



EFFECT OF RESISTANCE TRAINING FOLLOWED BY YOGIC PRACTICES ON MUSCULAR STRENGTH ENDURANCE AND BLOOD PRESSURE

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Abstract:

The aim of the study was to find out whether resistance training followed by yogic practices enhancing the muscular strength, strength endurance and reducing blood pressure of college level male football players. Thirty college aged male football players in 18 and 25 years of age group studying in various colleges around Thiruvananthapuram, Kerala were selected as subjects. They were divided into two equal groups, each group consisted of fifteen football players, in which group - I underwent resistance training followed by yogic practices and group - II acted as control which did not participate any training apart from their regular curricular activities. The period of training for the present study was three days (alternative days, such as, Monday, Wednesday and Friday) in a week for twelve weeks. Prior to and after the training period the subjects were tested on muscular strength, strength endurance and blood pressure (systolic and diastolic). The muscular strength was measured by administering push-ups test, strength endurance was measured by administering bent knee sit-ups test and blood pressure (both systolic and diastolic) was measured by using sphygmomanometer. The analysis of covariance (ANCOVA) was applied as statistical tool to find out any significant difference between the experimental and control groups. It was concluded from the result of the study that resistance training followed by yogic practices group have improved ($P < 0.05$) all the criterion variables, such as, muscular strength, strength endurance and decreased the blood pressure (both systolic and diastolic).

Key Words: Resistance Training Followed By Yogic Practices, Muscular Strength, Strength Endurance and Blood Pressure.

Introduction:

Numerous training procedures are in practice to improve each and every physical and motor fitness qualities at various levels. [1] The major objective in training is to cause biological adaptation in order to improve performance in a specific task. Resistance training is a form of exercise that improves muscular strength and endurance. [2] Resistance training is any exercise that causes the muscles to contract against an external resistance with the expectation of increases in strength, tone, mass, and/or endurance. [3] It also causes damage or tears in muscle cells (catabolism) and quickly repaired to regenerate the muscle and grow stronger (anabolism). [3] Resistance training also known as strength training or weight training is the use of resistance to muscular contraction which enables strength, aerobic and anaerobic endurance and muscle mass. [7] Frequent and regular resistance training has been shown to help prevent or treat serious and life-threatening chronic conditions such as high blood pressure, obesity, heart disease, Type 2 diabetes, insomnia, and depression. [8] Yoga is a complete science of life that originated in India many thousands of years ago, which of personal development in the world, encompassing body, mind and spirit. [4] Yoga is not an ancient myth buried in oblivion. It is the most valuable inheritance of the present. It is the essential need of today and the culture of tomorrow. [5] The yoga postures (known as asanas), help to stretch and relax the muscles and skeletal system. The physical release through these soothing movements can help create a sense of calmness and well-being [6] Muscular strength is defined as "the force that muscle or a group of muscle can exert against a resistance for a prolonged period". [9] The socio-psychological concept of self-confidence relates to self-assuredness in one's personal judgment, ability, power, etc., sometimes manifested excessively. [10] Blood pressure (BP) is a force exerted by circulating blood on the walls of blood vessels, and is one of the principal vital signs.

Methods:

This study under investigation involves the experimentation of resistance training followed by yogic practices on muscular strength, strength endurance and blood pressure (systolic and diastolic). Thirty college level male football players in 18 and 25 years of age group (mean age = 21 ± 0.9 years) studying in various colleges around Thiruvananthapuram, Kerala were selected as subjects. The selected thirty subjects were randomly divided into two groups of fifteen each, out of which, group - I ($n = 15$) underwent resistance training followed by yogic practice and group - II ($n = 15$) remained as control and they were permitted to participate any activity related with their curriculum. The training programme was carried out for three days (alternative days) per week during morning session only (6 am to 8 am) for twelve weeks. Before the commencement of resistance

training, all the subjects were tested with 1RM resistance. According to the 1RM the individual load was fixed for the resistance training. Muscular strength was measured by administering push-ups test, strength endurance was measured with the sit - ups test and blood pressure was measured by using sphygmomanometer. Before applying the experiment all the subjects of the resistance training followed by yoga practice and control groups were attended the pre-test, which was conducted a day prior to the commencement of the training and the data were collected on muscular strength, strength endurance and blood pressure (systolic and diastolic). After twelve weeks of training the post-test was conducted one day after the training period to find out any changes in the criterion variables.

