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Effect of Varied Intensities of Aerobic Training on Selected Physiological and Chemical Variables of Middle-Aged Men

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ABSTRACT

Cardio exercise is any exercise that raises your heart rate. Face it our bodies were made to move. And we all know that to keep our muscles in shape we need move them. This movement makes them stronger and stronger muscles make for a more efficient and healthy body. Aerobic Training is active and the methodical sequenced designs of biomechanical movements synchronized with breathing techniques that maximize circulation and energies the whole body system. The study was designed to investigate the influence of varied intensities of aerobic training on selected physiological and biochemical variables of middle aged men.

To achieve the determination of the study 60 middle aged men were selected Coimbatore district. Their age of the subject ranged from 35 to 45 years. Selected subjects was randomly allotted to four equal groups (n=15), group I underwent low intensity aerobic training (LIAT) , group II underwent medium intensity aerobic training (MIAT) , group III underwent High intensity aerobic training (HIAT) and group IV acted as control group (CG). The specific circuit training was given to the untried group for 3 days per week for the period of 12 weeks. The control group did not practice in any training except their routine work. The following variables were measured with standard test items: Vo2 Max (Cooper Vo2 Max test) and Low Density Lipoprotein (Blood Analysis). Pre and post test was conducted on distinct days with warm up.

The data was analyzed by smearing dependent 't test. The level of significance was set at 0.05. The varied intensities of aerobic training had positive impact on vo2 max and Low Density Lipoprotein among middle aged men. The result of the present study vo2 max and Low Density Lipoprotein speculated significant improvement due to the varied intensities of aerobic training of middle aged men.

A game-based involvement intensive on increasing active commuting was associated with increases in rates of varied intensities of aerobic training to

middle aged men, However, the game-based involvement avoided increases in rates of passive commuting in the experimental group, which were significantly increased the control group.
Key words: Vo2 Max, Low Density Lipoprotein, Varied Intensities of Aerobic Training and Middle aged men.

1.BACKGROUND

Aerobic training is one of the most effective forms of physical activity for improving overall health, fitness, and well-being. It primarily involves exercises that enhance the body's ability to use oxygen efficiently during prolonged physical activity. Activities such as walking, running, cycling, swimming, and dancing fall under this category, and they play a crucial role in enhancing cardiovascular health, lung capacity, and metabolic function. However, the intensity of aerobic training—low, moderate, or high—greatly influences the specific physiological and biochemical adaptations that the body undergoes. Understanding how varied intensities of aerobic training impact the human body is essential for developing tailored exercise programs that maximize health benefits.

Low-Intensity Aerobic Training: Activities performed at 50-60% of maximum heart rate (MHR), such as slow walking or light cycling, are characterized by low intensity. These activities are sustainable over extended periods and are ideal for beginners or individuals seeking gentle cardiovascular improvements.Moderate-Intensity Aerobic Training: This level corresponds to 60-75% of MHR and includes brisk walking, steady cycling, or light jogging. Moderate intensity is widely recommended for general health and fitness improvements, as it strikes a balance between effort and sustainability.High-Intensity Aerobic Training: Exercises performed at 75-90% or more of MHR, such as running, swimming at high speeds, or high-intensity interval training (HIIT), fall under this category. These activities demand greater energy output, improve VO2 max (maximum oxygen uptake), and promote significant cardiovascular and metabolic adaptations.

