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EFFECT OF RESISTANCE TRAINING WITH AND WITHOUT PROTEIN SUPPLEMENTATION ON MUSCULAR STRENGTH OF INTER-COLLEGIATE ATHLETES

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Abstract

The purpose of this study was to examine the effect of resistance training and resistance training with protein supplementation on muscular strength of inter-collegiate athletes. To achieve this purpose, forty five male inter-collegiate level athletes from various colleges affiliated to Acharya Nagarjuna University, Guntur, Andhra Pradesh during the academic year 2014-2015 were randomly selected as subjects. The age of the selected subjects were ranged from 18 to 24 years. The selected subjects were divided into three equal groups of fifteen subjects each at random. Group-I performed resistance training and group-II performed resistance training with protein supplementation for three days per week for twelve weeks and group-III acted as control. The selected dependent variable muscular strength was assessed by using dynamometer. The data collected from the experimental and control groups on selected dependent variable was statistically analyzed by paired 't' test to find out the significant differences if any between the pre and post test. Further, percentage of changes was calculated to find out the chances in selected dependent variables due to the impact of experimental treatment. The data collected from the three groups prior to and post experimentation on selected dependent variable was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Whenever the obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test. In all the cases the level of confidence was fixed at 0.05 level for significance. As a result of twelve weeks of resistance training and resistance training with protein supplementation the muscular strength of the inter-collegiate athletes was significantly improved however, resistance training with protein supplementation was significantly better than resistance training in improving muscular strength of the athletes.

Key Words: *Resistance training, Protein supplementation and muscular strength.*

INTRODUCTION

Due to the many important functions of protein in the body, it has become a significant topic in research. Protein is of utmost importance to the athletic community due to its role in anabolic processes that improve athletic performance and muscle development. Up to this point, protein supplementation has been used to increase the intake of daily protein. There are many theories as to why protein supplementation is effective. Coaches and athletes are looking to scientific community to provide evidence to support or refute these theories. When looking at protein supplementation, it is important to understand the functions of protein, observe current dietary protein requirements, the types and dosages used, timing of administration, improved athletic performance associated with protein supplementation, protein safety, advantages of protein use, necessity, cost, and athlete's knowledge regarding this nutrient.

The effects of protein supplementation have been investigated more recently. Some studies report that protein supplementation enhance subsequent exercise performance versus carbohydrate beverages, although others have reported no positive effects. The putative efficacy of protein supplementation could be due to influences on glycogen resynthesis, protein turnover, rehydration, attenuations in muscle disruption, or perhaps a combination of these factors. However, there are inconsistencies in the literature regarding the effects of protein supplementation on these factors, and the mechanisms explaining potential influences of protein supplementation are not defined clearly. Further research is required to address these limitations, but present evidence suggests that protein supplementation may positively influence physical and physiological variables under some exercise conditions.

Athletes are able to respond to both resistance training and the anabolic signals provided by protein ingestion, provided specific amino acids, such as leucine, are present. Proteins are a rich source of these essential amino acids and rapidly elevate plasma amino acids, thus providing the foundations for preservation of muscle mass. Several studies involving protein supplementation have been shown to be effective in augmenting the effects of resistance exercise, particularly when supplementation occurs in the hours surrounding

the exercise training. While further work is required, particularly in athletes, simple dietary and exercise strategies that may improve the maintenance of skeletal muscle mass will likely result in a decrease in body fat, increase muscle mass, increase weight, increase athletic ability, and to help with injury or illness (Dorsch & Bell, 2005).

Athletic performance and supplementation will remain in the spotlight from now and for many years to come. Not only does protein supplementation have an anabolic effect on the muscle fibers themselves, but glycogen synthesis is enhanced in the presence of post exercise carbohydrate/protein (CHO/pro) supplementation. These two variables are associated with an athlete's ability to enhance athletic performance. For now, it is understood that protein is required for body maintenance and the athletic performance of both strength and endurance athletes.

More information is needed to understand how athletes are meeting their protein requirements. A comparative study observing resistance training and protein supplementation during resistance training is needed to compare the two methods and determine if there is a benefit to either method.

METHODOLOGY

SUBJECTS AND VARIABLES

To achieve the purpose of the study forty five (N=45) inter collegiate level male athletes from various colleges affiliated to Acharya Nagarjuna University, Guntur, Andhra Pradesh, India during academic year 2014-2015 were selected as subjects. Their age ranged from 18 to 24 years. The selected subjects were divided into three equal groups of fifteen subjects each at random. Group-I performed resistance training, group-II performed resistance training with protein supplementation and group-III acted as control. The purpose, nature and importance of experiment, the procedure to be employed in the collection of data, and the role of the subjects during experimentation and testing periods were explained to the subjects. The selected dependent variable muscular strength was assessed by using dynamometer.

