Influence Of Resistance Exercise and Combined Resistance and Plyometric Exercise on Leg Strength and Strength Endurance Among Male Cricket Players

Mr. J. Alex[1], Dr. M. Kalimuthu[2]
[1]*Ph.D. Research Scholar, Department of Physical Education, Annamalai University*
[2]*Associate Professor & Research Supervisor, Department of Physical Education, Annamalai University*

***Abstract*—The purpose of the study was to find out the effect of resistance exercise and combined resistance and plyometric exercise, on leg strength and strength endurance. Forty-five male cricket players aged between 19 and 25 years studying in various colleges and faculties of Annamalai University, Tamil Nadu were selected for the present study. They were divided into three equal groups, each group consisting of fifteen subjects, two experimental groups and one control group, in which the group I (n=15) underwent resistance exercise, group II (n = 15) underwent combined resistance and plyometric exercise for three days (alternative days) per week for twelve weeks and group III, acted as control, which did not participate in any training apart from their regular cricket game practice. The subjects were tested on selected criterion variable as leg strength and strength endurance at prior to and immediately after the training period. For testing the leg strength, the leg lift with dynamometer was used and strength endurance was found out after administering sit-ups test. The analysis of covariance (ANCOVA) was used to find out the significant difference if any, between the experimental groups and control group on selected criterion variable separately. Since there were three groups involved in the present study, the Scheffe S test was used as post-hoc test. The selected criterion variables such as leg strength and strength endurance were improved significantly for the training groups when compared with the control group. But there was no significant difference between the training groups on selected criterion variables.**

***Index Terms*—resistance exercise, combined resistance and plyometric exercise, leg strength and strength endurance.**

I. INTRODUCTION

Cricket is a ball and bat sport played by two teams, each consisting of eleven players. Cricket is a popular team game in many Commonwealth countries. It was formerly played just in a specific season. However, in the past thirty years, its popularity has surged, and it is now staged throughout the entire year. The schedules for cricket players are more demanding, and they engage in longer durations of practice and training [Bhalse and Reddy, 2018].

Since cricket wasn't regarded as a physically demanding sport, players often overlooked enhancing their strength. If one examines modern athletes closely, they will notice how these individuals utilize their muscular power more effectively. As a result, it is almost impossible for a cricketer to perform on the global stage for long without a robust build. As a result, each cricket team globally dedicates considerable effort to enhance the strength of its players [Gosh and Das, 2017].

Cricket is a highly engaged sport that requires frequent, intense exercise sessions, with bowling placing the greatest anaerobic stress [Johnstone, et al., 2014]. For example, it has been suggested that the requirements of bowling are similar to those of repeated-sprint training, appearing as short sprints (i.e., a 15-20 m "run up") followed by a brief recovery time (i.e., 30 s) between deliveries [Maunder, Kilding and Cairns, 2017]. As a result, cricket athletes (notably fast bowlers) often participate in resistance training to enhance the physical attributes essential for the sport, including muscular strength, power, and efficiency [Johnstone, et al., 2014]. Nonetheless, the eccentric aspect of

resistance training can lead to exercise-induced muscle damage (EIMD) lasting several days post-exercise [Coratella and Vertinato, 2014], particularly in individuals who are new to or have become detrained from this form of training [Doma et al., 2017; Doma et al., 2013; and Doma and Deakin, 2013]. Resistance training exercises, also known as weight training, involve using weights other than body weight to strengthen targeted muscle groups. Weight training refers to using resistance beyond the individual's body weight to target specific parts of the body. Typically, it serves to enhance muscular strength and power. It also enhances muscle endurance, flexibility, and coordination [Anderson, 1957]. Plyometric training, commonly known as jump training or reactive training, leverages the neurophysiological stretch-shortening cycle (SSC) to create a training program that boosts explosive strength, quick force, and reactive power. The Eccentric Phase causes muscles to lengthen because of load-driven forces that generate mechanical tension in the elastic parts of the muscle-tendon unit (the series and parallel elastic structures). In this stage, the stretch reflex system activates to improve muscle strength through its neural control [Davies, Riemann and Manske, 2015, and Markovic and Mikulic, 2010].

The impact of plyometric and resistance training on young adolescents, along with its possible benefits and disadvantages, has been a widely debated research subject in exercise physiology and science for several years. Because the skeletal system is not fully developed, specialists and scientific society members believed that resistance training could heighten the risk of hidden injuries [Faigenbaum, et al., 2009]. There is undeniable proof that resistance and plyometric training enhances muscle fitness (i.e., local muscular endurance, power, and strength) [Behringer, et al., 2010; Harries, Lubans, and Callister, 2012, and Granacher, et al., 2016].

II. METHODS

The goal of this study was to determine how resistance exercise and combination of wight and plyometric exercise, affected leg strength and strength endurance. 45 male cricket players who were enrolled at various faculties and colleges of Annamalai University and those represented in inter-collegiate tournaments for the academic year 2024–2025 were chosen as subjects to fulfil the goal. They were divided into three equal groups of fifteen each and further divided as two experimental groups and one control group, in which the group I (n=15) underwent resistance exercise, group II (n = 15) underwent combined resistance and plyometric exercise for three days (alternative days) per week for twelve weeks, and group III (n=15) acted as control which did not participate in any special training apart from the regular cricket game practice.

