



Effect of aerobics, resistance and concurrent training programme on selected flexibility and breath hold time of college men students

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Abstract

The study was formulated as a true random group design, consisting of a pre-test and post-test. The subjects (n=80) were randomly assigned to four equal groups of twenty college men students each. The groups were assigned as Experimental Groups- I, II, III and control group respectively. Pre-tests were conducted for all the subjects on selected biomotor and physiological variables such as, flexibility, breath holding time which formed initial scores of the subjects. The experimental groups participated in their respective training programmes for 12 weeks.

Immediately after completion of the experimental period of 12 weeks, all the subjects were measured of their selected biomotor and physiological variables through standard tests which formed the final scores. The difference between the initial and final mean scores was considered as the effect of respective experimental treatment on the subjects. To test statistical significance of the differences, statistical tool ANCOVA was used. In all cases 0.05 level was fixed to test the hypothesis of the study.

Keywords: resistance, concurrent training

Introduction

If the proper study of mankind is man, the proper study of physical activity is sport. It is imparting learning to choose appropriate physical activity for personal growth well-being and pleasure in performance. Sports are one of the physical activities played at level for in conditioning fitness and recreation. Sports itself is a form of culture in society. In this aspect, it stands for highly competitive exertion and specialized motivation.

The objective of training for competitive sport is to prepare athletes for the achievements of outstanding performance in the competition. The main task of athletic training is based mainly on the specific requirements of sports competition but also on the amount of training itself.

Different Methods of Physical Activities

There are different methods of specific training programmes available for the development of speed, muscular strength level, endurance and cardio-respiratory endurance to their maximum. Training methods includes weight training, interval training, fartlek training, circuit training, isotonic training, isometric training, isokinetic training. But before giving training the coaches or physical education teachers should have clear understanding of the method of training to be given to the individual concerned. The basic scientific principles and guide lines for constructing an effective conditioning programme, since there are specific principles and guidelines that must be and bored to in order for optimal training adaptation to take place. Training programme should be designed to suit the specific energy sources needed.

Objectives of the Study

This research is to find out answers to the following research questions:

1. Does participation in Aerobics, Resistance training and concurrent training of Aerobic and Resistance Training would improve selected biomotor variables, of college men students.
2. Does participation in Aerobics, Resistance training and Concurrent training of Aerobic and Resistance Training would improve selected Physiological variables of college men students.
3. Does participation in Aerobics, Resistance and Concurrent training of Aerobic and Resistance Training would differ in improving selected biomotor and physiological variables of college men students..

Statement of the Problem

The purpose of the present study was to determine the “Effect of Aerobics, Resistance and Concurrent Training Programme on Selected Flexibility and Breath Hold Time of College Men Students”.

Hypotheses

The following hypotheses were formulated on the basis of available literature, the subject knowledge and experience of the research scholar.

1. It was hypothesized that “there will be significance difference on selected biomotor variables such as flexibility, due to aerobics, resistance training and concurrent training of aerobics and resistance training among college men students compared to control group”.
2. It was hypothesized that “there will be significance difference on selected physiological variables such as breath holding time due to aerobics, resistance training and concurrent training of aerobics and resistance training among college men students compared to control group.

3. It was hypothesized that “there will be no significant difference on selected biomotor and physiological variables among experimental groups, namely, aerobic training, resistance training and concurrent aerobic and resistance training among college men students”.

Significance of the Study

The present study is significant in the following aspects.

1. The present study is significant in designing the package of exercises using, aerobics training, resistance training and concurrent aerobic and resistance training. Of these, the aerobic and resistance are absolutely in the calisthenics format.
2. The study will be significant in determining selected biomotor abilities and physiological levels of college men students.
3. It is believed that the outcome of the study would motivate the college men students resulting in active participation in these physical activities.
4. The present study would provide a scientific base and guidance to the physical educationists, coaches, sports scientists, exercise physiologists and fitness leaders to design the concurrent training programme for the needed people.
5. The result of this study would add to the quantum of knowledge in the areas of fitness and wellbeing, exercise physiology and exercise science among college men students.