TRAINING PROTOCOL

During the training period, the two experimental groups (group I & II) namely resistance training group and protein supplementation with resistance training group underwent their respective training, three days per week for twelve weeks, in addition to their regular sports activities. For the both resistance training groups eight exercises were given in order to keep the number of the sets were kept constant for each exercise. In between exercises, stretching exercises were done properly and specifically. The load was fixed for the two experimental groups after seeing the one repetition maximum (1RM) of each participant in each exercise. All the subjects of the two experimental groups performed the same volume, intensity and frequency of training. However, 1.2 g/kg protein was supplemented for the subjects of experimental group-II before performing resistance training.

STATISTICAL TECHNIQUE

The data collected from the experimental and control groups on muscular strength was statistically analyzed by paired 't' test to find out the significant differences between the pre and post test. Further, percentage of changes was calculated to find out the chances in selected dependent variable due to the impact of experimental treatment. The data collected from the three groups prior to and post experimentation on muscular strength was statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since three groups were involved, whenever the obtained 'F' ratio value was found to be significant for adjusted post test means, the Scheffe's test was applied as post hoc test. In all the cases the level of confidence was fixed at 0.05 level for significance.

RESULT

The descriptive analysis of the data on muscular strength of experimental and control groups are presented in table-I.

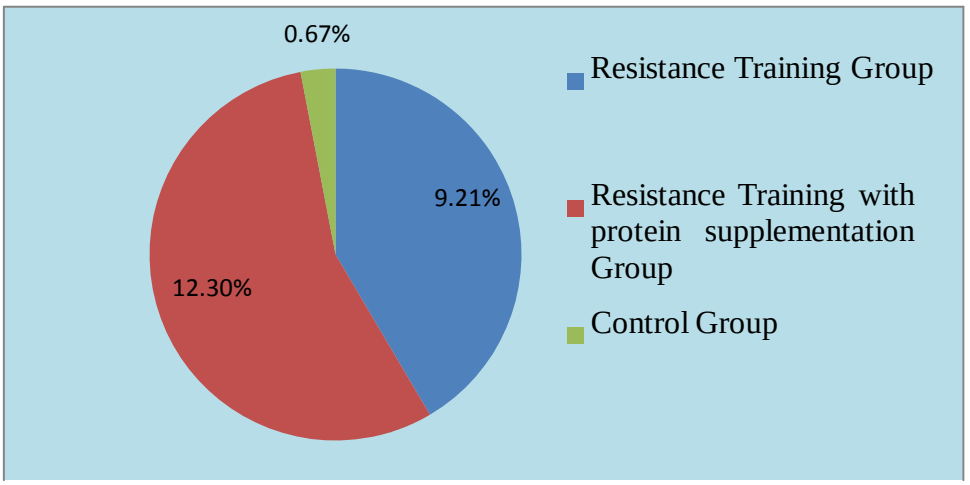
TABLE – I
DESCRIPTIVE ANALYSIS OF THE PRE AND POST TEST DATA AND 'T' RATIO ON MUSCULAR STRENGTH OF EXPERIMENTAL AND CONTROL GROUPS

Group	Test	Mean	S D	Range	MD	't' ratio	Percentage of Changes
Resistance Training	Pre test	90.40	6.67	24.00	8.33	14.94*	9.21%
	Post test	98.73	8.32	28.00			
Resistance Training with Protein Supplementation	Pre test	88.93	9.51	26.00	10.94	11.71*	12.30%
	Post test	99.87	10.03	32.00			
Control Group	Pre test	89.53	7.78	27.00	0.60	0.98	0.67%
	Post test	90.13	7.70	26.00			

Table t-ratio at 0.05 level of confidence for 14 (df) =2.15
**Significant*

Table-I shows that the obtained 't' values of resistance training and resistance training with protein supplementation groups are 14.94 and 11.71 respectively which are greater than the required table value of 2.15 for significance at 0.05 level for 14 degrees of freedom. It revealed that significant differences existed between the pre and post test means of experimental groups on muscular strength. However, no significant differences existed between the pre and post test means of control group on muscular strength since, the obtained 't' value 0.98 is lesser than the required table value of 2.15 for significance. The result of the study produced 9.21% of improvement due to resistance training, and 12.30% of improvement due to resistance training with protein supplementation on muscular strength.

FIGURE – I
PIE DIAGRAM SHOWING THE PERCENTAGE OF CHANGES ON MUSCULAR STRENGTH OF EXPERIMENTAL AND CONTROL GROUPS



The pre and post test data collected from the experimental and control groups on muscular strength is statistically analyzed by using analysis of covariance and the results are presented in table–II.

