Effect of Resistance Training and Plyometric Training on Explosive Strength in Adolescent Male Taekwondo Players

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ABSTRACT

The word 'Taekwondo' is derived from the Korean word 'Tae' means to kick or smash with the feet; 'kwon' implies punching or destroying with the hand or fist; and 'do' means way or method. Taekwondo thus is the technique of unarmed combat for self defense that involves the skillful application of techniques that include punching, jumping kicks, blocks, dodges, and parrying actions with hands and feet.

Strength is the ability to exert force against a resistance. It naturally increases with age because of the body growth and development of neuromuscular system. It depends upon age, sex, hormone, training etc. It is an essential element of fitness for virtually every sportsman and women. Explosive strength is a combination of strength and speed. It can be defined as the ability to overcome a resistance with high speed. In Taekwondo, and many other games and sports, the ability to generate maximum strength, in shortest period of time, has been considered as essential, to obtain high sport performance level. The purpose of the present study was to observe the effects of a combined training programme (weight training and plyometrics) on explosive strength development in adolescents Taekwondo players. Thirty Taekwondo state level players (E.G. n=15 and C.G. n=15), aged 14 to 15 years, volunteered to take part in this study. The experimental group underwent resistance training programme followed by plyometrics training programme, three days in a week, for six weeks. The subjects were assessed before and after 6 weeks of training programme for upper and lower extremity explosive strength. The results of the present study support the use of complex training to improve the upper and lower body explosive strength level, in the adolescents.

INTRODUCTION

The word 'Taekwondo' is derived from the Korean word 'Tae' means to kick or smash with the feet, 'Kwon' implies punching or destroying with the hand or fist, and 'Do' means way or method. Taekwondo thus, is the technique

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of unarmed combat for self defense that involves the skillful application of techniques that include punching, jumping kicks, blocks, dodges and parrying actions with hands and feet.Taekwondo is a martial art, a modern form of self defense that has evolved by combining many different styles of martial arts that existed in Korea.

Strength is the ability to exert force against a resistance. It naturally increases with age because of the body growth and development of neuromuscular system. It depends upon age, sex, hormone, training etc. Strength training is an essential element of fitness for virtually every sportsman and women. Long gone are the days when coaches believed that resistance training exercises only added unnecessary bulk to the athletes and hinder their ability to execute skill. Explosive strength is the combination of strength and speed abilities. It can be defined as the ability to overcome resistance with high speed.

It is well established that strength and power improve by a resistance training programme in children and adolescents, **(Faigenbaum et al, 1996).** Research indicated that regular participation in a resistance training programme, or a plyometrics training, improve measures of strength and power in adults **(Chu, 1998).** The studies of **Fleck & Kraemer (2004)** also suggest that changes in motor performance skill, resulting from the performance of combined resistance training and plyometric training, are greater than with either types of training alone. Plyometrics are training methods used by athletes, in all types of sports, to increase strength and explosiveness. Plyometrics consists of a rapid stretching of a muscle (eccentric action), immediately followed by a concentric or shortening action of the same muscle and connective tissue. Recent research suggest that plyometrics training is safe and effective for children and adolescent **(Chu et al, 2006 Morginson et al, 2005).**

In Taekwondo and many other games and sports, the ability to generate maximum strength, in shortest period of time, has been considered as essential to obtain high sport performance level. **Docherty et al (2004)** and **Chu, D.A. (1998)** have reported that combined training method is a method that combines resistance training and plyometric training; and has been proposed to increase muscular power. In the present study, the researchers first involved the subjects in resistance training programme in the school gymnasium; and then, in plyometric exercises, in the ground. This method enables the coach to easily supervise the resistance training and plyometrics training, in a single workout, on the same day.

Purpose of the study

To observe the influence of combined training programme of resistance training and pylometric training, on leg explosive strength.

To observe the influence of combined training programme of resistance training and plyometric training, on upper arm explosive strength.

