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Effect of Maximal and Sub-maximal Resistance Training on Selected Strength Parameters Among Volleyball Players

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Abstract

The aim of this study is to find out the influence of maximal and sub maximal resistance training on spiking and blocking performance among volleyball players. 45 male volleyball players from the different schools located at Andhra Pradesh in the age ranged between 15-17 years were selected. The selected subjects were further divided into three groups namely Maximal Resistance training group (MRTG), Sub maximal resistance training group (SMRTG) and control group (CG), on random basis. Prior to the experimental treatments, all the subjects were measured of their strength parameters, leg strength and abdominal strength using vertical jump test and sit ups respectively. All the subjects were determined their 1 repetition maximum (1RM) of resistance trainings, half squat, biceps, triceps, bench press, and leg press. The submaximal resistance group was asked to perform 50 to 60 % of 1 RM and maximal resistance group was asked to perform 90 to 95% of 1 RM for 8 weeks. After completion of eight weeks experimental period, the subjects were measured of their strength variables selected. The results proved that both maximal and sub maximal resistance training improved leg strength and abdominal strength of volleyball players compared to control group. The results also proved that maximal resistance training was found to be better than sub maximal resistance training in improving the leg strength and abdominal strength. The differences between sub maximal and maximal resistance training in improving the strength parameters were significant. ($P<0.05$) It was concluded that the maximal and sub maximal resistance training can be included in the training schedule of the school level volleyball players to improve strength parameters.

Key Words: Maximal, Sub Maximal Resistance Training, Leg Strength, Abdominal Strength.

Introduction

The concept of physical fitness is not only freedom from disease, but also to gain enough strength, agility, flexibility, endurance and skills to meet the demands of daily life and to build sufficient reserve energy to withstand stress and strain. Thus, physical fitness is a combination of qualities that enable a person to perform well in vigorous physical activities. These qualities include agility, endurance, flexibility and strength. The wealth of a nation depends entirely upon the health of every citizen of the country. Hence physical fitness of school children is a major important factor to be considered (Govindarajuly, 1991) Strength has been considered as the most important conditional ability. It has been the most significant factor to enhance sports techniques and performance. Since all sports movement are created by the contraction of muscle,

therefore, strength is an important component of various conditional abilities skills and tactical actions.(Uppal 2004)Strength helps the muscles to exert force to physical activity can be performed without strength. Strength in hands helps to pull, push and to lift objects. Strength in legs helps to carry body weight and to carry extra burdens.

Volleyball has changed beyond recognition in the past three decades from an unorganized sport into a highly competitive, requiring a high level of physical fitness, mental alertness and mastery over techniques. Volleyball is characterized mainly by its dynamic work of broken intensity. There are periods of significant muscular activity in alteration with periods of relative relaxation intensity of work. During the time of play, the intensity of play oscillates from moderate to maximum.(Sharma, 1986)The game at a high level of competition,requires quicker sudden movements and fast reaction. Volleyball matches have no time limit and matches can last for several hours, if the teams are evenly matched.In every tactical move in volleyball, one depends on team work and the individual skills, good passing, setting, spiking, jumping, controlling the ball, participation and speed to the ball and keeping the eyes on the ball. The execution of these skills effectively depend not only the practices but also the basal strength of these players.

Resistance training is needed to improve strength. Normally better performance is the product primarily of efficient technique, the progression of speed, the maturing competitive attitude, a sound general endurance, all around strength and general mobility. Though development of all round strength is best achieved through different training methods, resistance training is the most widely used and popular method for increasing strength. Harris C, et.al. (2007) assessed the influence of training intensity on strength retention and loss incurred during detraining. Blazevich AJ, et. al. (2003) examined changes in the muscle size, muscle architecture, strength, and sprint/jump performances of concurrently training athletes during 5 wk of "altered" resistance training (RT) and concluded that significant muscle size and architectural adaptations can occur in concurrently training athletes in response to a 5-wk training programme. These adaptations were possibly associated with the force and velocity characteristics of the training exercises but not the movement patterns. Factors other than, or in addition to, muscle architecture must mediate changes in strength, sprint, and jump performance.Falk B, et.al. (2002) documented that resistance training has been shown to be effective in enhancing muscle strength among prepubertal and adolescent boys.Crewther B, et.al. (2005) documented that a great deal of literature has investigated the effects of various resistance training programmes on strength and power changes.However, the effect of different combinations of kinematic and kinetic variables and their contribution to adaptation is unclear.Goto K, et.al. (2004)documented that acute and long-term effects of resistance-training regimens with varied combinations of high- and low-intensity exercises were studied and suggested that a combination of high- and low-intensity regimens is effective for optimizing the strength adaptation of muscle in a periodized training program. These theoretical foundations proved that there are different methods of resistance training on

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strength and power parameters of different groups, however, the influence of maximal and submaximal resistance training on selected strength variables, leg strength and abdominal strength among school volleyball players. Hence, this research was attempted.