There will be changes to the playing ability and systems with every training regimen. After consulting with the specialists, the researchers decided to use the following variables as criteria: 1. Leg strength, and 2. Strength endurance.

III. ANALYSIS OF THE DATA

The differences, if any, between the corrected post test means on several criteria variables were examined independently using analysis of covariance. The Scheffé S test was used as a post-hoc test if the adjusted post test mean's "F" ratio was shown to be significant. To evaluate the "F" ratio discovered using analysis of covariance, the level of significance was set at 0.05 level of confidence.

Table I. Analysis of Covariance and 'F' ratio for leg strength, and strength endurance of resistance exercise group, combined resistance and plyometric exercise group, and control group

Variable Name	Group Name	Resistance exercise Group	Combined resistance and plyometric exercise Group	Control Group	'F' Ratio
Leg Strength (in Kg)	Pre-test Mean ± S.D.	72.87 ± 1.17	72.93 ± 1.57	72.73 ± 1.28	0.152
	Post-test Mean ± S.D.	75.27 ± 1.28	76.00 ± 1.41	72.60 ± 1.35	26.35*
	Adj. Post-test Mean	75.249	75.929	72.689	65.99*
Strength endurance (in nos/min)	Pre-test Mean ± S.D.	30.67 ± 1.84	30.73 ± 2.15	29.60 ± 2.47	1.29
	Post-test Mean ± S.D.	33.40 ± 1.88	32.60 ± 2.36	29.53 ± 2.75	11.27*
	Adj. Post-test Mean	33.074	32.209	30.251	28.10*

* Significant at .05 level of confidence. (The table value required for significance at .05 level of confidence with df 2 and 42 and 2 and 41 were 3.21 and 3.23 respectively).

Table I show that the leg strength pre-test "F" ratio value of 1.52 was less than the necessary table value of 3.21 for significant with df 2 and 42 at 0.05 level of confidence. For the post-test and adjusted post-test mean 'F' ratio value of 26.35 and 65.99 for the adjusted post-test scores was greater than the necessary table value of 3.23 for significant. The strength endurance pre-test values 'F' ratio of strength endurance value was 1.29 which was insignificant. For post-test and adjusted post-test mean 'F' ratio values of strength endurance were 11.27 and 28.10 was greater than the necessary table value of 3.23 for significant. Further, to find out which training group has significant improvement on selected criterion variables, Scheffe S post-hoc test was applied and presented in table II.

Table II. Scheffĕ S Test for the difference between the adjusted post-test mean of leg strength, and strength endurance of training groups and control group

Resistance exercise Group	Combined resistance and plyometric exercise Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
Adjusted Post-test Mean for Leg strength				
75.249	75.929		0.68	0.75
75.249		72.689	2.56*	0.75
	75.929	72.689	3.24*	0.75
Adjusted Post-test Mean for Strength endurance				
33.074	32.209		0.865	0.95
33.074		30.251	2.823*	0.95
	32.209	30.251	1.958*	0.95

* Significant at 0.05 level of confidence.

IV. RESULTS

The adjusted post-test mean difference in leg strength between resistance exercise group and control group and combined resistance and plyometric exercise group and control group was 2.56 and 3.24, respectively, and these differences were significant at the .05 level of confidence, according to Table II. The table II also indicate that there was no significant difference was occurred between the training groups (0.68). Based on the study's findings, it can be said that resistance exercise group and combined resistance and plyometric exercise group considerably boost the leg strength.

The adjusted post-test mean difference in goal strength endurance between resistance exercise group and control group, combined resistance and plyometric exercise group and control group was 2.823 and 1.958, respectively, and these differences were significant at the .05 level of confidence, according to Table - II. The strength endurance was not significantly differed between the training groups (0.865). Based on the study's findings, it can be said that resistance exercise group and combined resistance and plyometric exercise group significantly improved the strength endurance.

V. CONCLUSIONS

The results of the study showed that both the resistance exercise group and the group participating in combined resistance and plyometric exercises experienced notable enhancements in leg strength. Nonetheless, no noticeable difference appeared among the exercise groups. Kabeer and Rafeeque (2016) discovered that circuit weight training enhanced leg strength in male cricket athletes. Sunil and colleagues (2017) discovered a notable enhancement in leg strength following the combination of plyometric and strength training in male cricket athletes. Gosh and Das, (2017) have reported that the strength exercise helped to improve the strength endurance among male cricket players. The strength endurance of both exercise groups significantly increased compared to the control group. Nonetheless, there was no significant distinction observed between the exercise groups, including the combined resistance and plyometric exercise group as well as the resistance exercise group. Gosh and Das (2017) reported that strength training enhanced the endurance strength in male cricket players. Ayyappan and Kumar (2021) reported a notable enhancement in strength

endurance following the plyometric exercise regimen.

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