

**Crossfit-Trainings Impact on the Level of Special Physical Fitness of Young
(16-17 Years Old) Athletes Practicing Judo**

Original Scientific Paper

CrossFit-trainings use in judo practice

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Abstract

The high level of special physical fitness of athletes is one of the main factors in achieving sports success in martial arts. Besides, the study aim was to assess crossfit-trainings impact on the level of special physical fitness of young (16-17 years old) athletes practicing judo. Also, athletes' competitive activity data was also assessed. For example, there are young boys (n=33) demonstrating athletic performance at a level approaching elite athletes. By the way, athletes were randomly divided into 2 approximately equal groups. During the training of one of the athletes' groups (n=15) crossfit-sessions were used. Moreover, the obtained data were evaluated using SJFT, the level of lactate concentration in blood and a comparative analysis of judoists' competitive coefficients (CC). Furthermore, statistical analysis was performed using the Mann – Whitney U – test. Besides, a significant ($P<0,05$) athletes' superiority has been revealed who used crossfit-trainings of the coefficient of active combat time (CC–3) in competitive duels. SJFT indicators of both athletes' groups show a positive trend. The increase dynamics of blood lactate concentrations after exercises was detected among both athletes' groups. Moreover, athletes who used crossfit-trainings, blood lactate levels data were significantly ($P<0,05$) higher averaging $14,54\pm 0,51$ mmol/L. The duels percentage won by athletes who have used crossfit-trainings was significantly higher than those athletes who have not used crossfit-trainings (59% vs. 54%).

Key words: *martial arts, judo, young athletes, crossfit-trainings, competitive activity.*

Introduction

However, experts indicate that one of the main factors for achieving significant success is athletes' special physical (Podrigalo, et al., 2019) and the functional fitness level in martial arts (Volodchenko, et al., 2017). It is known that athletes' level of physical and functional fitness practicing judo should be at their best, since judo is characterized by periodic high-intensity strength exercises (Mohammed, & Choi, 2017). Besides, experts also point out that athletes need developing muscle strength, strength and special endurance in order to achieve significant competitive results (Franchini et al., 2014). Unfortunately, scientists have revealed some lack of special physical fitness level of a part of elite Russian judoists to competitive fight (Adolf et al., 2018). Also, experts point out the lack problem of relevant data related to the possibility of a significant increase of judo athletes' physical and functional status (Ceylan et al., 2018).

It should be noted that it is customary to use interval hypoxic training increasing athletes' functional status in the practice of training elite fighters (Rovniy, et al., 2017). By the way, russian experts point to the need using exercises that affect the physical fitness of judo increasing athletes' level of special endurance practicing judo. Surkov recommends using the following exercises: "leap over partner while he is bent over and crawl under his legs after partner stands up" (Surkov, 2015). Pashintsev recommends the use of exercises with weights (30 seconds - exercise, 30 seconds - rest) for 5 minutes followed by 5 minutes of rest (Pashintsev & Surkov, 2015).

Recently cross-trainings are used increasing the level of athletes' special preparedness in the practice of sports. It should be noted that cross-trainings is actively used in the training of police officers and special services in the Russian Federation (Galimova et al., 2018). Some experts recommend the cross-trainings use for a significant increase of the level of athletes' special physical fitness practicing various types of martial arts (Osipov et al., 2017). Furthermore, there is possibility evidence of using cross-trainings effectively in the process of competitive training of elite Russian athletes who practice martial arts: judo, sambo and combat sambo (Osipov et al., 2018). However, there is a lack of accurate information about the required number and content of crossfit-trainings in the training process of elite

and subelite athletes practicing martial arts in the literature. There is a lack of reliable data on the impact of crossfit-trainings on the level of competitive results of young athletes practicing judo.

The purpose of the research: dynamics analysis of competitive activity and competitive results of young (16-17 years old) elite judo athletes using crossfit-trainings during pre-competitive and competitive training period. By the way, athletes' special physical fitness level during the use of crossfit-trainings was also assessed.

