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8. Effect of Concurrent Training on Leg and Shoulder Strength Among Badminton Players

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Abstract:

The purpose of the study was to find out the effect of concurrent training on leg and shoulder strength among badminton players. The sequential exercise regime is referred to as 'concurrent training'. Different types of training carried out during the same training session or within a few hours of one another. Concurrent training sessions need to be well designed to maximize the beneficial effects of each type of training and to minimize interference. To achieve this purpose of the study, forty badminton players in the Department of Physical Education and Sports Sciences, Annamalai University, Tamil Nadu and India were selected as subjects at random. Their age ranged between eighteen to twenty-two years. The selected subjects were divided into two equal groups of twenty each, namely concurrent strength and endurance training group and control group. The experimental group has undergone twelve weeks of concurrent strength and endurance training, whereas the control group maintained their daily routine activities and no special training was given. All the subjects of two groups were tested on selected criterion variables namely leg strength and shoulder strength using standardized tests, namely leg lift dynamometer and pushups test at prior to and immediately after the training period. The collected data were analyzed statistically through analysis of covariance (ANCOVA) to find out the significant difference, if any among the groups. .05 level of confidence was fixed to test the level of a significance which was considered as an appropriate. The results of the study that there was significant difference among concurrent strength and endurance training group and control group.

And also, concurrent strength and endurance training group showed significant improvement on leg strength and shoulder strength compared to control group.

Keywords:

Concurrent strength and endurance training, Leg strength, Shoulder strength Analysis of covariance (ANCOVA).

8.1 Introduction:

The sequential exercise regime is referred to as 'concurrent training'. Concurrent strength and endurance training is undertaken by numerous athletes in various sports in an effort to achieve adaptations specific to both forms of training. Literature findings to date, investigating the neuromuscular adaptations and performance improvements associated with concurrent strength and endurance training (referred to as concurrent training) have produced inconsistent results. Some studies have shown that concurrent training inhibits the development of strength and power, but does not affect the development of aerobic fitness when compared to either mode of training alone. Other studies have shown that concurrent training has no inhibitory effect on the development of strength and endurance.

8.1.1 Strength and Endurance Adaptions:

Strength and endurance training regimes represent and induce distinctly different adaptive responses when performed individually. Typically, strength-training programs involve large muscle group activation of high-resistance low-repetition exercises to increase the force output ability of skeletal muscle. In contrast, endurance-training programs utilize low-resistance, high-repetition exercises such as running or cycling to increase maximum O_2 uptake ($VO_{2\ max}$). Accordingly, the adaptive responses in skeletal muscle to strength and endurance training are different and sometimes opposite.

Strength training has been reported to cause muscle fibre hypertrophy, associated with an increase in contractile protein, which contributes to an increase in maximal contractile force (Sale et al 1990). Strength training also reduces mitochondrial density and suppresses oxidative enzymes activity which can cause impede endurance capacity, but has minimal impact on capillary density or in the conversion of muscle fibre types from fast twitch (type II fibres) to slow twitch (type I fibres). In contrast, endurance training usually causes little or no muscle fibre hypertrophy, but it does induce increases in mitochondria content, citric acid enzymes, oxidative capacity and the possibility of muscle fibre conversion from fast twitch to slow twitch.

Many competitive endurance athletes incorporate resistance training into their training in a hope to improve endurance performance. However, as previously mentioned adaptations to exercise are generally considered to be specific to the training type of stimulus. Although, many adaptations are specific to the type of training, some changes that occur with resistance training could influence endurance performance, which include: muscle fibre transformations and muscle fibre (type I) hypertrophy, which may alter fibre recruitment patterns and help prevent muscle fatigue, as less motor units need to be activated for the same work load (Bishop and Jenkins 1999). Bishop and Jenkins analyzed endurance performance in 21 female subjects over a 12-week program of strength training.

They found that strength training did not reduce endurance performance and may actually improve endurance capacity in the long term. Runners and cyclists may improve endurance performance via a resistive weight training program, due to increases in the size of type I fibres, changes in type II subtype ratios, and myofibril contractile properties. These changes may allow individuals to exercise longer at a given submaximal work rate by reducing the force contribution from each active myofibre or by using fewer myofibres. In conjunction, the myofibre changes may also allow individuals to delay the endurance capacity benefited only from an "in-water" resistance program specific to their swimming stroke, relative to a standard weights program usually given to these athletes. The "in-water" resistance program incorporates the use of biokinetic swim benches and reverse current hydrochannel swimming. This may imply that resistance training for swimming needs to be specific to their stroke to achieve any improvements in endurance performance.

8.1.2 Statement of the Problem:

The purpose of this study was to investigate the effect of concurrent training on leg and shoulder strength among badminton players of Annamalai University, Chidambaram, Cuddalore (Dt), age group between 18 and 22.

