THE EFFECT OF RESISTANCE TRAINING WITH ELASTIC BANDS ON STRIKE FORCE AT TAEKWONDO

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Abstract

The objective of this study is to analyze the effect of resistance training with elastic bands on strike force at the martial art of Taekwondo. During the study, 24 Taekwondo athletes were randomly but homogenously classified into three groups. In 2 of these groups elastic bands (Uguralp® Istanbul-Turkey) with different elasticity levels were utilized while the 3rd group remained as the control group. The 1st group used a kind of elastic band with (n=8):1.5 m stress value and 7.25 kg impact value which was particularly designed for the sport of Taekwondo (Type 1 band); the 2nd group used a kind of elastic band with (n=8):1.5 m stress and 14.5 kg impact value (Type 2 band); and the 3rd group did not used any elastic bands and maintained their usual Taekwondo training schedule. Each of these groups went on with their training which comprised of a 6-week training period for 3 days a week with 90 minutes a day covering the same number of strikes and techniques. During the pre- and post-training periods of the 6-week long training period, the variations of impact force of the participants were measured for Palding chagi (roundhouse kick), Dollyo chagi (turning kick) and aeryo chagi (downward kick). In order to realize the measurements, Herman Digital Trainer®, which measures and records the impact of a preselected number of hits, was utilized. As a result, it was established that resistance training sessions conducted with elastic bands have positive effects on strike force of Taekwondo athletes (p< .05). The same way, it was observed that through 2 different elastic bands better results were obtained for the members of the 2nd group (p<.05).

Key words: Elastic band, resistance training, Taekwondo, strike force

Introduction

During Taekwondo matches, the strikes which are delivered correctly to the opponent may bring about points when they are managed above a certain level of strength (Koh & Watkinson, 2002; Shirley, 1992). Especially the application of high-tech measuring gears with clear-cut analysis capabilities at point evaluation at Sydney Olympic Games in 2000 brought about the need for developing more elaborate training systems. In order to get points during Taekwondo matches, one should be able to display a high level of neuromuscular coordination to stop the opponent, or to deliver strikes with great force to shock and imbalance the opponent. This motor property is called swift force and can be described as being able to display the greatest force at the shortest time (Bompa, 1998). Swift force is the backbone of all sports involving jumping, throwing, striking and changing directions very rapidly (Açıkada & Ergen, 1990). Training sessions conducted with elastic bands have replaced the traditional training methods where free weight formed the backbone of the training.

Becoming a crucial and necessary component of Taekwondo trainings, elastic bands produce better resistance due to their flexible feature and thus playing an important role at variable loading trainings as well as volume and intensity determination trainings (Shoepe, Ramirez, & Almstedt, 2010). Elastic resistance training (ERT) is often used with the aim of improving kicking performance; however, the efficacy of this has never been examined experimentally (Jakubiak, & Saunders, 2008). During this study, elastic bands with a variety of resistance values were used at Taekwondo trainings and their effects on strike force of Taekwondo athletes were observed.

Material and Methods

Staying at a military boarding school and having homogenous life styles such as common daily routines, nourishment, sleeping hours, 24 Taekwondo athletes (aged 16; body weight: 61,3±6,3 kg; height: 164,2±8,6 cm) with red/red-black belts were randomly divided into 3 groups. The 1st group used a kind of elastic band with (n=8):1.5 m stress value and 7.25 kg impact value which was particularly designed for the sport of Taekwondo (Type 1 band); the 2nd group used a kind of elastic band with (n=8):1.5 m stress and 14.5 kg impact value (Type 2 band); and the 3rd group did not used any elastic bands and maintained their usual Taekwondo training schedule. Each of these groups went on with their training which comprised of a 6-week training period for 3 days a week with 90 minutes a day covering the same number of strikes and techniques.

Under Taekwondo trainers' supervision, the athletes completed the common warm up period for 30 minutes and, as the testing protocol, delivered 3 strikes of each technique, that is, palding chagi (roundhouse kick), dollyo chagi (turning kick) ve naeryo chagi (downward kick), within 40 seconds. In order to realize the measurements, Herman Digital Trainer®, which measures and records the impact of a preselected number of hits, was utilized and the of all 3 strikes, the strike with the highest value were taken as the benchmark. The test was applied all 3 groups before and after the training sessions.