Material & Methods

Research participants: young (16-17 years old) male athletes who have been practicing judo for at least 4-5 years. The weight category of judo wrestlers is 73 kg. Sports qualifications – athletes who are close to the elite: candidates for master of sports in judo (n=33). Regularly all athletes underwent medical examination and had no contraindications to judo. Moreover, all athletes gave informed consent participating in the research. The athletes were randomly divided into 2 approximately equal groups: group №1 (n=16) and group № 2 (n=15).

The research duration was being conducted for 10 months (August-May 2018) during which all athletes in addition to their training took part in 7 judo competitions. During the study period, training of athletes for competitions was somewhat different. Group number 1 (n=16) was prepared according to the standard training program operating in many judo schools of the Russian Federation and the CIS countries (Koptev, Osipov, et al., 2019). This program is a certain ratio of the volume of training load: physical training (100-120 hours); tactical and technical training (380-400 hours); Randori (50-55 hours). For the development of special endurance were used: Randori and circular training (serial execution of strength and gymnastic exercises in a certain sequence with the same rest intervals between the series). These trainings were part of athletes physical training of group №1 and took about 30-40% of the total time.

The program of athletes' pre-competition and competitive training of group №2 (n=15) included: physical training (120-130 hours); tactical and technical training (380 hours); Randori (50 hours). For the development of special endurance were used: Randori and crossfit-trainings. Crossfit-trainings took about 50% of the total amount of time spent on physical training of athletes in this group. The trainings consisted of a serial performance of the following exercises: fast run (60 m); work with

weights (16 kg); squats with a barbell (weight 50-60% of the athlete' weight); jumping on the pedestals (height - 60-80 cm); carrying the load (40-50% of the athlete' weight) for speed, etc. The duration of each series is 4 minutes (the time of a competitive duel in judo). Rest between the series - 4-5 minutes. The duration of each crossfit workout is 45 minutes.

However, special tests are used for qualitative monitoring of athletes' functional status practicing martial arts. Also, we used lactate data concentration in judoists' blood for a qualitative assessment of athletes' condition after intensive training (circular and crossfit-sessions). A glucose and lactate analyzer BIOSEN 5030 (made in Germany) was used for data collection. All athletes took blood samples on a monthly basis during training sessions. The level of special physical fitness of athletes was assessed using SJFT. Moreover, data of Agostinho (Agostinho et al., 2018) and Osipov (Osipov, Kudryavtsev, Koptev, et al., 2018) were used for a qualitative comparison of the obtained data with the results of young and elite judoists.

The level of competitive activity of the studied athletes was assessed using special criteria - competitive factors (CC). These coefficients are the average arithmetic indicators values of certain athletes' actions in competitive duels (Koptev, 2018). In our studies, we used athletes' CC activity: the number of Nage-waza technical actions (CC-1) and Ne-waza (CC-2) as well as the ratio of active combat time and total match time (CC-3). Besides, CC was calculated by the structural analysis of athletes' competitive duels. All the matches of both athletes' groups were taken for analysis for the research period: 422 athletes' competitive duels of group №1 and 431 athletes' competitive matches of group № 2. Also, experts were involved (n=10) - coaches and judges of high qualification for the qualitative determination of CC in judo. Furthermore, the opinion of 3 experts was taken into account in the analysis of each match. Osipov data were used for comparison, CC of the studied athletes with CC indicators of elite athletes from Russia and Kyrgyzstan (Osipov, Kudryavtsev, Koptev, et al., 2018).

Statistical analysis of the results was performed using SPSS20. Furthermore, Mann – Whitney U – test is used determining the confidence level of the obtained data.

Results

It should be mentioned that improvement dynamics of index assessment of athletes' special physical fitness from Average classification (13,04-13,94) to Good classification (11,74-13,03) has been

revealed in SJFT terms. Insignificant superiority of SJFT data was recorded among athletes of group №2. It was revealed that the results of studied athletes are somewhat inferior to SJFT indicators of foreign junior athletes (Agostinho et al., 2018), but the differences are insignificant.

The lactate concentration of studied athletes' blood increased significantly over the study period. Also, an increase of lactate concentration was detected in both groups, however, athletes who have used crossfit during training effects their blood lactate content was significantly ($P<0,05$) higher – $14,54\pm0,51$ mmol/L than athletes who have not used crossfit – $13,79\pm0,38$ mmol/L.