TABLE –II
ANALYSIS OF COVARIANCE ON MUSCULAR STRENGTH OF EXPERIMENTAL AND CONTROL GROUPS

	Resistance Training Group	Resistance Training with Protein Supplementation Group	Control Group	S o V	Sum of Squares	df	Mean squares	'F' ratio
Pre test Mean	90.40	88.93	89.53	B	16.311	2	8.156	0.125
SD	6.67	9.51	7.78	W	2738.27	42	65.197	
Post test Mean	98.73	99.87	90.13	B	849.91	2	424.96	5.56*
SD	8.32	10.03	7.70	W	3208.4	42	76.39	
Adjusted Post test Mean	97.94	100.57	90.23	B	867.48	2	433.74	54.55*
				W	326.02	41	7.95	

(The required table value for significance at 0.05 level of confidence with degrees of freedom 2 and 42 and 2 and 41 is 3.23)

**Significant at .05 level of confidence*

Table-II shows that the adjusted post-test means on muscular strength of resistance training and resistance training with protein supplementation groups and control group are 97.94, 100.57 and 90.23 respectively. The obtained 'F' value of 54.55 on muscular strength is greater than the required table value of 3.23 of 2, 41 df at 0.05 level of confidence. Hence, it is concluded that significant differences exist between the adjusted post test means of resistance training, resistance training with protein supplementation and control groups on muscular strength. Since, the obtained 'F' value in the adjusted post test means is found to be significant, the Scheffe's test is applied as post hoc test to find out the paired mean difference, and it is presented in table-II.

Table –III: Scheffe's Post Hoc Test for the Differences among Paired Means of Experimental and Control Groups on Muscular Strength

Resistance Training Group	Resistance Training with Protein Supplementation Group	Control Group	Mean Difference	Confidence Interval
97.94	100.57		2.64*	2.62
97.94		90.23	7.71*	2.62
	100.57	90.23	10.35*	2.62

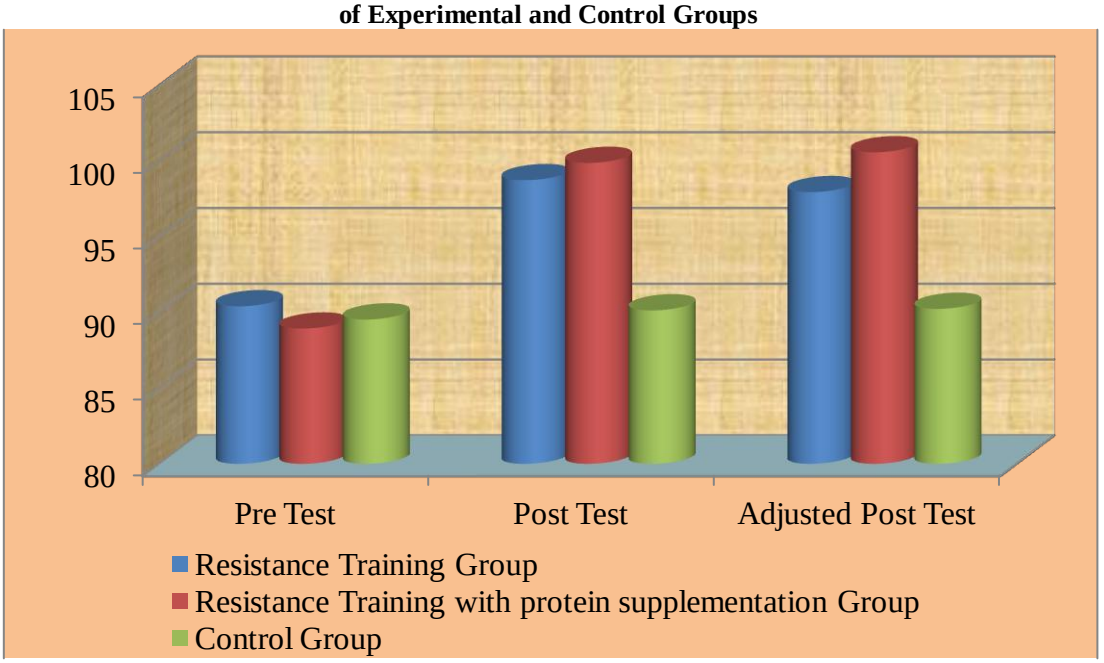
**Significant at .05 level*

As shown in table-III the Scheffe's post hoc analysis proved that significant mean differences existed between resistance training and resistance training with protein supplementation groups, resistance training and control groups, resistance training with protein supplementation and control groups on muscular strength since, the mean differences 2.64, 7.71 and 10.35 are higher than the confident interval value of 2.62 at 0.05 level of significance.