Delimitations

The following delimitations were recorded for this study.

1. The study was delimited to eighty college men students selected from different colleges in Andhra Pradesh.
2. In the present study, random method of sampling was used.
3. In distribution of samples to experimental group used in the study, the present study was confined to equal number of samples, each group consisting of 20 men. The age of the samples for the present study was confined to the range of 21–25 years.
4. For the purpose of the study, treadmill exercises were considered as aerobic training for college men students.
5. For the purpose of the study, resistance training consisting of weight training were considered as resistance training.
6. For the purpose of the study concurrent training consists of both treadmill training and weight training for the college men students.
7. As biomotor variables, the present study was confined to flexibility.
8. As physiological variables, the present study was confined to breath holding time.
9. The duration of the treatments for the present study was confined to six days a week for 12 weeks as total period.

Limitations

The study was limited in the following ways, which would be taken into consideration at the time of findings of this study.

- a. The influence of certain factors like life style, daily routine work diet and other factors on the results of the study were not taken into consideration.
- b. No attempt has been made to control the factors like air

resistance, intensity of light atmosphere and temperature during training and testing period.

- c. The difference in economic and educational background of the subjects was not taken into consideration.
- d. The knowledge of the subjects in exercise science and their previous experiences in doing physical activities were not taken into consideration.
- e. Since the subjects were motivated orally during testing and training periods no attempt was put to differentiate their level of motivation.
- f. The psychological stress and other factors which affect the metabolic function were not taken into consideration.
- g. The heredity of the subjects and its influence on the selected criterion variables.

Methodology

Selection of Subjects

To facilitate the study 80 college men students from different colleges in Andhra Pradesh were randomly selected as subjects and their age was between 21 to 25 years. The subjects were from different colleges and expressed' willingness to participate in the research programme were got by explaining the usefulness of this research, the benefits of incorporating different training methods in the daily routine and the resultant health benefits. Thus, all the subjects selected for this study were volunteers.

The selected subjects were assigned into four groups consisting of 20 in each group. The first group served as aerobic exercise group, group two served as resistance training group, third group served as concurrent training group and fourth group served as control group.

The requirements of the experimental procedures, testing as well as exercise schedules were explained to the subjects so as to avoid any ambiguity of the effort required on their part and prior to the administration of the study, the investigator got the individual consent from each subject.

Selection of Variables

The research scholar reviewed the various scientific literature pertaining to the different forms of aerobic exercises, resistance training and concurrent training and its effects on biomotor abilities and physiological variables among different groups from books, journals, periodicals, magazines and research papers. Taking into consideration of feasibility criteria, availability of instruments and the relevance of the variables of the present study, the following variables were selected.

Dependent Variables

Biomotor variables

- a. Flexibility

Physiological variables

- b. Breath Holding time

Independent Variables

1. Twelve weeks of aerobic exercises in treadmill.
2. Twelve weeks of resistance training in multi gym.
3. Twelve weeks combined aerobic exercises in treadmill and resistance exercises Multi Gym.

Experimental Design

The study was formulated as a true random group design, consisting of a pre-test and post-test. The subjects (n=80) were randomly assigned to four equal groups of twenty college men students each. The groups were assigned as Experimental Groups- I, II, III and control group respectively. Pre-tests were conducted for all the subjects on selected biomotor and physiological variables such as, flexibility, breath holding time which formed initial scores of the subjects the experimental groups participated in their respective training programmes for 12 weeks.

Immediately after completion of the experimental period of 12 weeks, all the subjects were measured of their selected biomotor and physiological variables through standard tests which formed the final scores. The difference between the initial and final mean scores was considered as the effect of respective experimental treatment on the subjects. To test statistical significance of the differences, statistical tool ANCOVA was used. In all cases 0.05 level was fixed to test the hypothesis of the study.

Criterion Measures

By glancing the literature, and in consultation with professional experts, the following variables were selected as the criterion measures in this study.