METHODOLOGY

The study was designed to assess the effects of a complex training programme on the

power development of adolescent male Taekwondo players. Thirty state level Taekwondo players, aged 14 to 15 years, were selected for the study. The subjects belong to the colliery belt of Burdwan district, West Bengal. The subjects were healthy. Both the participants and their parent were informed about the nature of the study. The total players were randomly divided into two groups. Experimental group (n=15) and control group (n=15). The experimental group performed resistance training followed by plyometrics exercises, three days per week for 6 weeks. Before each training session, all the subjects performed 10 minutes of low to moderate exercise and stretching for warming up and researcher discussed and demonstrated proper resistance training and plyometric exercises. Subjects were assessed before and after a six-week training programme for upper and lower body explosive strength, according to the Two Hand Medicine Ball Put and Vertical Jump **(Glencross, 1960)** test. Both the tests were performed three times and the highest values were taken in meter (for M.B.P.) and cm (for V.J.) respectively for statistical analysis. The detail training protocols described in table 1 and table 2.

TRAINING PROTOCOLS

Table-1 : Resistance and Plyometric Training Protocol for 1-3 weeks.

Exercises	Sets	Rept.	Weight
Bench Press	3	8	55% of 1RM
Leg Press	3	8	55% of 1RM
Front Press	3	8	55% of 1RM
Hamstring Curl	3	8	55% of 1RM
Tuck Jump	3	10	Own body weight
Medicine Ball Over Head Throw	3	10	M.Ball. of 3 Kg.
Hurdle Jump	3	10	Own body weight
Medicine Ball Seated Throw	3	10	M.Ball. of 3 Kg.

Table-2 : Resistance and Plyometric Training Protocol for 4-6 weeks.

Exercises	Sets	Rept.	Weight
Bench Press	3	10	60% of 1RM
Leg Press	3	10	60% of 1RM
Front Press	3	10	60% of 1RM
Hamstring Curl	3	10	60% of 1RM
Tuck Jump	3	15	Own body weight
Medicine Ball Over Head Throw	3	15	M.Ball. of 3 Kg.
Hurdle Jump	3	15	Own body weight
Medicine Ball Seated Throw	3	15	M.Ball. of 3 Kg.

The training programme consisted of 8 exercises in which 4 were resistance training exercises and 4 were plyometric exercises. The resistance exercises were Bench Press, Leg Press, Front Press, and Hamstring Curl. The plyometric exercises were Tuck Jump, Medicine Ball Over Head Throw, Hurdle Jump, and Medicine Ball and Seated Throw. For the first 3 weeks the resistance exercises started with 55% of 1RM.

Each resistance exercise was performed 3 sets of 8 repetitions and each plyometric exercise was performed 3 sets of 10 repetitions, with own body weight. After 3 weeks of training programme, the resistance exercises were performed in 3 sets of 10 repetitions with 60% of 1RM and plyometric exercises were performed 3 sets of 15 repetitions. There was a rest interval of 60 seconds in between the sets.

RESULTS & DISCUSSION

The results between the pre and post test for explosive strength scores, in the groups, at base lines and after the training programme, are presented in Table 3.

Table-3 : Mean, S.D., % of improvement, and t-value of collected data.

	Groups	Pre-Mean SD	Post-Mean SD	% Gains	t-value
M.B.P.	E.G.	3.31±0.31	4.01±0.35	21.14	9.733 *
	C.G.	3.30±0.34	3.32±0.32	0.60	0.0054
V.J.	E.G.	26.66±2.28	32.4±2.13	21.53	2.077**
	C.G.	26.06±2.57	26.2±2.65	0.53	0.164

E.G. = experimental group. C.G. = control group.
* = significant at .01 level. ** = significant at .05 level

