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Introduction

The execution rapidity of kicks' techniques is a fundamental quality to excel in Tae-Kwon-Do. Such a quality could be limited by the fatigue due to the physical effort of the match and by the psychological stress of the competition. The relationship between fatigue and performance is still subject of many studies; to offer our contribution we started a experimentation in order to verify the incidence of fatigue on knocks' rapidity in Tae-Kwon-Do.



Methods

We conducted our experimentation on a group of 10 TKD athletes (age 23±5; years of practice 9±3; h 176±5; weight 72±14) of different agonistic level (regional and international).

The athletes, after a specific warm-up of about 15 minutes had to face a modified version of SOK test (Villani, Angiari, Tomasso, 2004; Fig.1) with which, through an integrated system of photocells and piezoelectric drug (wrapped around a sack), we evaluated the execution time of the pandalchagi kick performed both on the right and on the left.

After the warm up and the basic test, the athletes had to do a TKD standard match and at the end of each round, during the rest of 1 minute, had to repeat the test to evaluate again the rapidity of the kick and the related decrease.

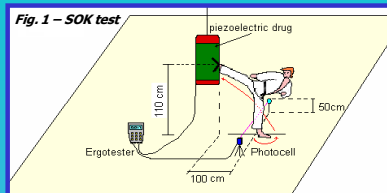
This procedure was repeated at the end of each round (the fight has 3 rounds of 2 minutes).

To study the trend of the specific fatigue, we compared the results of tests executed after each round (diff. %, t-test and Anova).

To evaluate the test reliability each trial was repeated by each athlete twice after 3 days.

The objectivity was granted through a precise protocol standardization.

To have further comparison information we also analyzed some official matches performed by the athletes of the group



SOK right (mean)								
test	rest		after 1 round		after 2 round		after 3 round	
mean	0,187	0,193	0,207	0,207	0,217	0,217	0,227	0,233
correlation	0,783		0,782		0,807		0,787	

SOK left (mean)								
test	rest		after 1 round		after 2 round		after 3 round	
mean	0,168	0,174	0,178	0,182	0,195	0,202	0,21	0,22
correlation	0,766		0,765		0,742		0,755	

Results

The results of the reliability study (test-retest) pointed out r values between 0.74 and 0.81, both for the right kicks and left kicks.

The comparison of the results of the SOK test during the three rounds, pointed out how the fight fatigue reduced the performance of the kicks rapidity, with a decrease in each round.

Such a rapidity decrease was evaluated between 5-6±1% after the first 2' of fight (p<0.01), raised at 9±2% after the 2nd round (p<0.01) and raised of another 6-7±2% after the third (p<0.01) both for the right and the left leg.

the gradual worsening is also confirmed by the video analysis of the official matches performed by athletes of the studied group. During these matches the higher decrease was registered for the dominant leg (the leg that kicks more) and the round in which is registered the highest decrease seems to be the second one (mean decreases 9-10%), while in the third round we noticed great inter-individuals variations between athletes (individuals decreases was variables between 0% and 30%), most of all due to each technical-tactical characteristic.

SOK right (mean)				
test	rest	after 1 round	after 2 round	after 3 round
mean	0,172	0,181	0,199	0,213
DS	0,016	0,016	0,026	0,024
diff%		-5±1% (p<0,01)	-9±2% (p<0,02)	-6±2% (p<0,001)

SOK left (mean)				
test	rest	after 1 round	after 2 round	after 3 round
mean	0,168	0,178	0,195	0,21
DS	0,011	0,016	0,017	0,028
diff%		-6±1% (p<0,01)	-9±1% (p<0,01)	-7±2% (p<0,01)



Conclusions

The experimentation we conducted permits us to state that the fatigue weigh on the kicks rapidity in TKD proportionally to the length of the match, with a progressive decrease of the rapidity during the three fighting rounds, especially in the 2nd. But on this decrease weighs the match tactic adopted by each athlete, and its effects are very clear in the last match round. In the light of the results obtained, in the preparation of the TKD results fundamental:

- 1) To organize the training of the elite athletes, taking care in a specific way the development of the rapidity endurance
- 2) Pay great attention to the tactical management of the matches in order to have a more balanced energy use.

References

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