1. Flexibility was measured through sit and reach test and the scores recorded in centimeters.
2. Breath Holding time was measured through 'nose clip method' and the scores were recorded in seconds.

The intraclass correlation coefficient obtained for test-retest data are presented in Table I.

Table 1: Intra Class Correlation Coefficient of Test – Retest Scores

S. No.	Variables	Coefficient of Correlation
1	Flexibility	0.93*
2	Breath Holding Time	0.79*

* Significant at 0.01 level

Subjects Reliability

The intraclass correlation value of the above test and retest also indicated subject reliability as the same subjects were used under similar conditions by the same tester. The coefficient of reliability were significant at 0.01 level, for the above test under investigation.

Test administration

Flexibility (Sit and reach test)

Flexibility was measured by sit and reach test.

Equipments

Plain level floor and one meter scale

Procedure

The subject took sitting position on the floor with both the legs stretched in front and with the knees fully extended. The measuring scale was placed in such a manner so that 50 cms mark bisected the heel of the foot of the stretched legs.

The subject was permitted to do two or three warm up stretches. At the command 'go' the subject with fully stretched both the hands together and with maximum possible flexion at the hips reached out beyond the foot and touched the scale with his finger tips.

Score

The score was the distance the subject flexed as far as possible at the holding position measured to the nearest centimeter.

Breath Holding Time

Objective

The purpose of this test was to measure the breath holding time.

Equipments

For recording the breath holding time, a stop watch (1/10th of second) and nose clip were used.

Administration

The subject was instructed to stand at ease and to inhale deeply after which he holds his breath for a length of time possible by him. A nose clip was placed on nose to avoid letting the air through nostrils. The duration from the time of holding his breath until the movement he let air out was clocked by using the stop watch to the nearest one tenth of a second as breath holding time. The co-operation of the subject to let out the air by opening the mouth was sought to clock the exact breath holding time.

Scoring

The time is recorded in seconds and the beset of two trials were recorded (Mathew, 1988).

Statistical Technique

The data obtained were analysed by analysis of variance (ANOVA) and analysis of covariance (ANCOVA). The analysis of variance was used to assess the significance of difference between the pre-test and post-test, for each of the variables on the aerobic training and combined aerobic and resistance training separately.

Analysis of covariance was computed for any number of experimental groups, the final means were adjusted for differences in the means were tested for significance. The analysis of variance was first computed to find out the difference between the initial means. The obtained 'F' ratio compared with critical F-value for significance, will provide confidence that the critical samples came from the same population and are devoid of sampling bias.

When the F-ratio was found to be significant, Scheffe's post-hoc test was used to find out the paired mean significant difference (Thirumalaisamy, 1998). Scheffe post-hoc test has the greatest power and is the most conservation with respect to Type I error: this method loads to the smallest number of significance differences. The difference between two means would be significant if it exceed Scheffe F. In order to be significant, F' must equal $(k - 1) (F_{.05} \text{ or } F_{.01})$. Thus, the necessary F' ratios for the difference between paired adjusted mean (k-1) would be computed and compared for significance.

Results and Discussions

Computation of analysis of covariance and post- hoc test

Results on Flexibility

The descriptive statistics comparing the initial and final means of variable Flexibility due to aerobic training, Resistance training, concurrent training and control groups of college men is presented in Table2

Table 2: Descriptive Statistics on effect of Aerobic training, Resistance training, Concurrent training and Control Groups of College Men

Groups	Test	Mean	Standard Deviation	RANGE	
				Min.	Max.
Aerobic training	Initial	21.15	1.42	19.00	23.00
	Final	24.20	1.47	21.00	26.00
	Adjusted Mean	23.97			
Resistance training	Initial	21.05	2.14	17.00	23.00
	Final	24.10	1.41	21.00	27.00
	Adjusted Mean	23.93			
Concurrent training	Initial	21.10	2.25	15.00	23.00
	Final	24.00	2.05	19.00	27.00
	Adjusted Mean	23.80			
Control Group	Initial	19.90	3.01	15.00	23.00
	Final	20.35	2.64	16.00	23.00
	Adjusted Mean	20.95			

aerobic training group was 21.15 with standard deviation + 1.42 pre-test mean of resistance training group was 21.05 with standard deviation + 2.14, the pre-test mean of concurrent training group was 21.10 with standard deviation + 2.25, the pre-test mean of control group was 19.90 with standard deviation + 3.01.

