre and post the intervention. The result of the value shows the significant improvement for improving the Heart Rate and Blood Pressure (Shinde *et al* 2013).

Conclusion

This study concluded that the Exercise interventions in form of Jacobson's Relaxation Technique and Aerobic Exercise can bring improvement in maximal oxygen uptake (VO_2max) in normal young adults.

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