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Experimentation Of Serial And Parallel Strength And Endurance Training On Leg Strength Vital Capacity And Lean Body Mass

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Abstract

The purpose of the study was to find out the effect of serial and parallel strength and endurance training on leg strength, vital capacity and lean body mass. Forty five male players of various games aged between 19 and 25 years were selected for the study. They were divided into three equal groups, each group consisting of fifteen subjects in which three experimental groups and one control group, in which the group I (n=15) underwent serial strength and endurance training, group II (n = 15) underwent parallel strength and endurance training 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 game practice. The subjects were tested on selected criterion variables as leg strength, vital capacity and lean body mass at prior to and immediately after the training period. For testing the leg strength the leg lift with dynamometer was used, for measuring the vital capacity, expirograph was used and LBM was assessed by using Getlet formula. 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 Scheffé S test was used as post-hoc test. The selected criterion variables such as leg strength, vital capacity and lean body mass were improved significantly for all the training groups when compared with the control group. But there was no significant difference was found between the training groups.

Key Words: serial and parallel, strength and endurance training, leg strength, vital capacity and lean body mass.

INTRODUCTION

Humans have long sought to outperform one another in terms of speed, height, strength, endurance, and skill. We strive for excellence in athletic performance because humans are essentially competitive. Despite their allure and rich history, new procedures based on insight and knowledge gathered from practical experience, observation, and scientific study have overtaken old conditioning techniques. For a long time, progress towards enhanced conditioning techniques was slow, but in recent years, considerable advancements have resulted in some astounding performance gains (Boucher and Malina, 1993)

Athletic performance has significantly improved in recent years. Performance levels that were previously unthinkable are becoming the norm, and the number of athletes capable of producing outstanding performances is increasing. Athletics is a challenging discipline, and dedication has resulted in long and gruelling hours of practice. Coaching has also progressed thanks to the work of sports specialists and scientists. Sports science has moved from descriptive to scientific. A larger corpus of knowledge regarding athletes is now available, which is reflected in training methods (Bompa, 1999).

Conditioning is a regulated training and adaptation process that necessitates continual incremental effort (Kalf and Arnheim, 1963). The phrase "training means" encompasses a variety of physical exercises as well as other activities, strategies, and processes used to create, maintain, and recover performance capability and preparation.

Sports training is a scientifically based athletic development technique that enables athletes to accomplish remarkable and record-breaking athletic achievements by gradually improving mental and physical efficiency, skill, and drive. Physical training is one of the most significant components of high-performance training. Physical training seeks to raise an athlete's physiological capacity and improve biomotor skills to the maximum possible level (Harre, 1982).

Sports tutoring is based on a scientifically structured pedagogical process that effects performance ability and preparedness in performance, with the goal of improving and perfecting sports performance while also competing in various sports competitions. A training schedule is designed to improve a sportsperson's ability and energy capacity in preparation for a specific event. Initially, the athlete's capacity to carry out motor actions with varied degrees of strength, speed, resistance, and skill in order to accomplish the individual and group actions—the divisions of sports training technique—represented the intensity of sports training in any athletic event (Simon, Mihaila and Stanculescu, 2011).

Physical exercise causes anatomical, physiological, metabolic, and psychological changes. A physical activity's efficiency is determined by its time, distance, and repetitions, as well as its load, velocity, and frequency of performance. Consider these factors, known as training variables, when designing training dynamics based on a competition's functional and psychological characteristics. Define which component to focus on and achieve the intended performance target during the training phases leading up to a competition (Zatsiorsky, 1995). According to studies, strength training preserves functional capabilities, has significant affects on the musculoskeletal system, and helps to avoid sarcopenia, lower-back pain, osteoporosis, and other disorders (Winett and Carpinelli, 2001).

The purpose of endurance training is to improve endurance efficiency, which is commonly characterised as exercising the aerobic system. Strength endurance and speed endurance have been demonstrated to predict medium-term endurance efficiency, despite the fact that anaerobic workouts lasting two to eight minutes are required.

Methods

The goal of this study was to determine how serial and parallel strength and endurance training, affected on leg strength, vital capacity and lean body mass. 45 male players of different games who were enrolled in the Selvam College of Physical Education, Namakkal, and represented in various inter-collegiate tournaments, for the academic year 2023–2024 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 serial strength and endurance training, group II (n = 15) underwent parallel strength and endurance training 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 physical and curricular activities.

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, 2. Vital capacity and 3. Lean body mass.