The descriptive statistics on post-test mean on Flexibility of aerobic training group was 24.20 with standard deviation + 1.47 post-test mean of resistance training group was 24.10 with standard deviation + 1.41, the post-test mean of concurrent training group was 24.00 with standard deviation + 1.41, the post-test mean of control group was 20.35 with standard deviation + 2.64.

The adjusted mean on Flexibility on aerobic training group was 23.97, resistance training group was 23.93, concurrent training group was 23.80 and control group was 20.95, as shown in Table 2

The obtained mean values on the experimental and control groups were presented in Figure I.

Table 2 shows that the pre-test mean on Flexibility of

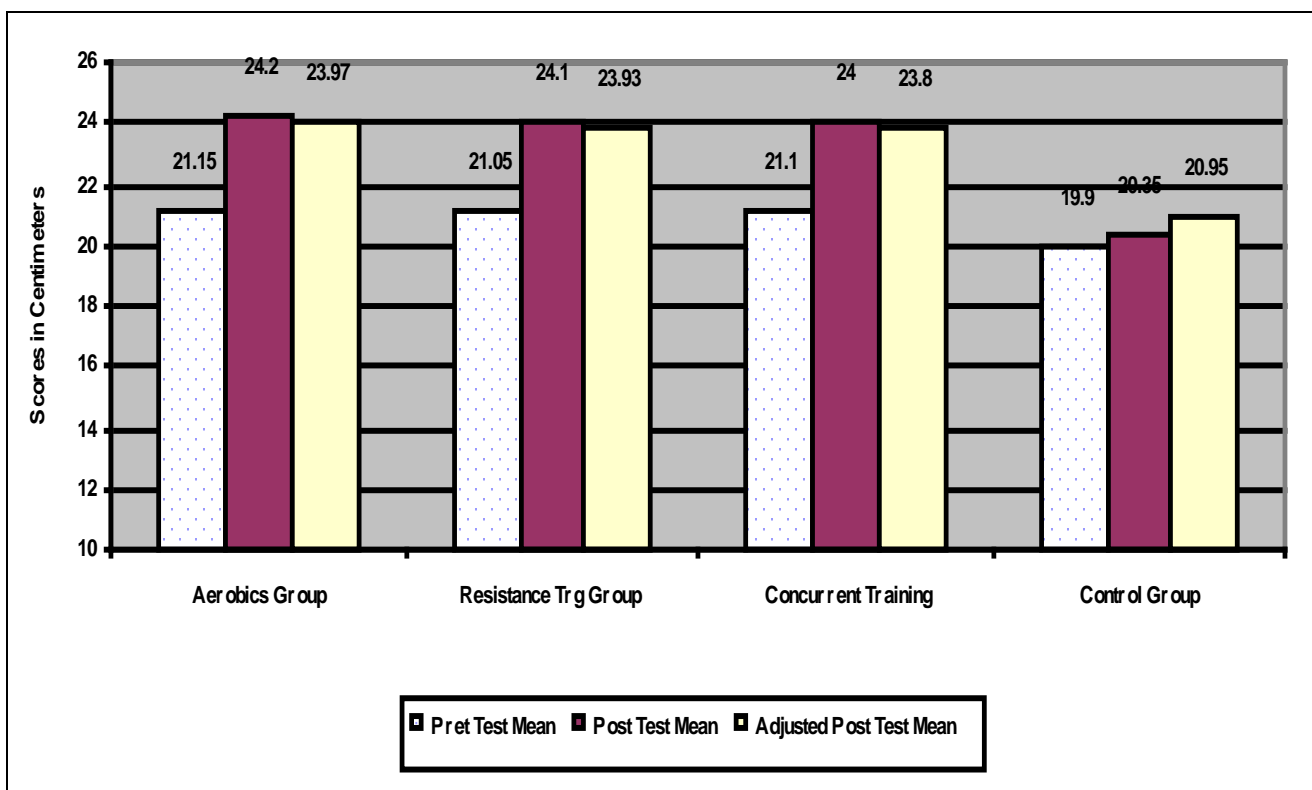


Fig 1: Bar Diagram Showing Pre, Post and Adjusted Means on Flexibility Due To Aerobic, Resistance and Concurrent Training Among College Men

The results on descriptive statistics proved that physiological variable Flexibility was improved. And to test

statistical significance of the differences, the obtained data on Flexibility using ANCOVA was presented in Table 3.

Table 3: Computation of Analysis of Covariance Due To Aerobic, Resistance and Concurrent Training and Control Group on Flexibility among College Men

	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre-test Mean	Between	21.70	3	7.23	1.40
	Within	393.10	76	5.17	
Post-test Mean	Between	211.34	3	70.45	18.36*
	Within	291.55	76	3.84	
Adjusted Post-test Mean	Between	124.06	3	41.35	26.52*
	Within	116.93	75	1.56	

Required F (0.05), (df 3, 75) = 2.77

*Significant at 0.05 level of confidence

As shown in Table 3, the obtained F-ratio of 1.40 on pre-test means of the groups was not significant at 0.05 level as the obtained F-value was less than the required table F-value of 2.77 to be significant at 0.05 level. This shows that there was no significant difference in means of the groups at initial stage.

The results presented in Table 4.5, the obtained F-ratio of 18.36 on post-test means of the groups was significant at 0.05 level, as the obtained F-value was greater than the required table F-value of 2.77 to be significant at 0.05 level. This shows that there was significant difference in means of the groups at initial stage.

