

## FULL LENGTH ARTICLE

**Effect of endurance and strength training on muscular endurance of college men**

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G. Santosh Kumar <sup>a, \*</sup>

<sup>a</sup> Department of Physical Education and Sports & Sciences, Annamalai University, Chidambaram-608002, Tamil Nadu, India.

\*Corresponding Author Ph: +91 9865218741; Email: [footballsantosh12@gmail.com](mailto:footballsantosh12@gmail.com)

**ABSTRACT:** The purpose of the present study was to find the effect of endurance and strength training on the muscular endurance of college men. For this purpose, forty-five men students studying of Annamalai University in the age group of 18 – 23 years were selected. They were divided into three equal groups, each group consisted of fifteen subjects, in which group – I underwent endurance training, group – II underwent strength training and group – III acted as a control group who did not participate in any special training. The training period for this study was three days in a week for eight weeks. Prior to and after the training period, the subjects were tested for muscular endurance. The result proved that endurance training displayed mild improvement but strength training elicited greater improvement in muscular endurance. It is concluded that strength training is more suitable for improving core strength than endurance training.

**Keywords:** Endurance, strength, muscular endurance, sit-ups.

## 1 Introduction

Endurance training is the act of exercising to increase endurance. The term endurance training generally refers to training the aerobic system as opposed to anaerobic. The need for endurance in sports is often predicated on the need of cardiovascular and simple muscular endurance, but the issue of endurance is far more complex. Endurance can be divided into two categories including general endurance and specific endurance. It can be shown that endurance in sport is closely tied to the execution of skill and technique. A well-conditioned athlete can be defined as, the athlete who executes his or her technique consistently and effectively with the least effort.

Endurance training is essential for a variety of endurance sports. A notable example is a distance running events (800 meters upwards to marathon and ultra-marathon) with the required degree of endurance training increasing with race distance. Two other popular examples are cycling (particularly road cycling) and competitive swimming. Although in triathlon, athletes require greater endurance ability to swim, cycle and run. Other endurance sports for

which extensive amounts of endurance trained include rowing and cross country skiing. Athletes can also undergo endurance training when their sport may not necessarily be an endurance sport in the whole sense but may still demand some endurance. For instance, aerobic endurance is necessary (to varying extents) in racket sports, football, rugby, martial arts and basketball. Endurance exercise tends to be popular with non-athletes for the purpose of increasing general fitness or burning more calories to increase weight loss potential.

Strength training is a type of physical exercise specializing in the use of resistance to induce muscular contraction which builds the strength, anaerobic endurance, and size of skeletal muscles. When properly performed, strength training can provide significant functional benefits and improvement in overall health and well-being, including increased bone, muscle, tendon and ligament strength and toughness, improved joint function, reduced potential for injury, increased bone density, increased metabolism, increased fitness, improved cardiac function, and improved lipoprotein lipid profiles, including elevated HDL ("good") cholesterol. Training commonly uses the technique of

progressively increasing the force output of the muscle through incremental weight increases and uses a variety of exercises and types of equipment to target specific muscle groups. Strength training is primarily an anaerobic activity, although some proponents have adapted it to provide the benefits of aerobic exercise through circuit training.

It is believed that a strong core allows an athlete to transfer full forces generated with the lower extremities, through the torso, and to the upper extremities and sometimes an implement [1-2-3]. A weak core is believed to interrupt the transfer of energy, resulting in reduced sports performance and risk of injury to a weak or underdeveloped muscle group. For this reason, there is an assumption that an increase in core strength will result in increased sports performance. Therefore, training the core has become popular among strength coaches and personal trainers as a means to improve performance and reduce the chance for injury despite the lack of research to support such findings. Therefore, the purpose of the present study was to find the effect of endurance and strength training on the muscular endurance of college men.

**METHODS**

**Subjects and variables**

This study under investigation involves the experimentation of endurance and strength training on muscular endurance. Only men students of Annamalai University and aged between 18 and 25 years were selected. The selected forty-five subjects were randomly divided into three groups of fifteen each, out of which group - I (n = 15) underwent endurance training, the group - II (n = 15) underwent strength training and group - III (n = 15) remained as a control. Muscular endurance was measured by a number of sit – ups test in one minute.