Elastic bands peculiar to Taekwondo were used in the following ways:

a) One end of the elastic band was fixed to a point on the ground,
b) The other end of the elastic band, which was designed so as to be attached to the athletes' ankles, was fastened in a way that enabled the athlete to force his/her Achilles' tendon.
c) The elastic band was stretched up to 1.5 m towards the training glove held by the partner with each instruction of the partner.

Statistical analysis

Paired T-test was applied in order to make comparisons within the group whereas One-way ANOVA was applied for comparisons amongst groups. For Posthoc analyses, Tukey test was applied.

Results

The findings of the study at hand are indicated in the following tables:

Table 1: The changes at pre- and post-test values for Palding chagi technique during the course of the 6-week training period

		Mean ± Stand.Dev.	P
1st group (Type 1 elastic band)	pre-test palding (*g*)	60.00 ± 5.73	.003
	post-test palding(*g*)	74.50 ± 10.49	
2nd group (Type 2 elastic band)	pre-test palding(*g*)	61.25 ± 6.54	.000
	post-test palding(*g*)	81.38 ± 4.21	
control	pre-test palding(*g*)	66.25 ± 8.75	.036
	post-test palding(*g*)	71.50 ± 5.68	

Table 2: Inter-group comparison of pre- and post-test variations for Palding chagi technique

1st group (Type 1 elastic band)	2nd group (Type 1 elastic band)	Control	
Mean ±Stand.Dev.	Mean ±Stand.Dev.	Mean ±Stand.Dev.	P
-14.50 ± 9.21	-20.13 ± 7.41	-5.25 ± 5.75	.003

With the variations analysis it was clearly observed that there was considerable differences between the pre- and post-test values of the groups analyzed ($F(2.21)=7.83$, $p=.003$).

According to Posthoc analysis, it was clearly determined that the difference at values in question was between the 2nd group and the control group.

Table 3: The variations obtained at the end of the 6-week analysis period for pre- and post-test values of Dollyo chagi technique.

		Mean ±Stand.Dev.	p
1st group (Type 1 elastic band)	pre-test dollyo chagi(*g*)	61.00 ± 12.18	.022
	post-test dollyo chagi(*g*)	73.38 ± 7.01	
2nd group (Type 2 elastic band)	pre-test dollyo chagi(*g*)	57.13 ± 4.67	.007
	post-test dollyo chagi(*g*)	69.88 ± 6.90	
Control	pre-test dollyo chagi(*g*)	71.13 ± 7.95	p>.05
	post-test dollyo chagi(*g*)	71.13 ± 7.36	

Table 4: The inter-group pre- and post-test comparison of Dollyo chagi technique

1st group (Type 1 elastic band)	2nd group (Type 1 elastic band)	Control	
Mean ±Stand.Dev.	Mean ±Stand.Dev.	Mean ±Stand.Dev.	p
-12.38 ± 12.00	-12.75 ± 9.45	0.00 ± 5.04	.018

With the variations analysis it was clearly observed that there was considerable differences between the pre- and post-test values of the groups analyzed ($F(2.21)=4.882$, $p=.018$).

According to Posthoc analysis, it was clearly determined that the difference at values in question was between the 1st and 2nd groups ($p<.05$).

Table 5: The variations obtained at the end of the 6-week analysis period for pre- and post-test values of Naeryo chagi technique.

		Mean ±Stand.Dev.	p
1st group (Type 1 elastic band)	pre-test naeryo chagi(*g*)	47.38 ± 7.85	.006
	post-test naeryo chagi(*g*)	54.38 ± 6.35	
2nd group (Type 2 elastic band)	pre-test naeryo chagi(*g*)	41.38 ± 5.45	.006
	post-test naeryo chagi(*g*)	59.00 (14.03)	
Control	pre-test naeryo chagi(*g*)	49.75 ±4.83	p>.05
	post-test naeryo chagi(*g*)	55.13 ± 4.19	

Table 6: Inter-group comparison of pre- and post-test variations for naeryo chagi techniques

1st group (Type 1 elastic band)	2nd group (Type 1 elastic band)	Control	
Mean ±Stand.Dev.	Mean ±Stand.Dev.	Mean ±Stand.Dev.	p
-7.00 ± 5.07	-17.63 ± 12.70	-5.38 ± 6.76	.023

With the variations analysis it was clearly observed that there was considerable differences between the pre- and post-test values of the groups analyzed ($F(2.21)= 4.563$, $p=.023$.)

