Effects of passive repeated plyometric training on specific kicking performance of elite Olympic Taekwondo player

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INTRODUCTION

Sporting activities involved striking, kicking, jumping, or high frequency rapid acceleration movements require a high power output of the involved muscles (Newton, et.al 1996). Coaches and athletes have modified training method in an attempt to develop explosive power, because velocity of movement is an important factor to reach perfect performance. Therefore, The Passive Repeated Plyometric Training Machine (PRP Training Machine) was designed in order to reach the best power training effect. PRP movement has been shown consisted of many characteristics that set them distinctly apart from other types of movement such as high velocity, high frequency movement and isokinetic contraction during entire range of motion under passive contraction (Wang, et al 2001). Many researches indicated that PRP training could improve neuromuscular system of general players. However, it is not clear how much training effect can beneficial to elite players. Hence, the aim of this study was to determine the effects on specific kicking performance of a 6-wk PRP training program of elite Olympic Taekwondo player.

METHODS

Subject: The subject was an elite athlete who won a gold medal of Taekwondo event in 2004 Athens Olympic games. The subjects' age, height, and weight was 22 years, 173 cm, and 58 kg, respectively.

Specific kick test: Subject chose kicking movements according to his special skills and necessary of competition. The test movements include right leg turning kicking **(RTK)**, left leg turning kicking **(LTK)**, left leg slide step turning kicking **(LSTK)**, right leg axe kicking **(RAK)**, left leg axe kicking **(LAK)**, right leg back kicking **(RBK)**, and left leg 5 continuous kicking **(LCK).** An accelerometer was attached on the back of dummy to catch time and impact acceleration of dummy. When the movement test begins, subject standing in front of dummy and chose a suitable distance. Subject has to kick the target of dummy as rapidly as possible while trigger was flashed red light. The kicking velocity was displacement divided by movement time (m/sec). Besides, total time of 5 kicks (sec) was used to calculate kicking velocity of LCK. The kicking power was the square root of 3 dimensional impact accelerations of the tri-axial accelerometer while the dummy was kicked by subject. The kicking power of LCK was calculated total power of 5 kicks (g).

Training program: PRP machine can control the frequency of pedal and monitor training load during entire movement in passive and repeated form. Training duration was three times a week for six weeks before the pre-competition of Athens Olympic Games. The training load was between 60%MVC to 70%MVC; the frequency of pedal was between 1.5Hz to 3Hz. Exercise duration was set 10 seconds to 15 seconds. The training program was 8 sets a time, and took three minutes rest between each set.

RESULTS AND DISCUSSION

The results indicate that velocity of RTK was significantly increased after PRP training ($p < 0.05$). Beside, the kicking power of LAK and RBK were also significantly increased after PRP training ($p < 0.05$). The velocity and power of most movements were increased after PRP training, but no significant change occurred (Table 1). The subject of this study was elite Taekwondo player who won three times gold medal of international championship during 2002 to 2004. Therefore, breakthrough of physical strength and specific kicking performance was difficult for top athlete. Thus, even very little progress of velocity and power was valuable to an elite player and excited everyone who joined this training project.

Table 1: Training effect of PRP after 6-wk. (n = 3)

Variable	Pre-training M ± SD	Post-training M ± SD	p
Velocity (m/sec)			
RTK	3.496±0.167	3.666±0.161	.04*
LTK	3.606±0.205	3.906±0.442	.33
LSTK	2.646±0.213	2.630±0.160	.81
RAK	3.190±0.180	3.436±0.211	.11
LAK	3.250±0.230	3.080±0.235	.57
RBK	2.970±0.547	3.196±0.083	.52
LCK (sec)	2.406±0.041	2.316±0.073	.30
Power(g)			
RTK	124.39±6.02	138.51±9.31	.16
LTK	112.65±2.03	122.63±11.44	.24
LSTK	103.91±3.90	109.38±11.44	.38
RAK	32.47±6.96	36.92±9.72	.42
LAK	60.72±3.53	63.24±2.74	.03*
RBK	112.69±5.28	135.06±4.20	.02*
LCK	449.11±47.90	546.47±14.13	.07

* p-value significantly less 0.05

CONCLUSIONS

The results indicate that a PRP training program could improve the velocity and power of kicking of elite Taekwondo player in a sport specific kicking performance. Based on the results of this study, we believe that PRP training is an efficient method of training for elite players to improve strength and power. Therefore, PRP training could be used for those sports activities that involve high muscle speed and power such as Taekwondo, soccer and volleyball etc.

REFERENCES

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