Effect of Aerobic and Anaerobic Training on Speed Vital Capacity and Lean Body Mass

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***Abstract*—The purpose of the study was to find out the effect of aerobic and anaerobic training on speed, vital capacity and lean body mass. Forty five male players of various games aged between 19 and 25 years were selected for the study. They were divided into three equal groups, each group consisting of fifteen subjects in which three experimental groups and one control group, in which the group I (n=15) underwent aerobic training, group II (n = 15) underwent aerobic anaerobic training for three days (alternative days) per week for twelve weeks and group III, acted as control, which did not participate in any training apart from their regular game practice. The subjects were tested on selected criterion variables as speed, vital capacity and lean body mass at prior to and immediately after the training period. For testing the speed the 30 meters test was administered, for measuring the vital capacity, expirograph was used and LBM was assessed by using Johnson formula. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the experimental groups and control group on selected criterion variable separately. Since there were three groups involved in the present study, the Scheffé *S* test was used as post-hoc test. The selected criterion variables such as speed, vital capacity and lean body mass were improved significantly for all the training groups when compared with the control group. But there was a significant difference was found between the training groups on all criterion variables, in which speed was significantly improved for anaerobic training group and aerobic training group improved the vital capacity and lean body mass.**

***Index Terms*—aerobic and anaerobic training, speed, vital capacity and lean body mass.**

I. INTRODUCTION

Humans have long sought to outperform one another in terms of speed, height, aerobic, anaerobic, and skill. We strive for excellence in athletic performance because humans are essentially competitive. Despite their allure and rich history, new procedures based on insight and knowledge gathered from practical experience, observation, and scientific study have overtaken old conditioning techniques. For a long time, progress towards enhanced conditioning techniques was slow, but in recent years, considerable advancements have resulted in some astounding performance gains (Boucher and Malina, 1993)

Athletic performance has significantly improved in recent years. Performance levels that were previously unthinkable are becoming the norm, and the number of athletes capable of producing outstanding performances is increasing. Athletics is a challenging discipline, and dedication has resulted in long and gruelling hours of practice. Coaching has also progressed thanks to the work of sports specialists and scientists. Sports science has moved from descriptive to scientific. A larger corpus of knowledge regarding athletes is now available, which is reflected in training methods (Bompa, 1999).

Conditioning is a regulated training and adaptation process that necessitates continual incremental effort (Kalf and Arnheim, 1963). The phrase "training means" encompasses a variety of physical exercises as well as other activities, strategies, and processes used to create, maintain, and recover performance capability and preparation.

Sports training is a scientifically based athletic development technique that enables athletes to accomplish remarkable and record-breaking athletic achievements by gradually improving mental and physical efficiency, skill, and drive. Physical training is one of the most significant components of high-performance training. Physical training seeks to raise

an athlete's physiological capacity and improve biomotor skills to the maximum possible level (Harre, 1982).

Sports tutoring is based on a scientifically structured pedagogical process that effects performance ability and preparedness in performance, with the goal of improving and perfecting sports performance while also competing in various sports competitions. A training schedule is designed to improve a sportsperson's ability and energy capacity in preparation for a specific event. Initially, the athlete's capacity to carry out motor actions with varied degrees of aerobic, speed, resistance, and skill in order to accomplish the individual and group actions—the divisions of sports training technique—represented the intensity of sports training in any athletic event (Simon, Mihaila and Stanculescu, 2011).

Physical exercise causes anatomical, physiological, metabolic, and psychological changes. A physical activity's efficiency is determined by its time, distance, and repetitions, as well as its load, velocity, and frequency of performance. Consider these factors, known as training variables, when designing training dynamics based on a competition's functional and psychological characteristics. Define which component to focus on and achieve the intended performance target during the training phases leading up to a competition (Zatsiorsky, 1995). According to studies, aerobic training preserves functional capabilities, has significant affects on the musculoskeletal system, and helps to avoid sarcopenia, lower-back pain, osteoporosis, and other disorders (Winett and Carpinelli, 2001).

The purpose of anaerobic training is to improve anaerobic efficiency, which is commonly characterised as exercising the aerobic system. Aerobic anaerobic and speed anaerobic have been demonstrated to predict medium-term anaerobic efficiency, despite the fact that anaerobic workouts lasting two to eight minutes are required.

II. METHODS

The goal of this study was to determine how aerobic and anaerobic training, affected on speed, vital capacity and lean body mass. 60 male students various colleges, Anantapur, Andhra Pradesh were selected as subjects, during the academic year 2024–2025 were chosen as subjects to fulfil the goal. They were divided into three equal groups of fifteen each and further divided as two experimental groups and one control group, in which the group I (n=15) underwent aerobic and anaerobic training, group II (n = 15) underwent aerobic and anaerobic training for three days (alternative days) per week for twelve weeks, and group III (n=15) acted as control which did not participate in any special training apart from the regular physical and curricular activities.

There will be changes to the playing ability and systems with every training regimen. After consulting with the specialists, the researchers decided to use the following variables as criteria: 1. Speed, 2. Vital capacity and 3. Lean body mass.

III. ANALYSIS OF THE DATA

The differences, if any, between the corrected post test means on several criteria variables were examined independently using analysis of covariance. The Scheffé *S* test was used as a post-hoc test if the adjusted post test mean's 'F' ratio was shown to be significant. To evaluate the 'F' ratio discovered using analysis of covariance, the level of significance was set at 0.05 level of confidence.