Table 1: Training Schedule

Weeks	Name of the Exercises
1 - 4	Warming up. Then bench press (5 reps:1 set), squat (5 reps:1 set), shoulder press (3 reps:1 set), knee extension (5 reps:1 set), forward biceps curl (3 reps:1 set), leg curl (5 reps:1 set) and ab crunches (12 reps: 1 set) - 15 minutes rest - Suryanamaskar (10 Min : 5 Min), Vajrasana (30 sec : 30 sec), Gomukasana (30 sec : 30 sec), Pawanmuktasana (30 sec : 30 sec), Dhanursana (30 sec : 30 sec), - All 2 repetitions, Shavasana (2 min)
5 - 8	Warming up. Then bench press (7 reps:2 set), squat (7 reps:2 sets), shoulder press (5 reps:2 sets), knee extension (7 reps:2 sets), forward curl (5 reps:2 sets), leg curl (7 reps:2 sets) and ab crunches (15 reps: 2 sets) - 15 minutes rest - Suryanamaskar (10 Min : 5 Min), Vajrasana (1min : 30 sec), Pawanmuktasana (1 min : 30 sec), Dhanursana (1 min : 30 sec), Ardhamatyendrasana (both sides) (2 min : 1 min), Paschimotsasana (1min : 30 sec), Bhujangasana (1 min : 30sec) - All 2 repetitions, Shavasana (2 min)
9 - 12	Warming up. Then bench press (10 reps:3 set), squat (10 reps:3 sets), shoulder press (10 reps:3 sets), knee extension (10 reps:3 sets), forward curl (8 reps:3 sets), leg curl (10 reps:3 sets) and ab crunches (20 reps: 3 sets) - 10 minutes rest - Suryanamaskar (10 Min : 5 Min), Vajrasana (1min : 30 sec), Pawanmuktasana (1min : 30 sec), Dhanursana (1 min : 30 sec), Ardhamatyendrasana (both sides) (2 min : 1 min), Paschimotsasana (1 min : 30 sec), Bhujangasana (1 min : 30 sec) Matsyasana (1 min : 30 sec) - All 2 repetitions, Shavasana (2 min).

- The percentage of intensity for weight training during I - IV week is 45%, V - VIII week is 55% and IX - XII week is 65% of their 1 Repetition Maximum test.
- For the resistance training group, the rest period between each set was five minutes and the individual care was taken.
- For yogic exercise maintaining duration in minutes and the recovery between repetitions and next yogic exercises were given in training schedule.

Statistical Analysis:

The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the experimental groups on selected criterion variables separately. In all the cases, 0.05 level of confidence was fixed to test the significance, which was considered as an appropriate.

Analysis of Data:

The data collected prior to and after the experimental periods on muscular strength, strength endurance and blood pressure (systolic and diastolic) on resistance training followed by yogic practices group and control group were analysed and presented in the following table - 2.

Table 2: Analysis of Covariance and 'F' ratio for Muscular strength, Strength endurance and Blood Pressure (systolic and diastolic) for Resistance Training followed by Yoga Practice Group and Control Group

