

REPETITION SPEED IN THE CONTEXT OF SPECIFIC PHYSICAL TRAINING PERIOD FOR JUDO ATHLETES

PÉTER-ZSOLT SZABÓ^{1*}, EMILIA FLORINA GROSU¹, IOAN NELU POP¹,
ALMOS ANDRAS¹, DAN MONEA¹, MIHAELA MARIA BOTEZAN¹

ABSTRACT. Introduction: Muscles are the main driving force in the locomotive system. Moreover, their activity is crucial for athletic performance. The repetition speed they generate allows for higher performance. Maintaining a positive average for repetition speed is essential for constant performance. **Hypothesis:** A specific physical training period influences the evolution repetition speed. **Methods and Materials:** Seventeen female subjects from Romania's Junior Olympic Judo Team took part in our study with the age between 14 and 20 years old. The MGM-15 Jump Carpet was used for the repetition speed test. **Results:** There was no significant statistical difference between the initial and final repetition speed measurement but there was a strong difference between the test's values for both feet and each single ones. **Conclusions:** The physical training period the subjects undergone had no impact over the way repetition speed behaves. Even though this element showed significant differences between various jumping positions this was not enough to confirm the hypothesis. This being the case, there may be another factor that influences the repetition speed's evolution.

Key words: *judo, MGM-15, repetition speed, physical training*

REZUMAT. Viteza de repetiție în contextul unui program de antrenament fizic specific al sportivilor de judo. Introducere: Mușchii sunt principalul motor în cadrul sistemului locomotor. Activitatea lor este crucial pentru performanța sportivă. Viteza de repetiție generată de aceștia permite atingerea unei performanțe ridicate. Menținerea unei viteze de repetiție ridicată este esențială pentru performanță constantă. **Ipoteză:** O perioadă de antrenament fizic specific influențează viteza de repetiție. **Metode și Materiale:** 17 subiecți de gen feminin din cadrul Lotului Olimpic al României de Judo categoria Juniori cu vârsta cuprinsă între 14 și 20 de ani au participat la studiul nostru. Covorul de sărituri MGM-15 a fost

¹ Babeș-Bolyai University, Physical Education and Sport, Cluj-Napoca, Romania

* Corresponding author: szabo.peterzsolt@yahoo.com

folosit pentru măsurarea vitezei de repetiție. **Rezultate:** Nu a fost identificată o diferență semnificativ statistică între valoarea inițială și finală a variabilei măsurate. S-a identificat o diferență semnificativ statistică între valorile acesteia între săriturile pe ambele picioare și pentru fiecare dintre ele în parte. **Concluzii:** Perioada de antrenament fizic în care au fost integrați subiecții nu a avut un impact asupra modului în care evoluează viteza de repetiție. Deși la acest capitol este prezentă o diferență semnificativă între valorile variabilei pentru săriturile pe ambele picioare și pentru ele individual acest lucru nu a fost îndeajuns pentru confirmarea ipotezei. Aceasta fiind starea de fapt, putem presupune că există o variabilă neidentificată care influențează evoluția vitezei de repetiție.

Cuvinte cheie: *judo, MGM-15, viteza de repetiție, antrenament fizic*

Introduction

Your body constantly adapts to the stresses under which you place it. Exercise is one such stress. Over time, your body will physiologically adapt to aerobic training. These physiological adaptations will decrease muscle soreness and make your heart more efficient so you can exercise more easily and at a higher intensity than when you first start a workout routine. More importantly, your overall health will improve (Dudley, 1982).

Your muscles can be comprised of Type I or Type II fibers. Type I fibers are suitable for endurance exercise because they do not contract as quickly, but they also do not fatigue as quickly. By contrast, Type II fibers are suitable for sprinting exercise because they contract rapidly, but also fatigue rapidly. With aerobic training, Type I muscle fibers increase in size. This means your muscle fibers are able to contract for a longer period of time (Trappe, 2006).

Judo is characterized by high-intensity intermittent efforts, resulting in high physiological demand (Franchini, 2011). Judo athletes typically take part in seven to eight competitions, either regionally or internationally (Julio, 2013).

Thus, the training schedule is important to provide judo athletes a better chance to qualify in these tournaments (Crnogorac, 2010; Fukada, 2013; Stojanovic, 2009).

There are three elements involved for attaining the desired speed: the mental quickness and the physical approach combined with the appropriate technique. Physical speed is normally defined as the quickness of movement of a limb, whether this is the legs or the arms of a judoka. Physical speed as an integral part of the judo performance is influenced by: the judoka's quick mental response, the choice of the target, his mobility, his endurance, his basic strength

and by the technique he chooses. We normally develop the physical speed through the application of various techniques of sprinting first rehearsed at slow speeds and then transferred to runs at maximum speed over set distances and times. This chosen gradation ensures proper warm up of the muscles and joints groups, increase endurance, provide opportunities to correct the running technique and influence the stride length needed to reach an upper speed level.