Table – I Analysis of Covariance and 'F' ratio for speed, vital capacity and lean body mass of aerobic and anaerobic aerobic and anaerobic training groups, and control group

Variable Name	Group Name	Aerobic Training Group	Anaerobic Training Group	Control Group	'F' Ratio
Speed (in sec)	Pre-test Mean ± S.D.	4.79 ± 0.10	4.80 ± 0.09	4.83 ± 0.06	0.61
	Post-test Mean ± S.D.	4.76 ± 0.10	4.73 ± 0.10	4.82 ± 0.06	3.80*
	Adj. Post-test Mean	4.772	4.743	4.803	37.50*

Vital capacity (in Liters)	Pre-test Mean ± S.D.	3.34 ± 0.08	3.32 ± 0.06	3.30 ± 0.08	1.36
	Post-test Mean ± S.D.	3.61 ± 0.11	3.52 ± 0.07	3.29 ± 0.08	46.42*
	Adj. Post-test Mean	3.587	3.523	3.313	63.93*
Lean body mass (in Kg/m^2)	Pre-test Mean ± S.D.	55.89 ± 3.27	55.01 ± 3.23	55.47 ± 3.65	0.25
	Post-test Mean ± S.D.	57.19 ± 3.32	55.88 ± 3.27	55.49 ± 3.62	1.05
	Adj. Post-test Mean	56.757	56.323	55.455	50.65*

* Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with df 2 and 42 and 2 and 41 were 3.21 and 3.23 respectively).

Table – I shows that the speed pre-test 'F' ratio value of 0.61 was less than the necessary table value of 3.21 for significant with df 2 and 42 at 0.05 level of confidence. For the post-test mean and adjusted post-test mean 'F' ratio value of 3.80 and 37.50 for the adjusted post-test scores was greater than the necessary table value of 3.24 for significant. According to Table - I, the pre-test averages of vital capacity 'F' ratio value of 1.36 was less than the necessary table value of 3.21 for significant with df 2 and 42 at 0.05 level of confidence. For post-test and adjusted post-test mean 'F' ratio values of vital capacity were 46.42 and 63.93 was greater than the necessary table value of 3.24 for significant. The LBM pre- and post-test mean values 'F' ratio value was 0.25 and 1.05 which was insignificant. For adjusted post-test mean 'F' ratio values of LBM was 50.65 was greater than the necessary table value of 3.24 for significant. Further, to find out which training group has significant improvement on selected criterion variables, Scheffe *S* post-hoc test was applied and presented in table – II.

Table – II Scheffĕ S Test for the difference between the adjusted post-test mean of speed, vital capacity and lean body mass

Aerobic Training Group	Anaerobic Training Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
Adjusted Post-test Mean for Speed				
4.772	4.743		0.029*	0.017
4.772		4.803	0.031*	0.017
	4.743	4.803	0.06*	0.017
Adjusted Post-test Mean for Vital capacity				
3.587	3.523		0.064*	0.062
3.587		3.313	0.274*	0.062
	3.523	3.313	0.210*	0.062
Adjusted Post-test Mean for LBM				
56.757	56.323		0.434*	0.334
56.757		55.455	1.302*	0.334
	56.323	55.455	0.868*	0.334

* Significant at 0.05 level of confidence.

IV. RESULTS

The adjusted post-test mean difference in speed between aerobic training group and anaerobic training group, aerobic training group and control group and anaerobic training group and control group was 0.029, 0.031, and 0.06, respectively, and these differences were significant at the 0.05 level of

confidence, according to Table II. Based on the study's findings, it can be said that aerobic training group and anaerobic training group considerably boost the speed ability.

The adjusted post-test mean difference in vital capacity between aerobic training group and anaerobic training group, aerobic training group and control group and anaerobic training group and control group was 0.064, 0.274 and 0.210, respectively, and these differences were significant at the 0.05 level of confidence, according to Table - II. Based on the study's findings, it can be said that aerobic training group and anaerobic training group considerably boost the vital capacity ability.

The adjusted post-test mean difference in LBM between aerobic training group and anaerobic training group, aerobic training group and control group and anaerobic training group and control group was 0.434, 1.302, and 0.868, respectively, and these differences were significant at the 0.05 level of confidence, according to Table - II. Based on the study's findings, it can be said that aerobic training group and anaerobic training group considerably boost the LBM.

V. CONCLUSIONS

The speed was enhanced for both training groups, namely aerobic and anaerobic training, in comparison to the control group. This outcome aligns with the conclusions of Şahin, et al., (2023); Yuvaraj, et al., (2022) and Khabiruddin, Mondal, and Sahu, (2016) regarding aerobic training, while Tamilselvan, Nandagopal, and Giridharaprasath, (2021) observed that the speed was considerably greater in comparison to the control group. Furthermore, the findings indicate a significant disparity among the training groups, with the anaerobic training group experiencing gains from it.

The results of this study also indicated that vital capacity significantly improved for both training groups, with the aerobic training group showing more improvement than the anaerobic training group. İşleyen, and Dağlioğlu, (2020); Kumaravelu, (2019); Çiçek, *et al*., (2018); Mishra and Rathore, (2015) and Vats and Pathra (2015) discovered a notable enhancement in vital capacity following aerobic exercise. Sepang and others (2023) discovered that interval training has notably enhanced the vital capacity of futsal athletes. Furthermore, the findings indicate that a significant difference existed among the training groups, with the aerobic training group reaping its benefits.

The study revealed a notable enhancement in lean body mass following both aerobic and anaerobic training. Indranil et al., (2010) discovered that aerobic training considerably enhances lean body mass

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