Physiological and Biochemical Adaptations

The body's response to aerobic training varies based on the intensity at which it is performed. Each intensity level influences specific physiological and biochemical parameters, including cardiovascular function, muscular endurance, metabolic rate, and lipid profiles. Varied intensities of aerobic training enhance cardiovascular health by strengthening the heart muscle, improving stroke volume (the amount of blood pumped per heartbeat), and increasing overall cardiac output. High-intensity training, in particular, has been shown to improve VO2 max, a critical measure of cardiorespiratory fitness. Moderate and low-intensity exercises, on the other hand, promote better blood circulation and reduce resting heart rate, contributing to long-term heart health. Aerobic training improves pulmonary function by enhancing the lungs' ability to take in oxygen and expel carbon dioxide. Regular exercise at varying intensities can increase lung capacity and improve breathing efficiency. High-intensity activities often challenge the respiratory system to its limits, resulting in greater adaptation over time. Aerobic training significantly influences metabolic processes, including fat oxidation, glucose metabolism, and energy production. Low-intensity training predominantly utilizes fat as an energy source, while higher intensities rely on carbohydrates for fuel. These metabolic adaptations contribute to improved insulin sensitivity, better glycemic control, and reduced risk of metabolic disorders such as type 2 diabetes. Research indicates that aerobic training at varied intensities can positively affect lipid profiles by increasing high-density lipoprotein (HDL) levels and reducing low-density lipoprotein (LDL) and triglycerides. High-intensity training, in particular, has been linked to more pronounced changes in lipid metabolism, benefiting cardiovascular health. **Tipton, C. M. (1984).**

2. METHODS 2.1Participants

A total of 60 middle aged men were selected Coimbatore district. Their aged of the subject ranged from 35 to 45 years. Selected subjects was randomly allotted to four equal groups (n=15), group I underwent low intensity aerobic training (LIAT), group II underwent medium intensity aerobic training (MIAT) , group III underwent High intensity aerobic training (HIAT) and group IV acted as control group (CG). The specific circuit training was given to the untried group for 3 days per week for the period of 12 weeks. The control group did not practice in any training except their routine work. Pre and post test was conducted on distinct days with warm up. The control group was not given any sort of training except their monotonous.

2.2 DESIGN

The evaluated physiological and biochemical variables were Vo2 Max was assessed by Cooper Vo2 Max test the unit of measurements in ml/kg/lit and low density lipoprotein was assessed by Blood Analysis. The parameters were measured at baseline and after 12 weeks of specific circuit training were examined. The intensity was increased once in four weeks based on the variation of the exercises.

2.3 TRAINING PROGRAMME

The training programme was lasted for 60 minutes for session in a day, 3 days in a week for a period of 12 weeks duration. These 60 minutes included warm up for 10 minutes, 40 minutes specific circuit training and warm down. The equal in varied intensities of aerobic training is the length of the time each action in total 3 day per weeks. (Monday, Wednesday and Friday).

2.4 STATISTICAL ANALYSIS

The collected data on vo2 max and low density lipoprotein due to the combination of varied intensities of aerobic training was statically analyzed with "f" test to find out the significant improvement between pre, post & adjusted post test. In all case the criterion for spastically significance was set at 0.05level of confidence (P<0.05).

Table – I: Analysis of Covariance on Pre, Post and Adjusted Post test means on Vo2 Max of low intensity aerobic training group (LIAT), medium intensity aerobic training group (MIAT), high intensity aerobic training group (HIAT) and Control Group (Scores in ml/kg/litres)

* Significant at 0.05 level for the degrees of freedom (3, 56) and (3, 55), 2.76

Test	Low intensity **aerobic** training group (LIAT)	Medium intensity **aerobic** training group (MIAT)	High intensity **aerobic** training group (HIAT)	Control Group (CG)	Source of variance	df	Sum of Square	Mean Square	F-ratio
Pre-test Mean	42.44	42.38	42.52	42.49	B / S	3	0.20	0.10	0.07
					W / S	56	84.33	1.48	
Post-test Mean	44.02	43.38	45.94	42.43	B / S	3	54.25	27.12	13.40*
					W / S	56	115.37	2.02	
Adjusted Post-test Mean	44.03	43.37	45.95	42.42	B / S	3	48.38	24.19	27.92*
					W / S	55	48.51	0.86	

Table 4.5 reveals the computation of 'F' ratios on pre test, post test and adjusted post test means of LIAT, MIAT, HIAT and CG on vo2 max.

The obtained 'F' ratio for the pre test means of LIAT, MIAT, HIAT and CG on vo2 max was 0.07. Since, the 'F' value was less than the required table value of 2.76 for the degrees of freedom 3 and 56, it was found to be not significant at 0.05 level of confidence.

