EFFECT OF RESISTANCE TRAINING AND PLYOMETRIC TRAINING ON ARM POWER AMONG POLYTECHNIC COLLEGE PLAYERS

Submitted by

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ABSTRACT

The analysis of the data and the detailed results of the study are presented in this chapter. For this purpose, forty five female (N=45) students were studying in P.T.Lee Chengalvaraya naicker Polytechnic College, Vepery, Chennai District - 600007, Tamil nadu, were selected randomly as subjects. They were divided into three equal groups of fifteen (n=15) namely Experimental Group-I underwent Resistance Training, Experimental Group-II underwent Plyometric Training and Group-III acted as Control Group. The training period was limited to five days per week for eight weeks. The selected dependent variable of for this study Arm Power was analysed by using test of pulls ups. All the subjects were tested prior to and immediately after the experimental period on the selected dependent variables. The data obtained from the experimental groups before and after the experimental period were statistically analysed with dependent 't'-test and Analysis of covariance (ANCOVA). Whenever the 'F' ratio for adjusted post-test means was found to be significant, the Scheffe's Post hoc test was applied to determine the paired mean differences. The level of confidence was fixed at 0.05 level for all the cases. Results showed there was a significant difference in arm power comparatively in experimental groups with control group.

Introduction

Biceps Brachii

- **Location:** The biceps brachii (or biceps for short) are located on the anterior (front) part of your upper arm between your elbow and shoulder. Your biceps contain two different "heads" or muscle bellies; a short head, and a long head— each with different attachment sites.

- **Function**: Your biceps accelerate elbow flexion (bending your arm at the elbow), supination (moving from a palm down to palm up position) and assist with shoulder flexion (raising your arm in front of your body).
- **Example Exercises**: Dumbbell/barbell biceps curls, hammer curls, preacher curls

Triceps Brachii

- **Location:** The triceps brachii (or triceps for short) are located on the posterior (back) part of your upper arm between your elbow and shoulder. Your triceps contains three different "heads"; a short head, a medial head, and a long head— each with different attachment sites.
- **Function**: Your triceps accelerate elbow extension (straightening your arm at the elbow) and shoulder extension (moving your arm toward your backside— the exact opposite of shoulder flexion).
- **Example Exercises**: Triceps pushdowns, narrow-grip bench press, narrow-grip push-up, triceps kickbacks, supine triceps extensions (skull crushers)

Leg and arm muscle power are very important for athletes, volleyball players, badminton, basketball especially for smasher, since leg muscle has the main role in doing an optimal jump, and arm muscle actively contributes in hitting the ball. When the players' leg and arm muscle is in good condition, they will have optimal power, and their smash will be hard to block. In order to give a deadly smash to the opponents, the players have to make good position and power while smashing the ball, take the highest point to avoid opponents' block. Fortunately, many different arm exercises can help to develop the level of power.

Plyometric training involves exercises in which the active muscles are stretched prior to its shortening. Plyometric exercises can be done with or without external load, and both modalities have been shown to increase power, jumping height, and sprint performance. However, contradictory results exist regarding the effects of plyometric training on speed and power measurements and the effects of heavy strength training. Heavy strength training and plyometric training may affect different aspects of power-related skills.

Much has been written to support that muscle fibres respond to resistance training with an increase in the cross sectional area and force generating capacity (Moore et al., 2004). For instance, hypertrophic and neural adaptations are commonly used to induce structural changes in muscle morphology and increase the rate of force development (Verkhoshansky, 2006). Additionally, power and plyometric exercises are important to develop the muscle stretch shortening cycle capacity (Komi, 2000). In essence, strength training adaptations contribute to the increase of the muscular power output, the development of the capacity of energy producing systems of the body and the ability to improve motor power potential in competition (Verkhoshansky, 2006)

Methodology

For this research source of data is, forty five female (N=45) students were studying in P.T.Lee Chengalvaraya naicker Polytechnic College, Vepery, Chennai District -600007, Tamil nadu, were selected randomly as subjects. For this selection of subjects were divided into three equal groups of fifteen (n=15) namely Experimental Group-I underwent Resistance

Training, Experimental Group-II underwent Plyometric Training and Group-III acted as Control Group. The training period was limited to five days per week for eight weeks. The selected dependent variable for this study Arm Power was analysed by using test of pulls ups. All the subjects were tested prior to and immediately after the experimental period on the selected dependent variables. Analysis the data obtained from the experimental groups before and after the experimental period were statistically analysed with dependent 't'-test and Analysis of covariance (ANACOVA). Whenever the 'F' ratio for adjusted post-test means was found to be significant, the Scheffe's Post hoc test was applied to determine the paired mean differences. The level of confidence was fixed at 0.05 level for all the cases.