8.2 Methodology:

The purpose for this study subjects were randomly selected from Annamalai University, Chidambaram. In total 40 subjects were selected at random and they were divided into two equal groups that is experimental and control group in each group consist of 20 subjects their age ranged from eighteen to twenty-two. The experimental group has undergone concurrent strength and endurance training such as incline leg press, bench press, jump to box, jump from box, alternate leg squat, alternate leg hops in place, Jogging and cycling three days in a week for the period of 12 weeks and the control group was not undergoing concurrent strength and endurance training. To find out the Leg strength and Shoulder strength the investigator conducted the Leg lift Dynamometer and Pushups. Testers' competency, subject reliability and reliability of tests were established by using test and retest method and the reliability coefficient were found to be satisfactory high. The data were analyzed using analysis of covariance (ANCOVA) for determine the effect of concurrent strength and endurance training among badminton players have variables of Leg strength and Shoulder strength of badminton players of Annamalai University, Chidambaram, Cuddalore (Dt). on the age group between Eighteen to Twenty-two.

8.2.1 Selection of Variables and Tests:

The research scholar reviewed the available scientific literature pertaining to available the present study, the following variables were selected.

Table 8.1: Selection of Variables and Tests

Sr. No.	Variables	Test Items
1.	Leg strength	Leg lift Dynamometer
2.	Shoulder strength	Pushups

8.2.2 Statistical Techniques:

The data collected from the experimental group and control group, the selected variables on Leg strength and Shoulder strength was statistically examined by using the "F" ratio used to find out the significance difference between experimental group and control group, the level of significance was fixed at 0.05 level of confidence. The mean difference of the criterion measures for the control and experimental groups is presented in tables; mean difference of control and experimental groups for each variable is presented in figure.

Table 8.2: Analysis of covariance on Leg strength of pre and post test scores for concurrent strength and endurance training and control group

Test	CSE Group	Con Group		Sum of Squares	Df	Ms	F
Pre-Mean	81.7	81.75	B	0.025	1	0.025	0.01339
SD	1.525	1.251	W	70.95	38	1.867	
Post Mean	83.95	82.55	B	19.6	1	19.6	8.2848
SD	1.6051	1.468	W	89.9	38	2.366	
Adjusted Post Mean	82.825	82.15	B	19.68	1	19.68	8.1253
			W	89.621	37	2.422	

Table value of (1, 37) at 0.05 level is 4.06.

The calculated value of F ratio (8.1253) is greater than the table value of 4.06 at 0.05 level. Hence it is significant. Therefore, there is statistical significance difference between Control and Experimental scores of Leg strength.

