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Effect of isolated and combined strength and power training on elastic power of women Mallakhamb players

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Abstract
The purpose of the study was to find-out the effects of isolated and combined strength and power training on elastic power of women Mallakhamb players. To achieve the purpose of this study, sixty women Mallakhamb players were selected as subjects. The age, height and weight of the subjects ranged from 19 to 22 years, 162 to 170 centimetres and 58 to 70 kilograms respectively. The selected subjects were randomly assigned into four equal groups of 15 subjects each. Group I underwent strength training, group II underwent power training, group III underwent combined training and group IV acted as control. The collected data from the four groups prior to and post experimentation on elastic power were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since four 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 to determine the paired mean differences, if any. The result of the study proved that due to effects of isolated and combined strength and power training significantly increased the elastic power of men mallakhamb players.

Keywords: Elastic power, strength and power training

Introduction
Strength training is known to improve muscular strength and power, because hypertrophy and can even improve muscular endurance (Kraemer and Ratamess, 2004) [4]. These various outcomes of training are brought about as a result of manipulating certain variables including the number of sets performed, the intensity of each set and the entire workout, as well as the rest periods between sets and exercises (Campos *et al*., 2002) [1]. Muscles are constantly involved in exerting the forces required to perform everyday regular activities (Macaluso, *et al*., 2003) [5] and therefore certain levels of strength and power are required for functional movements. Power training enables an athlete to apply the greatest amount of their maximal strength in the shortest period of time.
This is not crucial for many sports men and women who will rarely be required nor have the time to produce maximal forces. Most athletic activities involve far faster movements and far higher power outputs than are found in maximal strength exercises (Newton and Kraemer, 1994; Komi, 1979) [6, 3]. An athlete can be exceptionally strong but lack significant explosive power if they are unable to apply their strength rapidly.

Methodology
Subjects and Variables
The purpose of the study was to find-out the effects of isolated and combined strength and power training on elastic power of men Mallakhamb players. To achieve the purpose of this study, sixty men Mallakhamb players were selected as subjects. The age, height and weight of the subjects ranged from 19 to 22 years, 162 to 170 centimetres and 58 to 70 kilograms respectively. The selected subjects were randomly assigned into four equal groups of 15 subjects each. Group I underwent strength training, group II underwent power training, group III underwent combined training and group IV acted as control.

Training Protocol

The training programmes were scheduled for one session a day each session lasted between thirty five to forty five minutes approximately including warming up and warming down. During the training period, the experimental groups underwent their respective training programme three days per week (Alternative days) for twelve weeks in addition to their curriculum. The group–I concentrated on strength training, Intensity starting from 45% of 1RM to 70% of 1RM of the subjects, once in two weeks the 5% of the load was increased. The group–II concentrated on power training, Intensity starting from 25% of 1RM to 35% of 1RM of the subjects, once in four weeks the 5% of the load was increased. The group–III concentrated on combined training, training programme four days per week (Alternative days) for twelve weeks. The training schedule followed as per the strength and power training group's schedules. The elastic power was measured by the bunny hop test.

Experimental Design and Statistical Technique

The experimental design in this study was random group design involving 60 subjects, who were divided at random in to four group of ten each. The collected data from the four groups prior to and post experimentation on abdominal strength were statistically analyzed to find out the significant difference if any, by applying the analysis of covariance (ANCOVA). Since four 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 to determine the paired mean differences, if any.

Table 1: Analysis of Covariance on Elastic Power of Experimental and Control Groups

	Strength	Power	Combined (SP)	Control Group	SoV	Sum of Squares	df	Mean squares	'F' ratio
Pre-test Mean SD	6.59	6.47	6.66	6.51	B	0.22	3	0.07	0.81
	0.23	0.32	0.30	0.32	W	5.03	56	0.09	
Post-test n SD	7.54	8.31	7.94	6.54	B	26.13	3	8.71	126.71*
	0.35	0.20	0.18	0.27	W	3.85	56	0.069	
Adjusted Post-test Mean	7.53	8.35	7.90	6.56	B	25.93	3	8.64	165.30*
					W	2.87	55	0.05	

(Required value - df 3 & 56 = 2.77; df 3 & 55= 2.77 *Significant at.05 level of confidence)

Table-1 shows the obtained 'F' ratio value of 0.81 for pre-test means on elastic power of strength, power, combined strength & power training groups and control group were less than the required table value of 2.77 for the degrees of freedom 3 and 56 at 0.05 level of confidence.

It reveals that there is statistically insignificant difference among the strength, power, combined strength & power training groups and control group during pre-test-period. It inferred that the random assignment of the participants for the 4 groups is successful. The obtained 'F' ratio value of 126.71 for post-test means on elastic power of strength, power, combined strength & power training groups and control group were higher than the required table value of 2.77 for the degrees of freedom 3 and 56 at 0.05 level of confidence. The adjusted post-test means on elastic power of strength, power, combined strength & power training groups and control groups are 7.53, 8.35, 7.90 and 6.56 respectively. The obtained 'F' ratio value of 165.30 on elastic power were greater than the required table value of 2.77 for the degrees of freedom 3and 55 at 0.05 level of confidence. It is observed from this finding that significant differences exist among the adjusted post-test means of experimental and control groups on elastic power.