Taking into consideration of the pre-test means and post-test means, adjusted post-test means were determined and analysis of covariance was done. The obtained F-value on adjusted means was 26.52. The obtained F-value was greater than the required value of 2.77, and hence it was accepted that there was significant differences among the adjusted means on the Flexibility of the subjects.

Since significant improvements were recorded, the results were subjected to post hoc analysis using Scheffe's Confidence Interval test. The results were presented in Table 4.

Table 4: Multiple Paired Adjusted Means Comparisons between varied physical exercises among college men on Flexibility

Aerobic training Group	Resistance training Group	Concurrent training Group	Control Group	Mean DIFF	C.I
23.97	23.93			0.03	1.13
23.97		23.80		0.17*	1.13
23.97			20.95	3.02*	1.13
	23.93	23.80		0.13*	1.13
	23.93		20.95	2.98*	1.13
		23.80	20.95	2.85*	1.13

* Significant at 0.05 level.

The post-hoc analysis of obtained ordered adjusted means proved that to be significant at 0.05 level confidence, the required confidence interval was 1.13. The following paired mean comparisons were greater than the required confidence interval and were significant at 0.05 level.

Aerobic training Vs Concurrent training Groups (MD: 0.17).

Aerobic training Vs Control Groups (MD: 3.02).

Resistance training Vs Concurrent training Group (MD: 0.13).

Resistance training Vs Control Groups (MD: 2.98).

Concurrent training Vs Control Groups (MD: 2.85).

The following paired mean comparisons were less than the required confidence interval and were not significant at 0.05 level.

Aerobic training Vs Resistance training Groups (MD: 0.03).

Results On Breath Holding Time

The descriptive statistics comparing the initial and final means of variable Breath holding time due to aerobic training, Resistance training, concurrent training and control groups of college men is presented in Table 5.