Further, the 'F' ratio for post test means of LIAT, MIAT, HIAT and CG on vo2 max was 13.40. Since, the 'F' value was higher than the required table value of 2.76 for the degrees of freedom 3 and 56, it was found to be statistically significant at 0.05 level of confidence.

The obtained 'F' ratio for the adjusted post test means of LIAT, MIAT, HIAT and CG on vo2 max was 27.92. Since the 'F' value was higher than the required table value of 2.76 for the degrees of freedom 3 and 55, it was found to be statistically significant at 0.05 level of confidence.

From the results it was inferred that there was significant difference in improvement of vo2 max among LIAT, MIAT, HIAT.

Table – II: Scheffe's Post hoc test for the differences between the paired Adjusted

Post-test means of Vo2 Max

Low intensity aerobic training group (LIAT)	Medium intensity aerobic training group (MIAT)	High intensity aerobic training group (HIAT)	Control Group (CG)	Mean difference	Confidence Interval
44.03	43.37			0.66*	0.31
44.03		45.95		1.92*	
44.03			42.42	1.62*	
	43.37	45.95		2.58*	
	43.37		42.42	0.95*	
		45.95	42.42	3.53*	

* Significant at 0.05 level

Table 4.6 reveals the mean differences between the paired adjusted post test means of all groups.The mean difference between LIAT and MIAT, LIAT and HIAT, LIAT and CG, MIAT and HIAT, MIAT and CG, HIAT and CG were 0.66, 1.92, 1.62, 2.58, 0.95 and 3.53 respectively. The values of mean difference were higher than the confidential interval value of 0.31, it was found to be statistically significant at 0.05 level of confidence.

From these results it was inferred that HIAT produced better improvement on vo2 max of middle aged men than the other training groups of LIAT, MIAT and CG.

Mean values of pre, post and adjusted post test of LIAT, MIAT, HIAT and control group on vo2 max was presented in figure 4.1

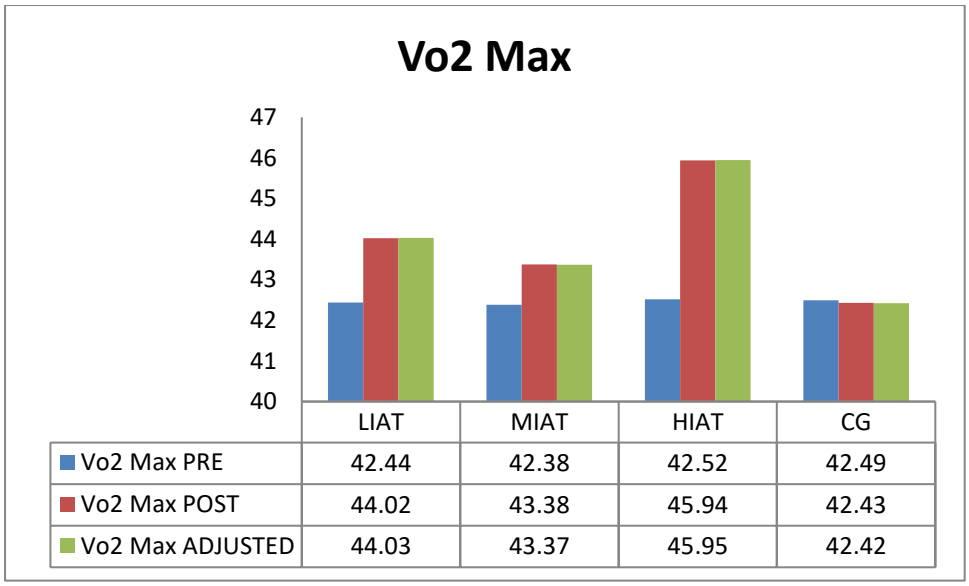


Figure I: Pre, Post and Adjusted Post test means on Vo2 Max of low intensity aerobic training group (LIAT), medium intensity aerobic training group (MIAT), high intensity aerobic training group (HIAT) and Control Group

Table III: Analysis of Covariance on Pre, Post and Adjusted Post test means on Low Density lipoprotein of low intensity aerobic training group (LIAT), medium intensity aerobic training group (MIAT), high intensity aerobic training group (HIAT) and Control Group

(Scores in mg/dl)