Summary of Mean Standard Deviation and Dependent 't' Test for the Pre and Post-Tests on Arm Power of Experimental Groups and Control Group

Test	Descriptive Statistics	Plyometric Training	Resistance Training	Control group
Pre Test	Mean	14.80	14.53	14.20
	SD (±)	1.64	1.75	2.14
Post test	Mean	19.60	17.87	14.67
	SD (±)	1.36	1.75	1.78
't'test		8.73*	5.23*	0.65

Significance at 0.05 level. The table value is required for 0.05 level of significance with df 14 is 2.15*

Computation of Analysis of Covariance of Pre Test, Post Test and Adjusted Post Test on Arm Power of Experimental Groups and Control Group

Test	Plyometric training	Resistance training	Control group	SOV	ss	df	Mean Squares	F-ratio
Pre test	14.80	14.53	14.20	B	2.71	2	1.38	0.37
				W	154.53	42	3.68	
Post test	19.60	17.87	14.67	B	187.91	2	93.96	32.70*
				W	120.67	42	2.87	
Adjusted post test	19.44	17.85	14.84	B	160.75	2	80.38	45.87*
				W	71.84	41	1.75	

* Significant at 0.05 level of confidence Table value for df (2, 42) at 0.05 level = 3.22 Table value for df (2, 41) at 0.05 level = 3.23

Scheffe's test for the Difference between Paired Means on Arm Power

Plyometric training	Resistance training	Control group	Mean difference	Confidence Interval Value
19.44	17.85	-	1.58*	1.23
19.44	-	14.84	4.60*	1.23
-	17.85	14.84	3.01*	1.23

Discussion on Findings

Karin Vassil K, Boris Bazanov 2012 study was to find out the efficiency of composed plyometric training program on youth volleyball players force capabilities in their usual training period. The plyometric training program was applied during 16 week period where was attended twenty-one 12-19 years old youth volleyball players. maximal vertical jump height. Testing results statistical analysis has shown athletes legs and arms speed force reliable improvement. Standing long jump, depth leap long jump and maximal vertical jump height test results, what has shown legs explosive power, has not shown remarkable reliable difference (P>0.05). Medicine ball throws and maximal vertical jumps to the maximal height in 10 seconds, what show speed force improvement, showed reliable difference.

Rubley et.al., 2011 was to measure the effects of low-frequency, low-impact plyometric training on vertical jump (VJ) and kicking distance in female adolescent soccer players. Sixteen adolescent soccer players were studied (age 13.4 ± 0.5 years) across 14 weeks. The control group (general soccer training only) had 6 subjects, and the plyometric training (general soccer training plus plyometric exercise) group had 10 subjects. No significant difference in kicking distance was found between groups at pre-test (p = 0.688) or 7 weeks (p = 0.117). The plyometric group had a significantly higher VJ after 14 weeks (p = 0.014). These results provide strength coaches with a safe and effective alternative to high-intensity plyometric training. Based on these findings, to increase lower-body power resulting in increased VJ and kicking distance, strength coaches should implement once-weekly, low-impact plyometric training programs with their adolescent athletes.

Joanne Munn and others, 2005 compared effects on strength in the early phase of resistance training with one or three sets and fast or slow speeds. All subjects attended training 3 wk1 for 6 wk. Subjects in the training groups performed unilateral elbow flexion contractions with a target six- to eight-repetition maximum load. Control subjects sat at the training bench but did not train. Three sets of exercise produce twice the strength increase of one set in the early phase of resistance training. Training fast produces greater strength increases than training slow; however, there does not appear to be any additional benefit of training with both three sets and fast contractions.

Skelton and their team 1995 determined the effects of 12 weeks of progressive resistance strength training on the isometric strength, explosive power, and selected functional abilities of healthy women aged 75 and over. Subjects were matched for age and habitual physical activity and then randomly assigned into either a control or an exercise group. Pre- and post-training comparisons were made using analysis of variance or analysis of covariance (using weight as a covariate) for normally distributed continuous data and one-sided Fishers exact test (2 x 2 table) for discontinuous data. Improvements in IKES were associated with training, but the improvement in LEP (18%, P = .11) did not reach statistical significance. There was an association between training and a reduction in normal pace kneel rise time (median change 21%, P = .02) and a small improvement in step up height (median 5%, P = .005). The other functional tests did not improve.

Jeffrey and others 2003 did their research in Poor muscle strength is associated with mortality, presumably due to low muscle mass. Arm-cranking power [relative risk (*rr*) = 0.984 per 100 kg·m·min^{-1}, $P < 0.001$] was a stronger predictor of mortality than was arm strength (*rr* = 0.986 per 10 kg, *P* = not significant), whereas rate of power change (*rr* = 0.989 per 100 kg·min^{-1}·yr^{-1}) and rate of arm strength change (*rr* = 0.888 per 10 kg/yr) were risks independent of the power or strength levels. The impacts of power and strength were partially independent of muscle mass and physical activity. The risk of mortality was similar across the four power workloads (*rr* = 0.93-0.96 per 100 kg·m·min^{-1}), whereas the lowest load generated less than one-half the power as the higher loads. Arm-cranking power is a risk factor for mortality, independent of muscle strength, physical activity, and muscle mass. The impact is found with loads that do not generate maximal power, suggesting an important role for motor coordination and speed of movement.

Conclusion

Significant difference found in post test of Control and Experimental group in Arm power of players because t-values are greater than the tabulated value. F ratio of value at 0.05 level of confidence of 2 and 48 degree of freedom, improvement difference of arm power among experimental group when compartively comparatively control group there was significant positive changes. hence this research suggest this training is effective and recommended study.

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