\* Significant at .05 level of confidence

**Protocol**

The training programme was carried out for three days per week during morning session only (6 am to 8 am) for eight weeks. Endurance training was administered 50 to 55% of maximum heart rate for first two weeks, 55 to 60% of maximum heart rate for the third and fourth week, 60 to 65% of maximum heart rate for the fifth and sixth week and 65 to 70% of maximum heart rate for the seventh and eighth week. Similarly, strength training was administered by calculating 1RM.

**Statistical techniques**

The data collected from the three groups before and after administering training programme on the muscular endurance were statistically analyzed by ANCOVA (Analysis of Covariance). To find out the difference among the three groups scheffe’s post hoc test was applied. The level of significance was fixed at 0.05 level of confidence.

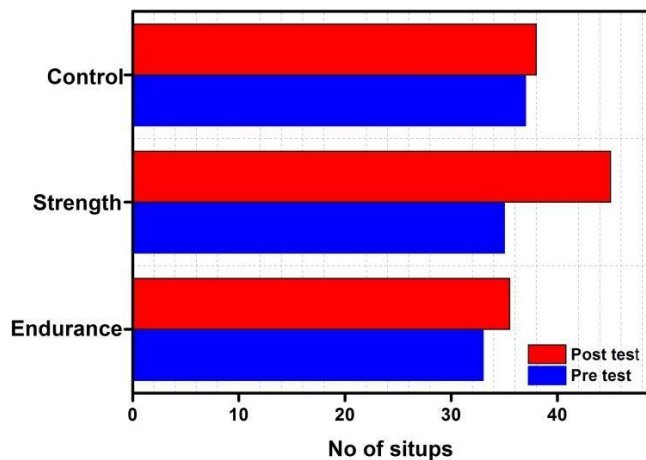
**RESULTS**

The data collected prior to and after the experimental periods on muscular endurance, strength and speed on endurance training group, strength training group, and control group were analyzed and presented in the following table -I.

The adjusted post-test means on the muscular endurance of endurance training group, strength training group, and control group are 44.87, 43.42 and 34.42 respectively. The obtained ‘F’ ratio of 89.57 for adjusted post-test means is greater than the table value of 3.21 for df 2 and 42 required for significance at .05 level of confidence on muscular endurance. The result of the study indicated that there was a significant difference among the adjusted post-test means of endurance training group, strength training group, and control group on muscular endurance. After adjusting the pre test effect on post adjusted mean values are presented in Figure 1.

**Table 1.** Analysis of covariance and ‘F’ ratio for endurance training and strength training for endurance training Group strength training Group and Control Groups

Variable Name	Group Name	Endurance training	Strength training	Control Group	‘F’ Ratio
Muscular endurance	Pre-test Mean ± S.D	35.80 ± 2.60	34.20 ± 2.75	33.30 ± 2.80	3.08
	Post-test Mean ± S.D.	37.24 ± 2.82	42.87 ± 2.60	33.50± 3.13	85.04*
	Adj. Post-test Mean ± S.D.	36.87	43.42	34.42	89.57*



**Figure 1:** Changes observed in muscular endurance among three groups

### Discussion

The present study proves that strength training improved 19.50% and endurance training 4.52% on muscular endurance. One study that looked at a specific task and how it was affected by an 8-week training program was that of [4]. Who looked at club head speed in golfers they found that the experimental group had an increase in club head speed of 4.9%, while the control group slightly decreased. Our result is in line with above said study result. Chittibabu and colleagues displayed no relationship between core strength and explosive power in terms of vertical and horizontal [5]. However, core strength should not be abandoned which may lead to injury possibly because of lack of strength.

### Conclusions

It is concluded that the muscular endurance has improved for both the experimental groups, such as endurance training group and strength training group when compared with the control group. The importance of core strength should not be neglected, the decline in core strength leads to injury. This can be prevented by supplementing strength training which possibly minimizes the incidence of injury.

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