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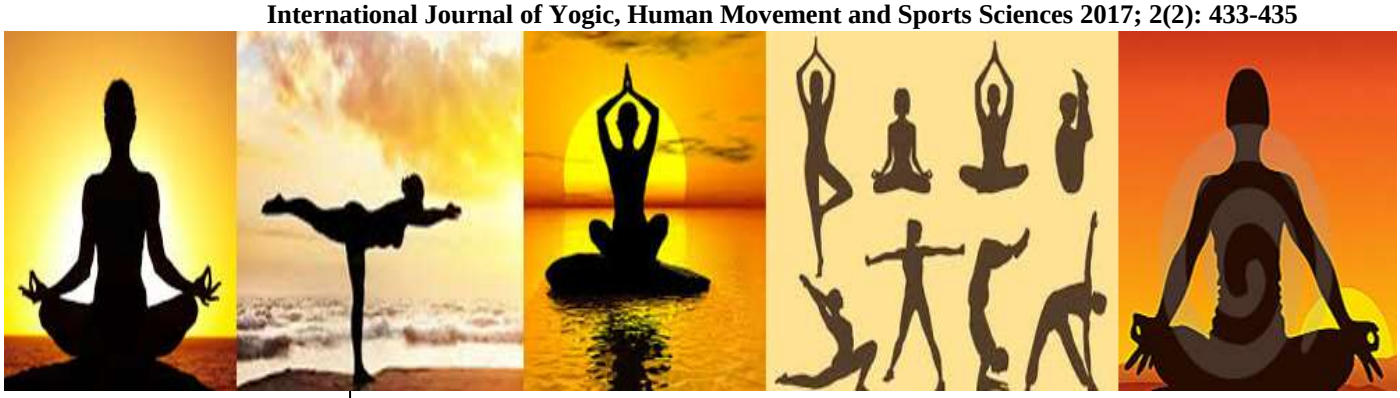

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Effect of resistance aerobic and concurrent training on muscular endurance of untrained students

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Abstract
The purpose of the study is to investigate the effect of resistance, aerobic and concurrent training on muscular endurance of untrained students. Sixty college men students from the Department of Arts and Sciences were selected as subjects. The age, height and weight of the subjects ranged from 18 to 23 years, 162 to 175 centimeters and 56 to 70 kg respectively. The selected subjects were randomly assigned into four equal groups of 15 subjects each. Group I underwent resistance training, group II underwent aerobic training, group III underwent concurrent training and group IV acted as control. Prior to and after the training the subjects were tested on muscular endurance using standard test and procedure. Analysis of covariance was used to determine the significantly difference existing between pre test and post test on muscular endurance. The result of the study proved that the effect of resistance, aerobic and concurrent training significantly improved muscular endurance of the untrained men students.

Keywords: Resistance, aerobic, concurrent training and muscular endurance

Introduction
The athletic world and it has its focal points in performing ordinary exercises, for example, lifting or conveying objects. Quality adds to the general effectiveness of the human body. Beginning a quality preparing system began another way of life since quality is reversible. It will decay if don't keep on acquiring a quality boost all through whole life. For some individuals in restoration or with a procured handicap, for example, following stroke or orthopedic medical procedure, quality preparing for frail muscles is a key factor to enhance recuperation. Ada., Dorsch and Canning (2006) [1]. For individuals with such a wellbeing condition, their quality preparing is probably going to should be structured by a suitable wellbeing proficient, for example, a physiotherapist. More grounded muscles improve execution in an assortment of games. Game explicit preparing schedules are utilized by numerous contenders. These regularly indicate that the speed of muscle withdrawal during weight preparing ought to be equivalent to that of the specific game. Exercise encourages a person's capacity to keep up an autonomous way of life and improves the probability that one appreciate the post-retirement years. Keeping up adaptability in the muscles of the legs and lower back, and quality in stomach and back muscles, can counteract the improvement of back issues that can be incapacitating and extremely difficult. (Brehm, 2010) [3].
Simultaneous quality and aerobic exercise does in reality effetely affect the advancement of solidarity or power creation. The neuromuscular status of the muscle is changed through opposition preparing by empowering either more prominent muscle fiber enlistment or by expanding the terminating recurrence of the engine units. It ought not out of the ordinary that these equivalent neuromuscular adjustments will happen when an untrained individual begins a program of simultaneous obstruction and aerobic exercise Docherty and Sporer (2000) [4].

Methodology
Subjects and Variables
The purpose of the study is to investigate the effect of resistance, aerobic and concurrent training on muscular endurance of untrained students. Sixty college men students from the Department of Arts and Sciences were selected as subjects.

The age, height and weight of the subjects ranged from 18 to 23 years, 162 to 175 centimeters and 56 to 70 kg respectively. The selected subjects were randomly assigned into four equal groups of 15 subjects each. Group I underwent resistance training, group II underwent aerobic training, group III underwent concurrent training and group IV acted as control. Muscular endurance was measured by Sit-ups test.

Training Protocol

The training programmes were scheduled for one session a day; each session lasted between thirty to forty five minutes approximately including warming up and warming down. During the training period, the experimental groups underwent their respective training programme three days per week (alternative days) twelve weeks in addition to their curriculum. The group–I concentrated on resistance training, intensity fixed based on their 1RM, once in two weeks the load was increased with 5%. Group–II on aerobic training, the intensity starting from 20minutes @ 40% of HRR to 35 minutes @ 65% HRR, followed from first week to twelve weeks. Group–III on concurrent training two session per day (morning and evening), the intensity of the training increased progressively across the weeks. As followed as the resistance training and aerobic training group schedule. Every odd numbered week they performed the strength training in the morning session and endurance training in the evening session. Every even numbered week they performed endurance training in the morning session and strength training in the evening session.