At the time of study beginning, data about athletes' CC have not been collected. Besides, athletes' CC determination values was carried out in the research course. Comparative analysis of the values of CC-1 and CC-2 have not revealed significant differences in the coefficients of competitive activity among the judoists of both groups. Somewhat higher values of these coefficients were found among athletes of group №2 but the differences between the results of groups are not significant. On average, athletes performed $6,22\pm0,17$ receptions of Nage-waza and $2,47\pm0,19$ receptions of Ne-waza per match. By the way, it should be noted that the smaller the value of this coefficient, the higher the level of activity was in the match when evaluating CC-3. A significant difference ($P<0,05$) of the values of this coefficient was found in favor of athletes from group №2. These studies are presented in table 1.

Table 1. Test results and CC values of studied athletes

Criteria	Group №1 (n=16)		Group №2 (n=15)	
	August	May	August	May
SJFT	$13,26\pm0,19$	$12,94\pm0,37$	$13,31\pm0,14$	$12,77\pm0,32$
Lactate	$13,09\pm0,44$	$13,79\pm0,38$	$13,21\pm0,46$	$14,54\pm0,51^*$
CC-1	-	$6,18\pm0,14$	-	$6,26\pm0,21$
CC-2	-	$2,39\pm0,22$	-	$2,55\pm0,16$
CC-3	-	$3,28\pm0,09$	-	$2,89\pm0,04^*$

Legend: * – $P<0,05$.

At the end of the research, some athletes' advantage from group №2 was revealed in the total number of competitive matches for the entire study period (August-May 2018). Besides, athletes of group №1 held 422 competitive matches and athletes of group №2 – 431 matches. Also, competitive

activity results of the studied judoists were also evaluated by the number of duels won at 7 competitions. Athletes of group 1 won 54% of matches, athletes of group 2 – 59% of competitive matches. Statistics of won competitive matches of both athletes' groups is presented in Figure 1.