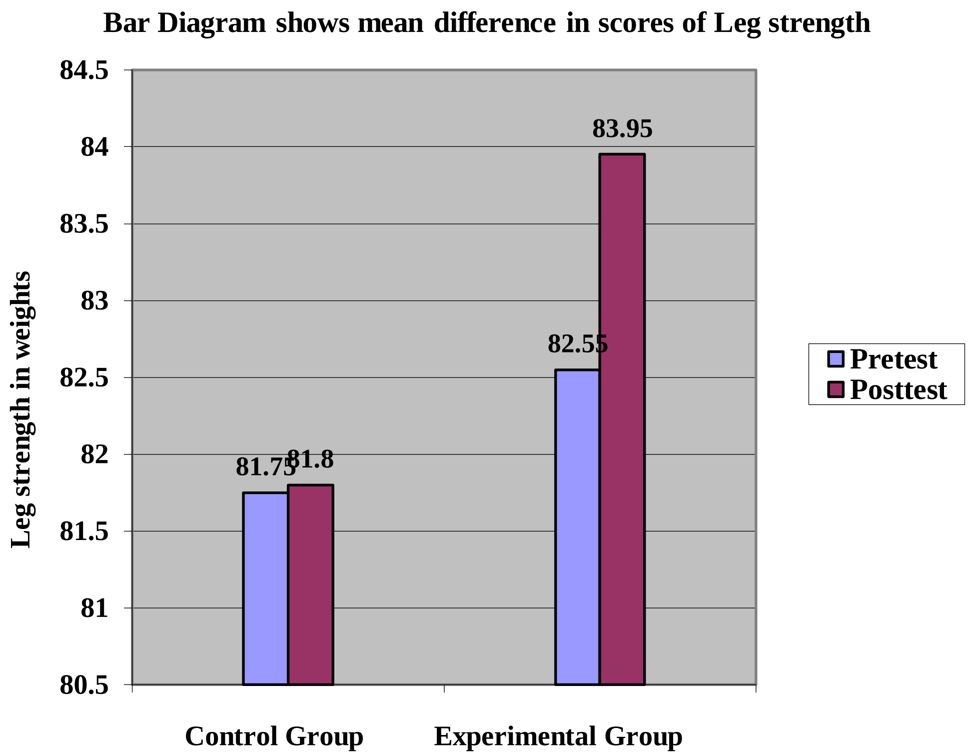


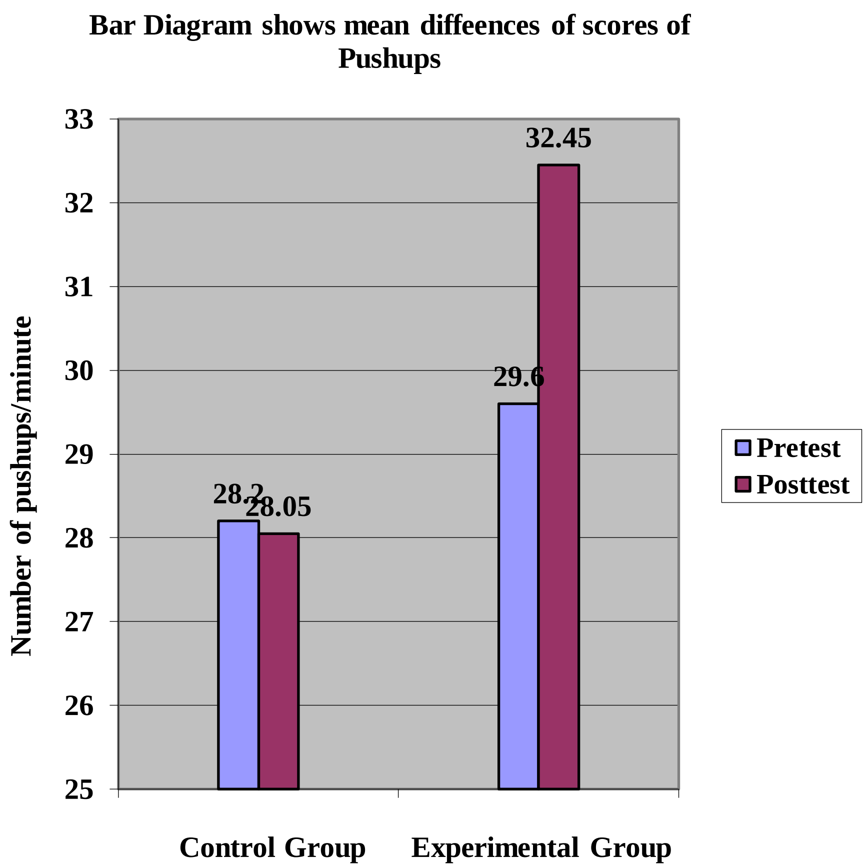
Table 8.2: Analysis of covariance on Pushups of pre and post test scores for concurrent strength and endurance training and control group

Test	CSE Group	Con Group		Sum of Squares	Df	Ms	F
Pre-Mean	28.05	28.2	B	0.225	1	0.225	0.057712
SD	2.188	1.735	W	148.15	38	1.57	
Post-Mean	32.45	29.6	B	81.225	1	81.225	10.65246

Test	CSE Group	Con Group		Sum of Squares	Df	Ms	F
SD	3.0345	2.4581	W	289.75	38	1.81	
Adjusted Post Mean	30.55	28.95	B	83.9002	1	83.9002	11.32542
			W	274.101	37	1.79	

Table value of (1, 37) at 0.05 level is 4.06.

The calculated value of F ratio (11.32542) is greater than the table value of 4.06 at 0.05 level. Hence it is significant. Therefore, there is statistical significance difference between Control and Experimental scores of Pushups.



8.3 Discussion:

The following studies would helpful for the result of this study. After a 12-week training period, fat-free mass, muscular strength [weight lifted in squat and bench press (kg)], muscular endurance [pull-ups and sit-ups (numbers)], aerobic power, flexibility and Sargent jump height increased similarly in both experimental groups (CDER and CPER).

Also, decreases in body fat percentage, mean time in 60 m running and agility occurred in CDER and CPER. A significant difference in body fat percentage was seen in CPER when compared to CDER and C. Body mass increased significantly in CPER when compared to CDER and C. Although body mass increased only after the CPER protocol application, it can be concluded that both CDER and CPER protocols were similarly effective in positive transformation of body composition, aerobic power and muscular endurance, Arazi, H. et al., (2001).

The present research similar to the following study, the purpose of this research was to determine the effects of high intensity endurance training |ET) and resistance training (RT) alone and in combination on various military tasks. Thirty-five male soldiers were randomly assigned to one of four training groups: total body resistance training plus endurance training (RT + ET). upper body resistance training plus endurance training (UB + ET}. RT only, and ET only.

Training was performed 4 days per week for 12 weeks. Testing occurred before and after the 12-week training regimen. All groups significantly improved push-up performance, whereas only the RT - ET group did not improve sit-up performance.

The groups that included ET significantly decreased 2-mile run time, however, only RT - ET and UB t ET showed improved loaded 2-mile run time. Leg power increased for groups that included lower body strengthening exercises (RT and RT + ET).

Army Physical Fitness Test performance, loaded running, and leg power responded positively to training, however, it appears there is a high degree of specificity when concurrent training regimens are implemented, William J. Kraemer. PhD, et. al., (2004).

8.4 Conclusion:

The finding of this study indicated that the effect of concurrent strength and endurance training significantly increase the Leg strength and Shoulder strength when compared with pretest as well as control group.

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