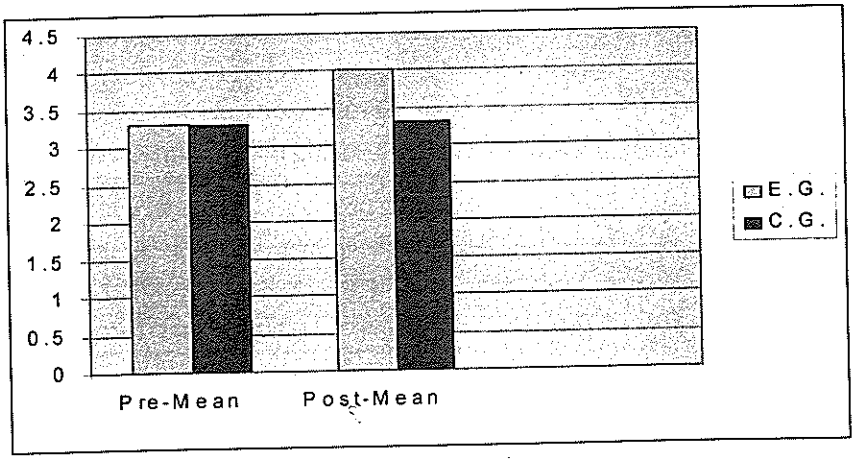

Fig-1 : Graphical presentation of pre and post mean value of Medicine Ball Put performance.

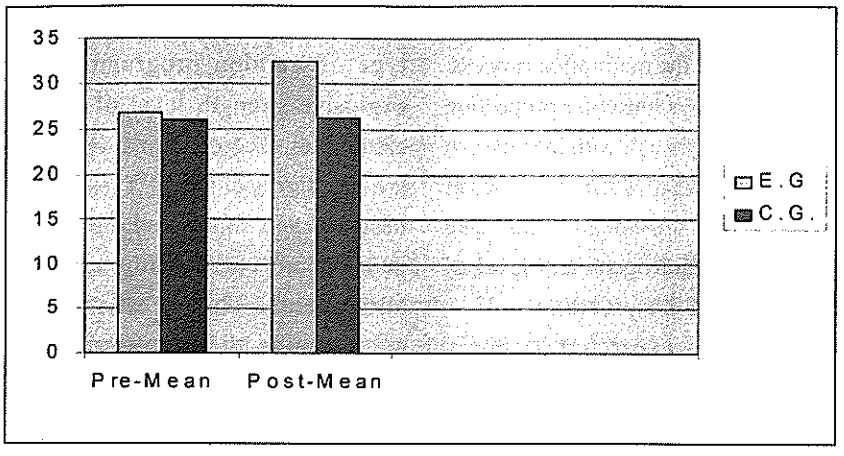

Fig-2 : Graphical presentation of pre and post mean value of Vertical Jump performance.

The groups were similar on pre-test, but significant differences were observed post test for experimental group, in both the variables.

The main findings of the study were the significant increase in height of the vertical jump and the distance of the medicine ball put, which proved the efficacy of the combined training programme of resistance training and plyometric training. The experimental groups improved in both the assessed variables, from pre to post testing. The control groups also improved in vertical jump and in medicine ball put, but the improvement in control group were statistically not significant. From the statistical analysis, Table 3, it was found that the improvement in both the variables was 21% of experimental group and about 1% of control group. Several factors may have contributed to the changes in vertical jump and medicine ball put. These factors are body segments, increased coordination level, muscular strength.

In this study, the training programme was designed to improve muscular power levels, focusing on vertical jump and medicine ball put. Researchers used a combined training method of resistance training and plyometric training, which enabled coaches to supervise weight training and plyometric training, in a single work out, on the same day's **(Ebben et al, 1998).** The values of vertical jump and medicine ball put performance enhanced due to the combined training methods which stimulate the neuromuscular system. It activates the muscular fibers and the nervous system. Due to this slow twitch muscle fibers behave like fast twitch fibers to some extent **(Chu, D.A., 1996).** Further more, resistance training increases motor neuron excitability and reflex action, which may lead to better training conditions for subsequent plyometric exercises **(Ebben et al, 1998).** This fact may have contributed to the improvement observed in this

study. On the other hand, with the beginning of puberty, and through out the maturation process, there is an increase in boys muscular proportion from 27% to 40% of body mass, with increases in muscular strength **(Israil, S., 1992). Kraemer et al (1993)** reported that hormonal factors like increase in circulating androgens and level of testosterone may help in this process.

In conclusion, researcher strongly believes that combined training programme increases vertical jump and medicine ball put performance. In other words we can say that this type of training programme improves the explosive strength level of upper and lower extremities. These strength level improvements are usually essential in Taekwondo. Correctly designed and supervised, this type of training programme carries no extra overload, on adolescents. This is an important part of conditioning that contributes to improved performance of young boys in various sports and games.

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