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Research Paper

Effect of Aerobic Exercises on Biceps Brachi Muscle Function in Non- Athletic Individuals

Medical Science

KEYWORDS : Aerobic exercises, Biceps brachi, Strength, Endurance, non-athletes

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ABSTRACT

The purpose of the current study is to evaluate the effect of aerobic exercises on strength and endurance of Biceps brachi muscle. A total of 40 non-athletic subjects were evaluated pre-test and post-test for aerobic capacity by Rockport test, muscle strength by strain gauge and endurance by repetition maximum (RM). After pre-test subjects were divided randomly into 2 groups: Group A (experimental n=20) and Group B (control n=20). Subjects in group A underwent aerobic exercise training for 4 weeks (3/week) at 70-85% HRmax for 20 min. Group B did not undergo any intervention. The study revealed that Group A (experimental) had significant improvement in all three parameters. Mean difference in VO2max after 4 weeks were 1.95+/-1.00, strength (1.91+/-1.31) and endurance (3.45+/-3.10) which were highly significant with P<0.05 for each as compared to Group B. There is a positive effect of aerobic capacity on Biceps brachi muscle function.

INTRODUCTION

Aerobic capacity is the maximum ability to perform exercise with large muscle groups. This ability is produced by the interaction of lungs, heart and peripheral tissues.[1] Aerobic capacity reflects the central cardiac function and the efficiency of the peripheral tissue to extract and use oxygen. Deconditioning due to reduction in daily activities or post injury appears to be important concern for quality of function by any major muscle group. Hence the purpose of the current study is to evaluate the effect of aerobic exercises on strength and endurance of Biceps brachi muscle.

METHODOLOGY

A total of 40 subjects were taken for the study by convenient sampling, and those with any history of regular exercise training, cardiac and pulmonary dysfunction or orthopedic and neurological complication were excluded. After obtaining informed consent as per the as per the ethical guidelines of Indian Council of Medical Research (ICMR, 2000)[2], each subject was evaluated during pre-test as well as post-test for Aerobic Capacity by Rockport test, Muscular strength by Strain gauge and muscle endurance by repetition maximum (RM) method for Biceps brachi muscle as depicted in figure 1.

Aerobic capacity measurement

Subjects was instructed to cover the distance of 1 mile on a level surface as fast as possible without running , at the end of 1 mile distance heart rate and time taken to cover the distance was measured and the value of VO_2 max was evaluated by putting the values in the in the formula[3].

$VO_2max = (132.853 - (0.0769 \times W) - (0.3877 \times A) + (6.3150 \times G - (3.2649 \times T) - (0.1565 \times HRp)$.

Where,

W = Weightof the subject in pounds.

A =Age of the subject in years.

G = Gender (female =0, Male 1).

T = Time to cover the 1 mile distance.

HRp = heart rate at end of mile (beats per minute)

Measurement of Biceps Brachi Muscle Strength

The biceps Brachi muscle strength of the dominant hand was evaluated by using a Strain Gauge. Subjects in sitting position with shoulder and elbow at 90°. At the distal end of the forearm strap was used which in turn was connected to the strain gauge[4]. Subject were instructed to pull on strap by bending elbow joint with maximum effort without leaning backwards or lifting the elbow joint from the plinth. Initial and final readings were recorded. A total of three readings were taken with a rest period of 30 seconds between each trial. Average of the three readings was taken for the study.

Measurement of Biceps Brachi Muscle Endurance:

Endurance was calculated by using a repetition maximum (RM) method. Subjects 1 RM was calculated by giving them appropriate weight and asked them to perform maximum number of repetitions. Maximum repetitions performed and weight lifted was used to calculate the 1RM by the formula.

1RM = 1.544 x 7-10RM (Wt. kg) – 5.181[5]

Once 1RM was calculated, weight equalent to 20% of 1RM was given to subjects and instructed to perform maximum number of repetitions until exhaustion.

Number of repetitions determined the endurance value.

After pre-test evaluation of all the three parameters subjects were divided randomly into two groups. Group A (n=20 Experimental) and Group B (n=20 Control).