* Significant at 0.05 level for the degrees of freedom (3, 56) and (3, 55), 2.76

Test	Low intensity **aerobic** training group (LIAT)	Medium intensity **aerobic** training group (MIAT)	High intensity **aerobic** training group (HIAT)	Control Group (CG)	Source of variance	df	Sum of Square	Mean Square	F-ratio
Pre-test Mean	114.80	114.53	114.60	114.67	B / S	3	0.58	0.19	0.28
					W / S	56	39.07	0.70	
Post-test Mean	109.27	112.40	113.73	114.53	B / S	3	241.78	80.59	115.13*
					W / S	56	39.20	0.70	
Adjusted Post-test Mean	109.15	112.49	113.77	114.52	B / S	3	252.34	84.11	305.82*
					W / S	55	15.13	0.28	

Table 4.5 reveals the computation of 'F' ratios on pre test, post test and adjusted post test means of LIAT, MIAT, HIAT and CG on Low Density lipoprotein.

The obtained 'F' ratio for the pre test means of LIAT, MIAT, HIAT and CG on Low Density lipoprotein was 0.28. Since, the 'F' value was less than the required table value of 2.76 for the degrees of freedom 3 and 56, it was found to be not significant at 0.05 level of confidence.

Further, the 'F' ratio for post test means of LIAT, MIAT, HIAT and CG on Low Density lipoprotein was 115.13. Since, the 'F' value was higher than the required table value of 2.76 for the degrees of freedom 3 and 56, it was found to be statistically significant at 0.05 level of confidence.

The obtained 'F' ratio for the adjusted post test means of LIAT, MIAT, HIAT and CG on Low Density lipoprotein was 305.82. Since the 'F' value was higher than the required table value of 2.76 for the degrees of freedom 3 and 55, it was found to be statistically significant at 0.05 level of confidence.

From the results it was inferred that there was significant difference in improvement of Low Density lipoprotein among LIAT, MIAT, HIAT.

Table – IV: Scheffe's Post hoc test for the differences between the paired Adjusted

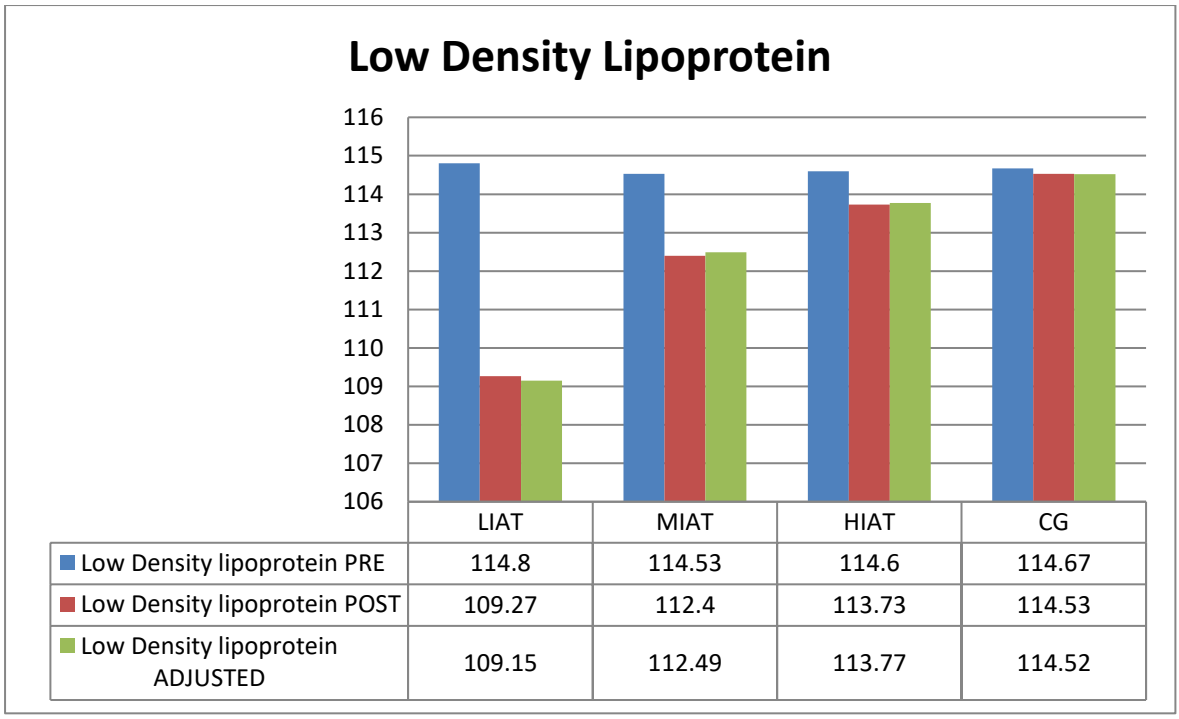
Post-test means of Low Density lipoprotein