Methodology

To facilitate the study, 45 male students from the different schools located at Andhra Pradesh in the age ranged between 15-17 years were selected. The subjects were volleyball players who represented their schools in district level sports competitions. The selected subjects were further divided into three groups namely Maximal Resistance training group (MRTG), Sub maximal resistance training group (SMRTG) and control group (CG), on random basis. Prior to the experimental treatments, all the subjects were measured of their leg strength through vertical jump test and abdominal strength through sit ups test. All the subjects were determined their 1 repetition maximum (1RM) of resistance trainings, half squat, biceps, triceps, bench press, and leg press. The submaximal resistance group was asked to perform 50 to 60 % of 1 RM and maximal resistance group was asked to perform 90 to 95% of 1 RM for 8 weeks. After completion of eight weeks experimental period, the subjects were measured of their strength variables selected. The differences between the initial and final scores were considered as effect of respective treatments and statistically analysed using ANCOVA for significance.

Results

Tab 1: Effect of Maximal and Sub Maximal Resistance Training on Leg Strength of Volleyball Players

	SMRTG	MRTG	CONTROL GROUP	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	46.07	47.00	45.33	Between	20.93	2	10.47	0.18
				Within	2470.27	42	58.82	
Post Test Mean	51.47	55.13	46.53	Between	558.71	2	279.36	6.23*
				Within	1883.20	42	44.84	
Adjusted Post Test Mean	51.52	54.49	47.13	Between	407.64	2	203.82	16.39*
				Within	509.88	41	12.44	
Mean Diff	5.40	8.13	1.20					

Table F-ratio at 0.05 level of confidence for 2 and 42 (df) =3.22, 2 and 41 (df) =3.23.
*Significant

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Tab 2 Multiple Comparisons of Paired Adjusted Means of Sub Maximal, Maximal and Control Groups on Leg Strength

SMRTG	MRTG	Control	MEAN DIFF	Reqd. C. I
51.52	54.49		2.97*	3.33
51.52		47.13	4.39*	3.33
	54.49	47.13	7.36*	3.33

***** Significant

Tab 3Effects of Maximal and Sub Maximal Resistance Training on Abdominal Strength of Volleyball Players

	SMRTG	MRTG	CONTROL GROUP	Source of Variance	Sum of Squares	df	Mean Squares	Obtained F
Pre Test Mean	27.20	27.93	26.93	Between	8.04	2	4.02	0.46
				Within	368.27	42	8.77	
Post Test Mean	30.20	32.80	26.93	Between	259.24	2	129.62	19.05*
				Within	285.73	42	6.80	
Adjusted Post Test Mean	30.31	32.40	27.22	Between	200.05	2	100.03	36.26*
				Within	113.11	41	2.76	
Mean Diff	3.00	4.87	0.00					

Table F-ratio at 0.05 level of confidence for 2 and 42 (df) =3.22, 2 and 41 (df) =3.23.
*Significant

Tab 4 Multiple Comparisons of Paired Adjusted Means of Sub Maximal, Maximal and Control Groups on Abdominal Strength

SMRTG	MRTG	Control	MEAN DIFF	Reqd. C. I
30.31	32.40		2.10*	1.57
30.31		27.22	3.08*	1.57
	32.40	27.22	5.18*	1.57

***** Significant

Discussions

The results presented in table 1 and 3 proved that maximal and sub maximal resistance training significantly improved strength parameters, leg strength and abdominal strength of the school volleyball players as the obtained F values of 16.39

and 36.26on adjusted means were greater than the required table F value of 3.23 to be significant at 0.05 level. Since significant F values were obtained, the results were subjected to post hoc analysis and the multiple paired adjusted mean comparisons were presented in Tables 2 and 4 on leg strength and abdominal strength of volleyball players. The results proved that both maximal and sub maximal resistance training improved leg strength and abdominal strength of volleyball players compared to control group. The results also proved that maximal resistance training was found to be better than sub maximal resistance training in improving the leg strength and abdominal strength. The differences between sub maximal and maximal resistance training in improving the strength parameters were significant. ($P<0.05$). Blazevich AJ, et. al. (2003) examined changes in the muscle size, muscle architecture, strength, and sprint/jump performances of concurrently training athletes during 5 wk of "altered" resistance training (RT). It was found significant muscle size and architectural adaptations can occur in concurrently training athletes in response to a 5-wk training program. And concluded factors other than, or in addition to, muscle architecture must mediate changes in strength, sprint, and jump performance. This study proved that submaximal and maximal resistance significantly contributed for improving in strength variables mainly due to improvement in muscle size and architectural adaptations. And the more intense the subjects trained improved more leg strength and abdominal strength. The findings of this study are in agreement with the findings of Blazevich AJ, et. al. (2003)

Conclusions

It was concluded that the maximal and sub maximal resistance training can be included in the training schedule of the school level volleyball players as these methods of training improves their strength variables, leg strength and abdominal strength.

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