Experimental Design and Statistical Technique

The experimental design in this study was random group design involving 60 men subjects, who were divided at random in to four group of fifteen each. All the four groups selected from the same population. No effort was made to equate the groups prior to the commencement of the experimental treatment. The pre test means of the selected dependent variable was used as a covariate. In order to nullify the initial differences the data collected from the four groups prior to and post experimentation on selected dependent variable were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since four groups were involved, whenever the obtained 'F' ratio for adjusted post test means was found to be significant, the Scheffe's test was applied as post hoc test to determine the paired mean differences. In all the cases level of confidence was fixed at 0.05 for significance.

Table 1: Analysis of covariance on muscular endurance of experimental and control groups

	Resistance Training	Aerobic Training	Concurrent Training	Control Group	SOV	Sum of Squares	df	Mean squares	'F' ratio
Pre test Mean SD	24.60	24.73	24.93	25.01	B	1.51	3	0.51	0.40
	1.12	1.22	1.16	0.92	W	69.46	56	1.24	
Post test Mean SD	28.66	29.67	32.20	25.26	B	370.85	3	123.61	65.30*
	1.29	1.34	1.82	0.88	W	106.00	56	1.89	
Adjusted Post test Mean	28.82	29.72	32.11	25.13	B	377.54	3	125.84	98.59*
					W	70.20	55	1.27	

The required table value for significance at 0.05 level of confidence with degrees of freedom 3 and 55 is 2.77 and degree of freedom 3 and 56 is 2.77

*Significant at .05 level of confidence

Table-I demonstrates that the pre test mean and standard deviation on muscular endurance of resistance, aerobic, concurrent training and control gatherings are 24.60 ± 1.12, 24.73 ± 1.22, 24.93 ± 1.16 and 25.01 ± 0.92 separately. The acquired 'F' proportion estimation of 0.40 for pre test implies on muscular endurance of opposition, oxygen consuming, simultaneous preparing and control gatherings were not exactly the required table estimation of 2.77 for the degrees of opportunity 3 and 56 at 0.05 degree of certainty. It uncovers that there is factually inconsequential distinction among the opposition, high-impact, simultaneous preparing and control groups during pre trial. It deduced that the arbitrary task of the subjects for the four gatherings is fruitful.

The post test mean and standard deviation on muscular endurance of resistance, aerobic, concurrent training and control gatherings are 28.66 ± 1.29, 29.67 ± 1.34, 32.20 ± 1.82 and 25.26 ± 0.88 separately. The acquired 'F' proportion estimation of 65.30 for post test implies on muscular endurance of opposition, oxygen consuming, simultaneous preparing and control gatherings are more noteworthy than the required table estimation of 2.77 for the degrees of opportunity 3 and 56 at 0.05 degree of certainty.

The adjusted post test implies on muscular endurance of resistance, aerobic, concurrent training and control gatherings are 28.82, 29.72, 32.11 and 25.13 separately. The acquired 'F' proportion estimation of 98.59 on muscular endurance were more prominent than the required table estimation of 2.77 for the degrees of opportunity 3 and 55 at 0.05 degree of certainty. It is seen from this finding noteworthy contrasts exist among the balanced post test methods for exploratory and control bunches on muscular endurance. Since, the balanced post test 'F' proportion worth is observed to be huge the Scheffe's test is connected as post hoc test to decide the combined mean contrasts, and it is introduced in table-II.

Table 2: Scheffe's test for the difference between the adjusted post test paired means of muscular endurance

Adjusted Post Test Means				DM	CI
Resistance Training	Aerobic Training	Concurrent Training	Control Group		
28.82	29.72			0.9	1.18
28.82		32.11		3.29*	1.18
28.82			25.13	3.69*	1.18
	29.72	32.11		2.39*	1.18
	29.72		25.13	4.59*	1.18
		32.11	25.13	6.98*	1.18

*significant

Table-II shows the Scheffe's test results that there are significant difference between the adjusted post test means of resistance training and concurrent training groups; resistance training and control groups; aerobic training and concurrent training groups; aerobic training and control groups; concurrent training and control groups on muscular endurance. The result also stated that there is no significant difference between resistance training and aerobic training groups on muscular endurance. Concurrent training group had high impact to improve on muscular endurance of the untrained college men students when compared to other experimental groups.

Fig 1: Cylinder diagram showing the mean value on muscular endurance of experimental and control groups

Discussion and Conclusions

It is seen from this result noteworthy contrasts exist among the balanced post test methods for exploratory and control bunches on muscular endurance. Moreover, Concurrent training group had high impact to improve on muscular endurance of the untrained college men students when compared to other experimental groups. The subsequent studies are confined with our study results. Anahita, *et al*., (2018) [2] assessed the effect of concurrent exercise training on cardiorespiratory capacity and cardio-vascular risk factors among sedentary overweight or obese post-menopausal women. Study stated that concurrent ER training can be a suitable exercise program for increasing VO_{2max} in postmenopausal women. Varghese and Muthueleckuvan (2018) [6] examined the effect of twelve weeks of combined aerobic with explosive strength training and aerobic with resistance training in enhancing the muscular strength endurance of female football players. The results suggest that both the combined aerobic with explosive strength training and combined aerobic with resistance training are significantly improved the muscular strength endurance of female football players. Muthuraj (2016) [5] investigated to find out the effect of concurrent training on explosive power of untrained men. The finding of the study showed that significant improvement on explosive power due to the concurrent training for the experimental group's subjects.

Conclusions

The conclusion of the study showed that the resistance, aerobic, concurrent training had significant improvement on muscular endurance when compared to the control group. Moreover concurrent training group had high impact to improve on muscular endurance of the untrained men students when compared to resistance training and aerobic training groups.

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