Intervention Protocol:

Subjects in Group A underwent an aerobic training protocol on Bicycle ergometer for 4 weeks (3times / week) at an exercise stimulus of 70-85% HR_{max} for 30 min. Training heart rate was maintained throughout the session by changing the power output. Intensity of the exercise was maintained by heart rate maximum method between 70 to 85% HRmax using a heart rate monitor.

HRmax = 208 – 0.7 X age in years[5]

Resistance was adjusted according to the heart rate response to maintain the exercise stimulus between 70 – 85%HR_{max} throughout the training session for 20 minutes. After bicycle ergometer training, subjects performed cool down for 5 minutes.

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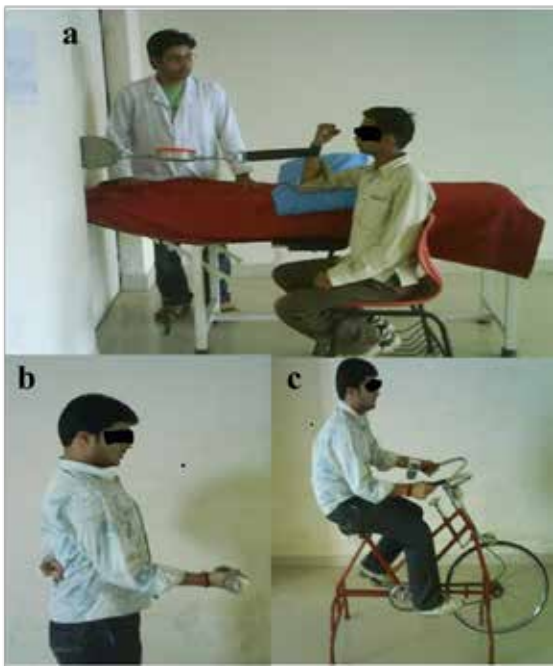

Figure 1: Subject's Measurement and intervention

STATISTICAL ANALYSIS

The statistical analyses were accomplished by software package, SPSS 16.0. For statistical analysis, standard descriptive statistics and student t-test were used for the outcome measures pre and post intervention. The significance level was set at P< 0.05.

RESULTS

The demographic profiles of the subjects in two groups are mentioned in table 1. The results revealed that Group A i.e. experimental Group showed an improvement in all the three parameters.VO_2max significantly ($P < 0.05$) leaped from pre intervention of 44.70±9.64 to post intervention of 46.65±9.70 by the end of 4 weeks. Biceps brachi muscle strength had been significantly ($P < 0.05$) found to be improved drastically from 23.50±5.52 pre intervention to 25.41±5.84 by the culmination 4 weeks. When the parameter of Biceps brachi muscle endurance was analyzed, it was found that pre intervention value being 18.05±6.55 had also been significantly ($P < 0.05$) enhanced to 21.50±6.27at post intervention level as a result of 4 weeks aerobic training as mentioned in the table 2.

But the scenario of all the three parameters viz. VO_2max, Biceps brachi muscle strength and Biceps brachi muscle endurance being found to non-significant ($p \geq 0.05$) for subjects of Group B (control). The increase in VO_2max on comparing the pre 4 weeks and post 4 weeks in Group B had been negligible with values being 39.02±7.96 and 39.08±8.00 respectively.

The average value of biceps brachi muscle strength was 21.12± 6.21 and 21.20 ± 6.09 pre 4 weeks and post 4 weeks respectively.

Endurance of biceps brachi for control Group also had not improved significantly with 15.65±5.25 to 16.10±4.64 being the pre 4 week and post 4 week values respectively.

DISCUSSION

The purpose of the current study was to check the effectiveness of the aerobic exercises on the Biceps brachi muscle function in non-athletic individuals. The main three parameters evaluated in this study are aerobic capacity, Biceps brachi muscle strength and Biceps brachi muscle endurance all these parameters were found to be significantly improved following 4 weeks of aerobic exercises on bicycle ergometer with subject performing at 70-85% of HRmax.