Hypothesis

A specific physical training period influences the evolution of repetition speed of judo athletes.

One of the aims of this study was to identify if an intensive training period would affect the repetition speed of judo athletes. The physical training period was expected to prepare the athletes for the upcoming national and international competitions.

Materials and Methods

Seventeen female subjects took part in our study with the age between 14 and 20 years old. All the subjects were athletes that compete in national and international judo competitions and are part of the Romania's Junior Olympic Judo Team. During the specific physical training period, all subjects underwent the same routine at the same location. The test's protocol was explained to the participants and written informed consent was obtained from them.

All the subjects were briefed beforehand regarding what the experiment consisted of and what they were required to do. The subjects were assured that any personal information would not be made public and their personal data recorded will be analysed under the cover of anonymity. Moreover the subjects were instructed how to control social and routine aspects of their lives so that those variables would not interfere with the experiment's results. Also, after the briefing, the subjects were asked to confirm their understanding of what was required on a premade consent form.

The study was conducted between May and July of 2016. The 17 subjects underwent an intensive physical training period that aimed to prepare them for the upcoming competitions. The main aspects that the training period was concern with were strength improvement, endurance and muscle fitness. All of these were intertwined with specific training for judo techniques. Overall this intensive and specific training period was a vigorous shock for the subject's physical performance.

For the measurements we've used the MGM-15 jumping carpet that offers data regarding the force-speed asymmetry and also the structural consistency of a subject's movement control. The carpet is used in the Miron Georgescu Modified Test that requires the subject to perform 1 set of 15 consecutive jumps on both legs, on left and on the right leg each. The data recorded is then analyzed by the instrument's software and final coefficients are offered.

We've conducted 2 measurements for the whole research. One was done before and one was after the physical training period. This schedule allowed us to identify as accurately as possible the effects of the training over the force-speed asymmetry.

The protocol for each measurement was as follows:

- The subjects were accommodated with the instrument;
- The subjects were informed with regards to the test's requirements;
- The subjects had 10-15 minutes for warm-up;
- The subjects could dry-test a few jumps;
- The subject started the test with 3 sets of 15 jumps (both feet (BF), right foot (RF), left foot (LF)) with 15 seconds pause between the sets.

We've focused our attention on one coefficient offered by the software: repetition speed. The repetition speed refers to the speed at which the subject can repeat a sport related technique on a loop. The value of the coefficient relates to the average value of the time spent on the ground and it offers data regarding the relation between force and speed. The quality and level of the speed for each subject is directly correlated to the value of the coefficient registered:

- High: speed values between 0.16-0.165 s;
- Average: normal speed values between 0.17-0.18 s;
- Very poor: speed values over 0.200 s.

The data we collected were analyzed using Excel Office software.

Results

A paired-samples t-test was conducted to compare the value of the initial repetition speed (V_{rep} at T1) and the value of the final repetition speed (V_{rep} at T2) for the judo athletes. There was no significant difference in the scores of the initial test and of the final test conditions no matter which indicator was tested. These results suggest that the training program the subjects undergone did not affect either positive or negative the repetition speed. (Table No. 1)

An independent t-test was conducted to compare the value of the repetition speed registered for each indicator (BF, RF, and LF) at the beginning and at the end of the study period. Significant statistical differences were observed for the pair BF-RF and BF-LF at both beginning and end of the study. (Table No. 1)

Table 1. Statistical analysis of the data for BF, RF and LF at the two measurement moments (T1 and T2).

Moment/ Indicator	Mean	Std. dev.	Min	Max	Statistical significance (p)				
T1	BF	0,18	0,0186	0,14	0,2	< 0,0001	BF-RF BF-LF RF-LF	1,67 x 10 ⁻¹¹ < 0,0001 0,6128	BF 0,1302 RF
	RF	0,27	0,0281	0,22	0,31				
	LF	0,27	0,0386	0,22	0,35				
T2	BF	0,19	0,0267	0,14	0,24	2,88 x 10⁻¹¹	BF-RF BF-LF RF-LF	2,1 x 10 ⁻¹⁰ 5,87 x 10 ⁻⁸ 0,2586	T1-T2 0,1387 PS 0,5791
	RF	0,28	0,0318	0,20	0,34				
	LF	0,27	0,0366	0,20	0,36				