Table 5: Descriptive Statistics on effect of Aerobic training, Resistance training, Concurrent training and Control Groups of College Men

Groups	Test	Mean	Standard Deviation	RANGE	
				Min	Max
Aerobic training	Initial	44.90	7.50	31.00	58.00
	Final	52.40	6.72	39.00	65.00
	Adjusted Mean	50.90			
Resistance training	Initial	44.60	8.60	29.00	57.00
	Final	52.45	9.02	36.00	65.00
	Adjusted Mean	51.23			
Concurrent training	Initial	41.65	5.28	31.00	58.00
	Final	49.75	6.15	39.00	65.00
	Adjusted Mean	51.32			
Control Group	Initial	42.10	2.36	38.00	48.00
	Final	40.95	1.82	39.00	45.00
	Adjusted Mean	42.10			

Table 4.19 shows that the pre-test mean on Breath holding time of aerobic training group was 44.90 with standard deviation + 7.50 pre-test mean of resistance training group was 44.60 with standard deviation + 8.60, the pre-test mean of concurrent training group was 41.65 with standard deviation + 5.28, the pre-test mean of control group was 42.10 with standard deviation + 2.36.

The descriptive statistics on post-test mean on Breath holding time of aerobic training group was 52.40 with standard deviation + 6.72 post-test mean of resistance

training group was 52.45 with standard deviation + 9.02, the post-test mean of concurrent training group was 49.75 with standard deviation + 9.02, the post-test mean of control group was 40.95 with standard deviation + 1.82.

The adjusted mean on Breath holding time on aerobic training group was 50.90, resistance training group was 51.23, concurrent training group was 51.32 and control group was 42.10, as shown in Table 4.19. The obtained mean values on the experimental and control groups were presented in Figure II.

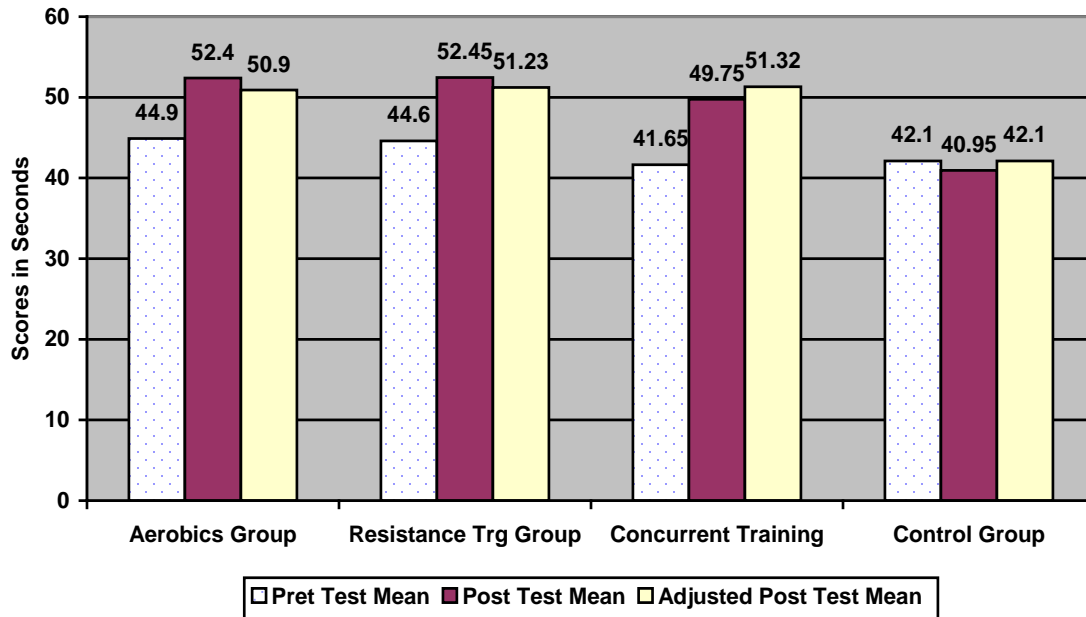


Fig 2: Bar Diagram Showing Pre, Post and Adjusted Means on Breath Holding Time Due To Aerobic, Resistance and Concurrent Training among College Men

The results on descriptive statistics proved that physiological variable Breath holding time was improved. And to test statistical significance of the differences, the obtained data on Breath holding time using ANCOVA was presented in Table 4.20.