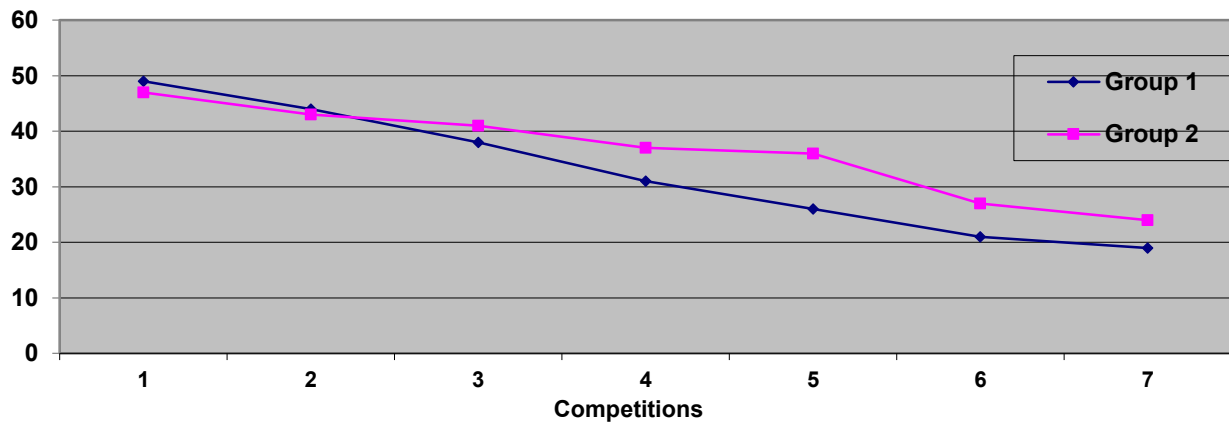


Fig. 1. Ratio of duels won by the studied athletes

Discussion

At the beginning of this section, there should be noted a certain lack of significant scientific research of crossfit-trainings use in practice of pre-competition and competitive training of judoists at various levels. This is a matter of some concern, since athletes need a high level of special endurance achieving success in judo (Kuvačić, et al., 2017). However, the scientific literature presents data on the benefits of interval training for the development of athletes' special endurance practicing martial arts (Rovniy, et al., 2017). The effect of high intensity interval training on the performance indicators of judo wrestlers has also been proven by experts (Franchini, Cormack, & Takito, 2019). In judo, interval workouts lasting for 20–60 minutes are used for certain cycles: from 4 to 8 weeks (Magnani Branco, et al., 2017; Pashintsev & Surkov, 2015). But scientists emphasize that the effect of short-term interval training for elite judo wrestlers will be minimal (Magnani Branco, et al., 2017). For a significant increase of the level of athletes' special physical fitness, regular and sufficiently long training effects of a certain power are necessary. In our studies, crossfit-sessions were used during the entire period of pre-competitive and competitive training of judoists at least 2 times a week. This made it possible increasing the indices of athletes' special physical fitness.

According to expert data, the average lactate concentration in blood of young athletes after intensive interval training is approximately $12,91 \pm 0,47$ mmol/L (Pashintsev & Surkov, 2015). There is evidence of lactate levels increase among young judoists after a strenuous load of up to 15 mmol/L and above (Campos, et al., 2017). In our studies, the increase dynamics in blood lactate concentrations of both athletes' groups was revealed. By the way, athletes using crossfit-trainings during the training showed an average of $14,54 \pm 0,51$ mmol/L at the end of the study period. This dynamic shows a higher efficiency of crossfit-workouts compared to circuit training.

It is known that many specialists use Randori on a large scale increasing the level of special fitness of judo wrestlers (Franchini, Del Vecchio, et al., 2015). However, the literature presents data on the insufficient effectiveness of Randori in the development of special physical fitness of judo wrestlers. Moreover, experts point out that the physiological requirements for meeting Randori differ from the requirements for intense competitive effects (Franchini et al., 2014). In our studies, an increase of special fitness level was found in both athletes' groups who used Randori in the amount of 50-55 hours for 10 months. We consider a further increase of Randori volume for athletes of this age and qualification will be ineffective.

However, the dynamics of SJFT index changes in both athletes' groups shows a significant improvement of indices of judo athletes' special physical fitness regardless of the training program. Besides, scientists point out that the effectiveness of SJFT performance is directly related to the effectiveness of competitive matches (Kons, et al., 2017). Also, athletes of group 2 showed better results which in our opinion indicates a high potential of crossfit-trainings in improving athletes' fitness. Interestingly, SJFT index indicators of young (16–17 years old) athletes compared with SJFT data of Russian older athletes (19–23 years old) (Osipov, Kudryavtsev, Iermakov, et al., 2018) turned out to be higher. In our opinion, a balanced program of crossfit-trainings (optimal choice of exercises and time interval of load) contributed to a higher result.

Comparison of CC data of the studied athletes with CC indicators of elite judoists from Russia and Kyrgyzstan of this weight category (up to 73 kg) have revealed a significant lag of young athletes of CC – 1 (the number of Nage-waza techniques) from elite judoists. If on average young athletes perform $6,22 \pm 0,17$ technical actions of Nage-waza then elite athletes of this weight category perform

9,25±0,41 judo techniques per duel. However, in terms of CC–2 (Ne-waza technique), young athletes of both groups significantly exceed the elite judo wrestlers. On average per match, the studied athletes perform 2,47±0,19 receptions of Ne-waza and the elite judo athletes perform only 1,41±0,09 receptions. However, this advantage of young athletes cannot be explained only by crossfit workouts. A significant advantage of CC–2 data over elite judoists was also found among athletes of group №1 who have not used crossfit-session in their pre-competitive and competitive training. It is possible that these results are explained by the tactical features of preparing athletes for dominance in the stalls.

It should be emphasized that the use of regular cross-trainings in the practice of judo young athletes seeking to the competitive elite can significantly increase the combat activity of judo athletes in competitive matches (CC–3). A higher percentage of won matches (an average was more than 5%) was also found among athletes who have used crossfit-trainings during pre-competition and competitive training period.

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Conflict of Interest

The authors declare that there are no conflicts of interest.

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