Variable Name	Group Name	Resistance Training followed by Yogic Practice Group	Control Group	'F' Ratio
Muscular strength (in numbers/min)	Pre-test Mean ± S.D	27.35 ± 1.08	27.39 ± 1.55	0.097
	Post-test Mean ± S.D.	31.59 ± 0.97	26.83 ± 1.67	63.89*
	Adj. Post-test Mean	30.96	27.08	73.55*
Strength endurance (in Kg)	Pre-test Mean ± S.D	31.09 ± 1.93	31.86 ± 2.31	0.056
	Post-test Mean ± S.D.	34.41 ± 1.08	31.93 ± 1.55	41.17*
	Adj. Post-test Mean	35.09	31.99	69.56*
Systolic Blood Pressure (mmHg)	Pre-test Mean ± S.D	122.36 ± 2.92	123.81 ± 2.44	0.85
	Post-test Mean ± S.D.	120.33 ± 2.86	123.77 ± 2.19	1.73
	Adj. Post-test Mean	120.87	123.63	35.87*
Diastolic Blood Pressure (mmHg)	Pre-test Mean ± S.D	82.55 ± 1.87	82.39 ± 2.31	0.15
	Post-test Mean ± S.D.	80.43 ± 1.25	82.53 ± 2.59	2.67
	Adj. Post-test Mean	80.16	82.44	28.71*

* Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with df 2 and 43 and 2 and 42 were 3.21 and 3.22 respectively).

Table 2 show that pre-test mean 'f' - ratio of resistance training followed by yogic practice group and control group on muscular strength was 0.097 which was insignificant at 0.05 level of confidence. The post-test and adjusted post-test mean 'f' - ratio value of muscular strength was 63.89 and 73.55 which was significant at 0.05 level of confidence. The above table also shows that pre-test mean 'f' - ratio of resistance training followed by yogic practice group and control group on strength endurance was 0.056 which was insignificant at 0.05 level of confidence. The post-test and adjusted post-test mean 'f' - ratio value of strength endurance was 41.17 and 69.56 which was significant at 0.05 level of confidence. Table - I show that pre and post-test mean 'f' - ratio of resistance training followed by yogic practice group and control group on systolic blood pressure was 0.85 and 1.73 which was insignificant at 0.05 level of confidence. The adjusted post-test mean 'f' - ratio value was 35.87 which was significant at 0.05 level of confidence. Table - I show that pre and post-test mean 'f' - ratio of resistance training followed by yogic practice group and control group on diastolic blood pressure was 0.15 and 2.67 which was insignificant at 0.05 level of confidence. The adjusted post-test mean 'f' - ratio value was 28.71 which was significant at 0.05 level of confidence.

Results:

After applying the analysis of covariance, the result of this study showed that there was a significant difference among resistance training followed by yoga practice and control groups on the changes in muscular strength, strength endurance and blood pressure after twelve weeks of training. The criterion variables such as, muscular strength was improved for both the resistance training followed by yoga practice and systolic and diastolic blood pressure has significantly decreased after the resistance training followed by yoga practice period.

Conclusion:

Muscular strength and leg strength has improved for the resistance training followed by yoga practice group when compared with the control group. The blood pressure has also decreased in resistance training followed by yoga practice group when compared with the control group.

Hong et al [11] found that the resistance training has improved the muscular strength for male college students. Several research studies also shows that there was an improvement in maximal muscular strength after the resistance training in young athletes. [12-14] A systematic review and meta-analysis shows that there was a significant reduction in systolic blood pressure after resistance training. [15] A meta-analysis of randomized and controlled trial reported that resistance training induced a significant blood pressure reduction in 28 normotensive or prehypertensive study groups. [16] Trevizani et al [17] reported that there was a significant reduction in blood pressure after the resistance training in treated hypertensive subjects. It is evident that there was a significant improvement in muscular strength after the yoga practice among college women hockey players. [18] There was a significant improvement in sit-ups after the yoga practice in young women. [19] An evidence shows that selected yogasana practices has enhanced the health related physical fitness such as, muscular strength, endurance, flexibility, body composition and pulmonary function. [20] There is a significant improvement in social self - esteem after selected yogasana practices and physical exercise. [21] Blood pressure was also reduced significantly after the selected yogic practices which will avert the hyper or hypotension for normal human beings who were attained the above 40 years of age. [22] Involving the physical activity improves the muscle strength, balance and endurance for people who were attained 40 years of age. [23, 24]

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