Table 6: Computation of Analysis of Covariance Due To Aerobic, Resistance and Concurrent Training and Control Group On Breath Holding Time Among College Men

	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre-test Mean	Between	168.24	3	56.08	1.37
	Within	3110.95	56	40.93	
Post-test Mean	Between	1775.54	3	591.85	14.12*
	Within	3186.45	76	41.93	
Adjusted Post-test Mean	Between	1218.33	3	406.11	75.97*
	Within	400.91	75	5.35	

Required $F_{(0.05), (df 3,75)} = 2.77$

*Significant at 0.05 level of confidence

As shown in Table 6, the obtained F-ratio of 1.37 on pre-test means of the groups was not significant at 0.05 level as the obtained F-value was less than the required table F-value of 2.77 to be significant at 0.05 level. This shows that there was no significant difference in means of the groups at initial stage.

Taking into consideration of the pre-test means and post-test means, adjusted post-test means were determined and analysis of covariance was done. The obtained F-value on adjusted means was 75.97. The obtained F-value was greater than the required value of 2.77 and hence it was accepted that there was significant differences among the adjusted means on the Breath holding time of the subjects.

Since significant improvements were recorded, the results were subjected to post hoc analysis using Scheffe’s Confidence Interval test. The results were presented in Table 7

Table 7: Multiple Paired Adjusted Means Comparisons between varied physical exercises among college men on Breath holding time

Aerobic training Group	Resistance training Group	Concurrent training Group	Control Group	MEAN DIFF	C.I
50.90	51.23			-0.33	2.09
50.90		51.32		-0.43	2.09
50.90			42.10	8.80*	2.09
	51.23	51.32		-0.09	2.09
	51.23		42.10	9.13*	2.09
		51.32	42.10	9.23*	2.09

*Significant at 0.05 level.

The post-hoc analysis of obtained ordered adjusted means proved that to be significant at 0.05 level confidence the required confidence interval was 2.09. The following paired mean comparisons were greater than the required confidence interval and were significant at 0.05 level.

Aerobic training Vs Control Groups (MD: 8.80)

Resistance training Vs Control Groups (MD: 9.13)

Concurrent training Vs Control Groups (MD: 9.23)

The following paired mean comparisons were less than the required confidence interval and were not significant at 0.05

level.

Aerobic training Vs Resistance training Groups (MD: -0.33)

Aerobic training Vs Concurrent training Groups (MD: -0.43)

Resistance training Vs Concurrent training Group (MD: -0.09)

Conclusions

Within the limitations and delimitations of the study, the following conclusions were drawn:

1. It was concluded that the obtained F-value of 26.52 on biomotor variable flexibility was greater than the required table F-value 2.77 to be significant at 0.05 level. The post-hoc analysis further proved that aerobic training, resistance training and concurrent training were significantly better than control group in improving flexibility of college men. The comparisons on effect of these experimental protocols through paired mean comparisons proved that aerobic training was significantly better than concurrent training of college men.
2. It was concluded that physiological variable breath holding time was significantly improved due to aerobic training, resistance training and concurrent training than control group among college men. The comparisons on effect of these experimental protocols through paired adjusted mean comparisons proved that there were no significant differences among treatment groups in altering breath holding time.

Recommendations

The findings of this research proved that twelve weeks aerobic training, resistance training and concurrent training significantly improved biomotor variables, and selected physiological variables. Based on these results, discussions and findings of the research, the following recommendations are made:

1. In view of the benefits of the varied aerobic exercises, educational authorities may consider inclusion of these exercises as part of the physical education programme for college students.
2. In view of the fact that aerobic exercises require no equipment or minimal equipments, students may be encouraged to undergo these types of training regularly for their total fitness.

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