Low intensity aerobic training group (LIAT)	Medium intensity aerobic training group (MIAT)	High intensity aerobic training group (HIAT)	Control Group (CG)	Mean difference	Confidence Interval
109.15	112.49			3.34*	0.68
109.15		113.77		4.62*	
109.15			114.52	5.37*	
	112.49	113.77		1.28*	
	112.49		114.52	2.03*	
		113.77	114.52	0.75*	

* Significant at 0.05 level

Table 4.6 reveals the mean differences between the paired adjusted post test means of all groups.The mean difference between LIAT and MIAT, LIAT and HIAT, LIAT and CG, MIAT and HIAT, MIAT and CG, HIAT and CG were 3.34, 4.62, 5.37, 1.28, 2.03 and 0.75 respectively. The values of mean difference were higher than the confidential interval value of 0.68, it was found to be statistically significant at 0.05 level of confidence.From these results it was inferred that HIAT produced better improvement on Low Density lipoprotein of middle aged men than the other training groups of LIAT, MIAT and CG.

Mean values of pre, post and adjusted post test of LIAT, MIAT, HIAT and control group on Low Density lipoprotein was presented in figure 4.2



	LIAT	MIAT	HIAT	CG
Low Density lipoprotein PRE	114.8	114.53	114.6	114.67
Low Density lipoprotein POST	109.27	112.4	113.73	114.53
Low Density lipoprotein ADJUSTED	109.15	112.49	113.77	114.52

Figure II Pre, Post and Adjusted Post test means on Low Density lipoprotein of low intensity aerobic training group (LIAT), medium intensity aerobic training group (MIAT), high intensity aerobic training group (HIAT) and Control Group

3. DISCUSSION AND FINDINGS

Human beings naturally develop movements such as gyration, standing, launching, jumping, running, walking, and jogging as part of their innate growth process. However, achieving optimal physical performance requires deliberate physical exertion. This study explored the effects of varying intensities of aerobic training on specific physiological and biochemical parameters in middle-aged men. The findings revealed that aerobic training at varied intensities effectively induces desirable changes in these parameters. Researchers have shown particular interest in examining VO2 max and low-density lipoprotein levels through different aerobic training approaches. Physiological adaptations, such as enhanced lung function and improved breathing capacity, are strongly associated with sustained aerobic activity. This emphasizes the potential for varied intensities of aerobic training to improve respiratory efficiency and overall health. A study by **Princy et al. (2022)** demonstrated significant improvements in physiological components such as resting pulse rate, breath-holding time, and VO2 max among middle-aged women after six weeks of aerobic training. Similarly, **Sumathi S. (2017)** highlighted that six weeks of aerobic training significantly enhanced strength parameters in college men. These findings collectively underline the effectiveness of aerobic training in improving both physiological and biochemical health markers across different populations.

4. CONCLUSIONS

Based on the results and discussion, the following conclusions were drawn: The findings from this study suggest that middle-aged men who engage in varied intensities of aerobic training allocate more time to improving physiological and biochemical parameters. This is particularly evident during key periods of the day that offer critical opportunities for physical exertion. These results significantly enhance our understanding of the impact of varied intensities of aerobic training on human health. They also provide valuable insights for designing game-based intervention strategies aimed at improving VO2 max and reducing low-density lipoprotein levels, thereby enhancing individual physical capabilities.

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