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, vital capacity and lean body mass of serial and parallel strength and endurance training groups, and control group

Variable Name	Group Name	Serial Training Group	Parallel Training Group	Control Group	‘F’ Ratio
Leg strength (in Kg)	**Pre-test Mean ± S.D.**	75.27 ± 1.79	76.47 ± 2.87	74.87 ± 2.90	1.57
	Post-test Mean ± S.D.	78.00 ± 1.60	78.67 ± 2.65	74.20 ± 3.51	11.34*
	Adj. Post-test Mean	78.270	77.722	74.875	54.19*
Vital capacity (in Liters)	**Pre-test Mean ± S.D.**	4.09 ± 0.06	4.05 ± 0.058	4.07 ± 0.067	1.30
	Post-test Mean ± S.D.	4.27 ± 0.059	4.24 ± 0.04	4.08 ± 0.07	53.82*
	Adj. Post-test Mean	4.260	4.251	4.079	111.45*
Lean body	**Pre-test Mean ± S.D.**	56.24 ± 0.98	54.97 ± 2.53	55.46 ± 3.65	0.61

mass (in Kg/m²)	**Post-test Mean ± S.D.**	56.24 ± 3.26	53.98 ± 2.53	55.47 ± 3.63	0.841
	Adj. Post-test Mean	54.268	54.564	55.558	51.45*

* 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 shows that the leg strength pre-test 'F' ratio value of 1.57 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 mean and adjusted post-test mean 'F' ratio value of 11.34 and 54.19 for the adjusted post-test scores was greater than the necessary table value of 3.24 for significant. According to Table - I, the pre-test averages of vital capacity 'F' ratio value of 1.30 was less than the necessary table value of 3.21 for significant with df 2 and 42 at 0.05 level of confidence. For post-test and adjusted post-test mean 'F' ratio values of vital capacity were 53.82 and 111.45 was greater than the necessary table value of 3.24 for significant. The LBM pre- and post-test mean values 'F' ratio value was 0.61 and 0.841 which was insignificant. For adjusted post-test mean 'F' ratio values of LBM was 51.45 was greater than the necessary table value of 3.24 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, vital capacity and lean body mass

Serial Training Group	Parallel Training Group	Control Group	Mean Difference	Confidence Interval at 0.05 level
Adjusted Post-test Mean for Leg Strength				
78.270		74.875	3.395*	0.88
78.270	77.722		0.548	0.88
	77.722	74.875	2.847*	0.88
Adjusted Post-test Mean for Vital capacity				
4.260		4.079	0.181*	0.034
4.260	4.251		0.009	0.034
	4.251	4.079	0.172*	0.034
Adjusted Post-test Mean for LBM				
54.268		55.558	1.29*	0.338
54.268	54.564		0.296	0.338
	54.564	55.558	0.994*	0.338

* Significant at 0.05 level of confidence.

Results

The adjusted post-test mean difference in leg strength between serial training group and control group and parallel training group and control group was 3.395, and 2.847, respectively, and these differences were significant at the 0.05 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. 548). Based on the study's findings, it can be said that serial training practice group and parallel training group considerably boost the leg strength ability.

The adjusted post-test mean difference in vital capacity between serial training group and control group, parallel training group and control group was 0.181, and 0.172, respectively, and these differences were significant at the 0.05 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. 009). Based on the study's findings, it can be said that serial training practice group and parallel training group considerably boost the vital capacity ability.

The adjusted post-test mean difference in LBM between serial training group and control group, and parallel training group and control group was 1.29, and 0.994, respectively, and these differences were significant at the 0.05 level of confidence, according to Table - II. The table II also indicate that there was no significant difference was occurred between the training groups (0.296). Based on the study's findings, it can be said that serial training practice group and parallel training group considerably boost the LBM.

Conclusions

The study's findings show that after the appropriate training regimen, leg strength significantly increased. Male volleyball players' leg strength significantly improved following the plyometric training program, according to Magray and Jain (2020). Following the weight training regimen, Rawte & Yadav (2020), and Mohammad (2016) reported a considerable improvement in leg strength. According to Blakey and Southard (1987), leg strength has grown as a result of a combination plyometric and weight training program.

Vital capacity was improved for both the training group, whereas there was no significant difference between the training groups. Moradians, et al., (2016) found that there was a significant improvement in vital capacity for aerobic and interval training groups.

The result of the study indicates that there was a significant reduction in LBM after the serial and parallel training groups. Genç, and Dağlıoğlui, (2021) found that there was a significant reduction in LBM after eight week plyometric training programme. Azeem and Ameer, (2013) found that there was an insignificant reduction after the strength training programme on LBM

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