Since, the adjusted post-test 'F' ratio value is found to be significant the Scheffe's test was applied as post hoc test to determine the paired mean differences, and it is presented in

Table 2: Scheffe's Test on Elastic Power

Adjusted-Post-Test Means				DM	CI
Strength-G	Power-G	Combined (SP)	Control-G		
7.53	8.35			0.82*	0.23
7.53		7.90		0.37*	0.23
7.53			6.56	0.97*	0.23
	8.35	7.90		0.45*	0.23
	8.35		6.56	1.79*	0.23
		7.90	6.56	1.34*	0.23

*Significant

Shows the Scheffe's test results that there are significant differences between the adjusted post-tests means of strength and power training groups (0.82); strength and combined training groups (0.37); strength training and control groups (0.97); power and combined training groups (0.45), power training and control groups (1.79); combined training and control groups (1.34) on elastic power. Moreover power training group had high impact to increase the elastic power of the subjects.–

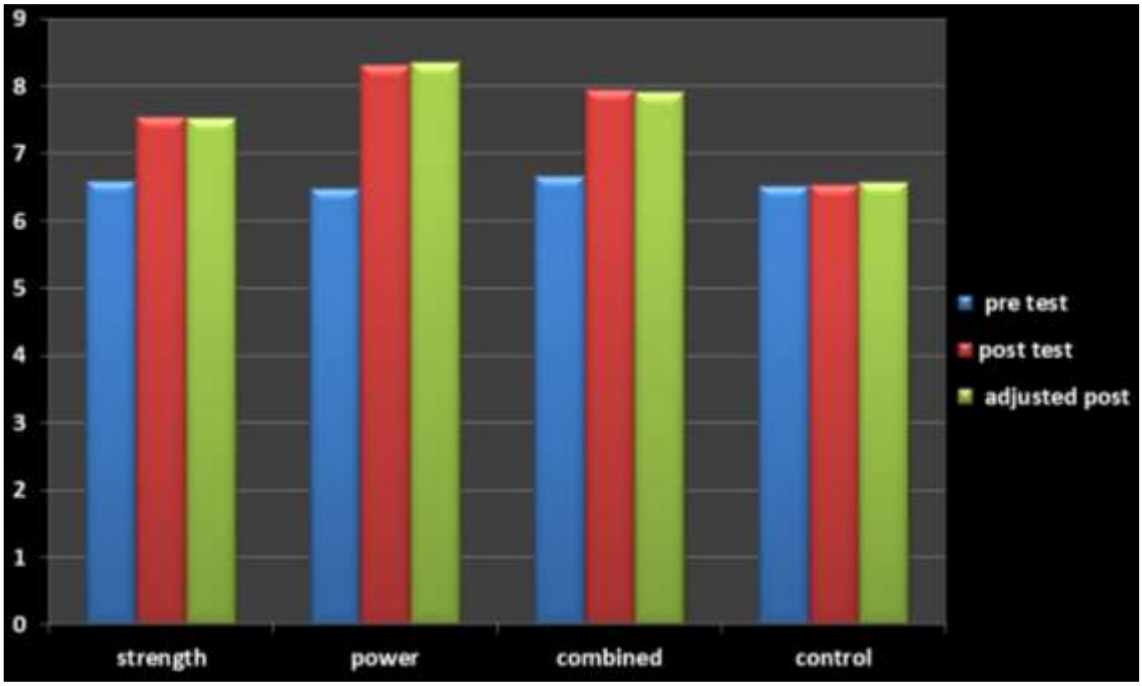

Fig 1: Diagram Showing the Mean Value on Elastic Power of Experimental and Control Groups

Discussion on Result

It is observed from this result that significant differences exist among the strength (S), power (P), combined training (CT) and control groups on elastic power. And also the power training had much effect to increase elastic power of the subjects. The below studies results are supporting the current study results.

Praveenkumar and others (2020) [7] the study was to investigate the effect of strength training programme on explosive power of college students. The analysis of data revealed that twelve weeks of strength training had an impact to increase explosive power. Dede and others (2019) [2] this study is to analyze the effect of a 8 week-explosive power training on some performance parameters of students who studying in sports high school. Explosive power trainings applied during 8 weeks had statistically significant effects in favor of the post-tests for 20m sprint, sprint-agility and standing long jump performances pre-test and post-test results. Saravanan and Mahaboobjan (2016) [8] study was to find out the influence of yogic and mallakhamb practices on selected physical variables. Mallakhamb practice group showed significant improvement on physical and performance variables. Todd and others (2011) [9] investigated was to assess the effectiveness of variable resistance as provided through elastic plus free weight techniques in college aged males and females. Combined variable elastic band plus free weight exercises are effective at increasing power similar to free-weights alone in novice college aged males and females.

Conclusions

The conclusion of the study stated that significant differences exist among the strength (S), power (P), combined training (CT) and control groups on elastic power. And also the power training had much effect to increase elastic power of the subjects.

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