According to Posthoc analysis, it was clearly determined that the difference at values in question was between the 2nd group and the control group ($p<.05$).

Discussion

In this study, elastic bands with a variety of resistance values were used at Taekwondo trainings and, through a 6-week period, their effects on strike force of taekwondo athletes when they exercise with a variety of techniques were observed. With the study, it was clearly observed that males produce faster and stronger forces. In addition, for both genders it was established that Dollyo chagi was the fastest technique while Twit chagi was the strongest strike technique. In terms of relative speed, no difference was detected (Pieter F., & Pieter W. 1995). In our study, the speed of the strike technique was not taken into consideration and the effect of applying Type 1 and Type 2 elastic bands with different elasticities over strike force were observed.

The target strike force of Palding chagi (Table 1) and Dollyo chagi (Table 3) were measured as having higher values in comparison to Naeryo chagi (Table 5). The reason for this was the difference in the target strike point as well as the application of the technique required using different muscles with Naeryo chagi than the other two techniques. While Palding chagi and Dollyo chagi techniques are applied with the front of the feet by moving it towards the torso and face in circles, the Naeryo chagi technique targets the face with the sole of feet. The 6-week long training sessions were realized with the application technical strikes at maximum speed and force. The resistance training sessions realized with maximal strength increased the speed as well as the explosive force (Newton, Kraemer, Häkkinen, Humphries, & Murphy, 1996).

Following the 6-week training period, it was observed that Palding chagi technique yielded better results for the 2nd group (using Type 2 elastic band) in comparison with the 1st group (using Type 1 elastic band) and the control group (Table 2). Thus, it has been established that training sessions held with elastic bands having 14.5 kg resistance force were more effective in comparison with the training sessions using elastic bands with 7.25 kg resistance force as well as sessions with no elastic bands at all. With the betterment of the strike force obtained with the elastic band, Taekwondo athletes are going to demonstrate greater performances, because 43% of the results obtained in 2009 European championship were the result of the Palding chagi technique (Imamoğlu, Açak, & Bayram, 2010).

After the 4-week long training sessions, Jakubia and Saunders (2008) detected a 7% increase at kicking speed with Dollyo chagi (turning kick) technique of Taekwondo athletes due to having resistance training sessions. In our study, as a result of resistance training sessions conducted with two loads, the Dollyo chagi technique improved significantly when compared with training sessions with no elastic bands. However, statistically speaking, the weight of the load played no significant role regarding the technique in question (Table 4). The underlying reason is assumed to be that the target striking point is the face, that is a quite far point, and also that the motor capabilities of Taekwondo athletes may shall fall short against the load stemming from the elastic band.

After the 6-week long training session, Taekwondo athletes maintaining their exercises with 14.5 kg loads demonstrated a better level of activities than those exercising with 7.25 kg and those in the control group (Table 6). The load used in the 1st group (using Type 1 elastic band) was observed to be lacking the condition to reach an ideal level of development. During matches athletes use a number of techniques (Imamoğlu, Atan, Kolukısa, Kaldırımcı, Kıshalı, 2004). At all branches, each and every technique must be thoroughly studied and applied to the point of perfection. For this purpose the tactical skills of athletes must be improved.

In the light of our study, it has been clearly observed and established that in order to increase the impact of strike techniques during Taekwondo matches, it is compulsory to use elastic bands with different elasticity varying according to each Taekwondo technique. The elasticity of bands may vary depending on the face or torso level where the technical strikes are delivered. The technical Taekwondo trainings conducted with elastic bands shall definitely increase the impact strength of the strike due to being in line with kinetic and kinematical chain (that is, hip, knee and ankle movement). Chiu PH et al (2007) have indicated that there is a parallel increase at strike speed depending on the strike force. Thus, as a result of Taekwondo trainings conducted with elastic bands shall increase the strike force of athletes, thus allowing them also to increase their technical strike speed, because elite athletes must be able to reveal great strike forces (Falco, Alvarez, Castillo, Estevan, Martos, Mugarra, & Iradi, 2009).

Conclusion

At the end of a 6-week training period, it was clearly observed that resistance training sessions realized with the application of elastic bands affected the technique strike force of Taekwondo athletes, increasing the impact of athletes on the electronic safe-guard applied during matches, and thus, contributing quite positively on getting better points to win the match.

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