Hence, it is concluded that due to the effect of resistance training and resistance training with protein supplementation the muscular strength of the inter-collegiate athletes is significantly improved. It is also concluded that resistance training with protein supplementation is significantly better than resistance training in improving muscular strength of the athletes.

The pre, post and adjusted post test mean values of resistance training, resistance training with protein supplementation and control groups on muscular strength is graphically represented in figure-II.

Figure – II: Diagram Showing the Mean Values on Muscular Strength of Experimental and Control Groups



DISCUSSION

The results of the study indicates that the muscular strength of resistance training and resistance training with protein supplementation groups changed significantly by underwent the twelve weeks of training. These results are conformity with the following findings. Resistance training twice a week over 2 months seemed to considerably improve muscle strength (Krist, Dimeo & Keil, 2013). Supervised strength training represents an efficacious intervention for improving strength in older adults with residual benefits lasting longer than previously expected (Sherk et al., 2012). Periodized resistance training intervention performed within the workplace improved different aspects of health and fitness in untrained men, thereby potentially providing other work-related benefits (Zavanela et al., 2012). Cowley et al., (2011) examined the effect of progressive resistance training on leg strength, aerobic capacity and functional tasks of daily living in persons with Down syndrome. The findings show that progressive resistance training is an effective intervention to improve leg strength. Alcaraz et al., (2008) found that heavy-resistance circuit training may be an effective training strategy for the promotion of both strength and cardiovascular adaptations. Coutts et al., (2004) observed that 12 weeks of direct supervision of resistance training in young athletes results in greater training adherence and increased muscular strength, power, and running speed than unsupervised training.

Athletes, especially those in strength and power sports, argue that much higher levels of protein are required, even though the scientific evidence does not support this. Several authors have reviewed the effect of protein supplementation (above 1.5 g/kg BW) on athletes with the general conclusion being that protein supplementation has little observable benefit. Coaches and teammates within the athletic community encourage the use of protein supplementation to support the development of lean body mass, strength, speed, and skill (Phillips, 2004). Many individuals remain unclear on what their protein requirements are. Hence it is suggested that by employing individualized nutrition education, the athlete will have more control of their health, performance, and longevity for many years to come.

CONCLUSION

It is concluded that due to the effect of resistance training and resistance training with protein supplementation the muscular strength of the inter collegiate athletes is significantly improved. It is also concluded that resistance training with protein supplementation is significantly better than resistance training in increasing muscular strength of the athletes. The result of the study produced 9.21% of improvement due to resistance training, and 12.30% of improvement due to resistance training with protein supplementation on muscular strength of inter- collegiate level athletes.

REFERENCES

1. Alcaraz, PE, *et al.*, (2008). Physical performance and cardiovascular responses

to an acute bout of heavy resistance circuit training versus traditional strength training, *Journal of Strength and Conditioning Research,* 22(3):667-71.

2. Coutts, AJ et al., (2004). Effect of direct supervision of a strength coach on measures of muscular strength and power in young rugby league players, *Journal of Strength and Conditioning Research,*18(2):316-23.
3. Cowley, P. M., Ploutz-Snyder, L. L., Baynard, T., Heffernan, K. S., Jae, S. Y., Hsu, S., Lee, M., Pitetti, K. H., Reiman, M. P., Fernhall, B., (2011). The effect of progressive resistance training on leg strength, aerobic capacity and functional tasks of daily living in persons with Down syndrome. *Disabil Rehabil*. 33(23-24): p.2229-2236.
4. Dorsch, K. D., & Bell, A. (2005). Dietary supplement use in adolescents. *Curr Opin Pediatr, 17*(5), 653-657.
5. Krist, L., Dimeo, F., Keil, T. (2013). Can progressive resistance training twice a week improve mobility, muscle strength, and quality of life in very elderly nursing- home residents with impaired mobility? A pilot study. Clin Interv Aging;8: 443-8.
6. Phillips, S. M. (2004). Protein requirements and supplementation in strength sports. *Nutrition, 20*(7-8), 689-695.
7. Sherk, Kyle A., Bemben, Debra A., Brickman, Sandy, E., Bemben, Michael G., (2012). Effects of resistance training duration on muscular strength retention 6-month post training in older men and women. *Journal of Geriatric Physical Therapy*: 35 (1), p.20–27.
8. Zavanela, P.M., Crewther, B.T., Lodo, L., Florindo, A.A., Miyabara, E.H., Aoki, M.S., (2012). Health and fitness benefits of a resistance training intervention performed in the workplace. *J Strength Cond Res*.26(3):811-7.