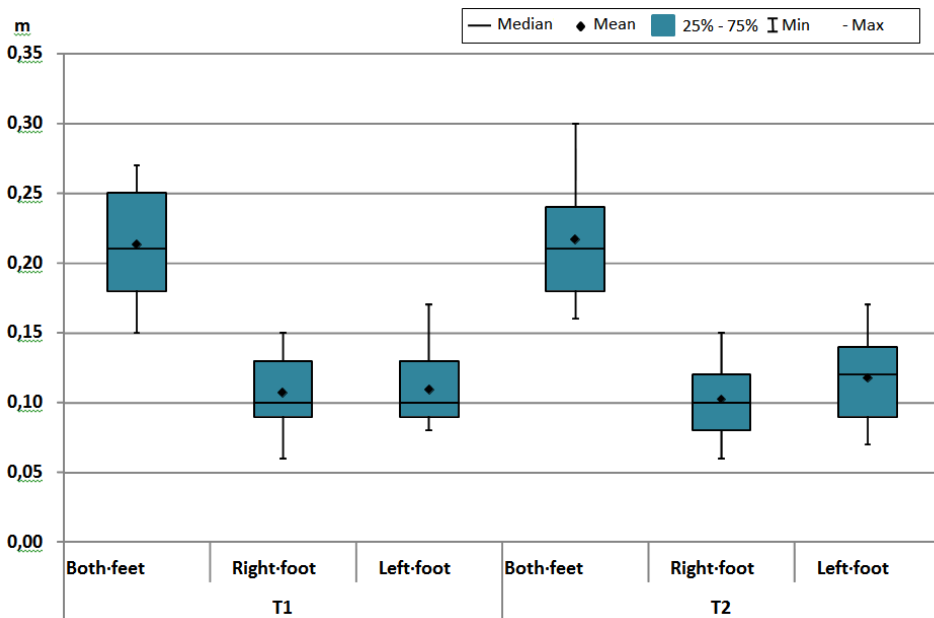


Fig. 1. Graphic representing the statistical results of the analysis of data

Discussion

An important aspect of this study that must be taken into account is the fact that the MGM-15 equipment offers a numeric value for the repetition speed of a subject without including the subject's technique specific to judo. The value for this index is raw due to the way the test is conducted. This study aimed to identify if this value can be affected by an intensive physical training. The value offered to us by the equipment does refer to the speed of repetition from a neuromuscular point of view, in other words it gives us the level at which the subject is able to perform a movement over and over again. This movement can be a judo technique or not. The study conducted by Almansba investigated the execution speed of judo athletes for a specific judo technique. Their study focused on the actual execution speed between different weight categories in judo. In the end they identified that there was an important factor that was discovered between the weight categories: the repetition speed of that particular technique. Our findings show that the actual repetition speed in judo may not be a major factor due to its raw origins. There might be many other more important factors such as actual muscle speed and not repetition speed that can determine the outcome of a judo competition.

Conclusions

One part of this study aimed at identifying if a specific physical training period influences the repetition speed of judo athletes. The lack of a statistical significance for any of the jump sets at the beginning and the end of the study may mean that the physical training period was not aiming to improve speed repetition its role being to improve the overall physical fitness of the athletes. Also, this result may suggest that the content of the training period might not be suited if the aim would be the increase in speed repetition.

On the other hand the fact that there is a significant difference between the data recorded for both feet and right foot and left foot at both the start and end of the study, suggests that both feet jumps offer a higher repetition speed than one foot ones.

REFERENCES

- Almansba, R., Franchini, E., Sterkowicz, S., Imamura, R. T., Calmet, M., Ahmadi, S. (2008) A comparative study of speed expressed by the number of throws between heavier and lighter categories in judo, *Science & Sports*, Volume 23, Issues 3-4, p. 186-188.
- Crnogorac, B., Mekić, A., Kajmović H. (2010) Deffects of basic preparation period at motor and functional abilities of Bosnia and Herzegovina female judokas *Homo Sporticus*, 1, pp. 17-20.
- Dudley G., Abraham W., Terjung R.. (1982) Influence of exercise intensity and duration on biochemical adaptations in skeletal muscle *J. Appl. Physiol*, 53(4), 844-850.
- Franchini, E., Del Vecchio, F.B .I, Matsushigue, K.A., Artioli G.G. (2011) Physiological profiles of elite judo athletes *Sports Med*, 41, pp. 147-166.
- Fukuda, D.H., Stout, J.R., Kendall, K.L., Smith, A.E., Wray, M.E., Hetrick, R.P. (2013) The effects of tournament preparation on anthropometric and sport-specific performance measures in youth judo athletes *J Strength Cond Res*, 27, pp. 331-339.
- Julio, U.F., Panissa, V.L.G., Miarka, B., Takito, M.Y., Franchini E. (2013) Home advantage in judo: a study of the world ranking list *J Sports Sci*, 31, pp. 212-218.
- Stojanovic, M., Ostojic, S., Patrick, D., Milosevic, Z. (2009) Physiological adaptations to 8-week precompetitive training period in elite female judokas *Med Sport*, 4, pp. 415-424.
- Trappe S, Harber M, Creer A, Gallagher P, Slivka D, Minchev K, Whitsett D., (2006) Single muscle fiber adaptations with marathon training, *J Appl Physiol*, 101: 721-727.