The leap in all three parameters can be attributed to many mechanisms and adaptations occurring in the body while exercising on a bicycle ergometer, demanding on cardiovascular, respiratory and peripheral systems increased many folds. These demands in turn overload the said systems further press to bring both physiological as well as morphological changes. In the current study enhancement of VO_2max among the subjects of intervention Group (A) had been quite significant quantitatively with 4.36% improvement. Gormley and Swain et al. (2008)[6] reported consistent findings and showed that VO_2max was significantly improved in their study protocol of 6 weeks with an exercise intensity of 50-60% of VO2 reserve (75-90% of HRmax).

Biceps brachi muscle strength of the subjects in the intervention Group was improved by 8.12% after 4 weeks of aerobic training on bicycle ergometer. Same results were observed by Izawa et al. (2004)[7] which showed that long term aerobic exercises significantly improves Hand grip strength in phase II cardiac rehabilitation. The improvement in the Biceps brachi strength is with the fact that there is increased storage of ATP –PC in the muscle and increased activity of the key enzymes involved in the ATP-PC system.

Evaluation of the Biceps brachi endurance after intervention showed significant improvements from its pre-test values. An increment of 19.11 % in intervention Group suggests efficacy of the training protocol.

Improvement is based on the fact that following an aerobic exercise training program there is enhanced interaction of the cardiorespiratory system and efficient peripheral extraction and utilization of the oxygen. Hence, improving the overall endurance. Hogan and Richardson reported that improved oxygenation halts the hydrolysis rate of phosphocreatine and in turn less accumulation of the inorganic phosphate and enhanced endurance of muscles.

CONCLUSION

As per the various postulates discussed above it is interpreted that effect of aerobic exercises on Biceps brachi muscle function in non- athletes is found to be quite significant. This information will be of utmost priority for the sports persons who are recovering from any injury and aim towards maintaining both aerobic fitness and muscular function of the injured area. Therefore providing faster rehab and early return to the sports. Those individuals who were suffering from pathologies of cardiovascular, respiratory and peripheral systems, the results of current study not guide regarding improving their aerobic fitness but will also enhance their muscle functions. Therefore contributing towards better active life style and quality of life.

Table 1: Demographic Profile of subjects

Demographic Data	Group A		Group B	
	Mean	SD	Mean	SD
AGE	23.70	1.55	23.45	1.19
HEIGHT	166.82	9.53	161.43	7.90
WEIGHT	135.01	17.24	131.71	16.96
BMI	21.35	2.04	22.16	1.82
WEIGHT LIFTED	6.00	1.18	5.55	1.19

Table 2: Comparison of mean values for VO2 max, Strength and Endurance at Pre and Post intervention within Group A and Group B.

Pre Vs Post	Group A	Group B
	t value	t value
VO2 max	-8.696**	0.287(NS)
Strength	-6.513*	-0.370(NS)
Endurance	-4.972**	-1.254(NS)

***p< 0.05, ** p<0.01, NS- non significant**

REFERENCE

1. Bassett DR. and Howley ET. Limiting factors for maximum oxygen uptake and determinants of endurance performance. Med. Sci. Sports Exerc. 2000 (32),70–84,. | 2. Indian council of medical research. Ethical guidelines for biomedical research on human subjects. New Delhi: ICMR 2000,1-77. | 3. Kline GM, Porcari JP, Hintermeister R, et al. Estimation of VO2 Max from a one mile track walk, gender, age, and body weight. Medicine and Science in sports and Exercise. 1987 (19),253-59. | 4. Petrofsky J and Laymon M. The Relationship between Muscle Temperature, MUAP Conduction Velocity and the Amplitude and Frequency Components of the Surface EMG during Isometric Contractions. Basic Appl Myol. 2005, 15 (2), 61-74. | 5. William D. McArdle, Frank I. Katch, Victor L. katch. Exercise Physiology, energy, nutrition and Human performance. 6th Edition. 2006, pp 512. | 6. Gormley SE, Swain DP, High R et al. Effect of intensity of aerobic training on VO2max. Med Sci Sports Exerc. 2008 (7),1336-43. | 7. Izawa K, Hirano Y, Yamada S, Oka K, Omiya K, Iijima S. Improvement in physiological outcomes and | | health-related quality of life following cardiac rehabilitation in patients with acute myocardial infarction. Circulation J. 2004 (68), 315-20. |