

Submaximal concentric contraction method application in judokas maximal strength development

¹Judo Federation of Bosnia and Herzegovina

²Faculty of Sport and Physical Education, Sarajevo

³Judo Federation of Vojvodina, Serbia

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Abstract

Maximal strength represent important success factor in judo. Aim of this research is to determine the efficiency of the submaximal contraction method at maximal strength development in judokas.

This research included Bosnia and Herzegovina's 20 top level judokas (24, 25±3, 19 yrs; 176, 35±9, 24 cm; 81, 48±18, 28 kg). Judo experience years ranged from 7 to 18. Maximal strength was tested.

At each measured test, with the exception of chin-ups, examinees achieved better results at final testing. Motor variables statistically derived between two measurements were: standing long jump $p < 0.001$, bench press $p < 0.001$, snatch and clean $p < 0.001$, chin-ups $p < 0.01$ and squat $p < 0.001$.

We can summarize that by the application of the submaximal concentric contraction method the observed judokas significantly improved their performance.

Key words: **bench press, snatch and clean, squat, top level athletes**

Sažetak

Maksimalna snaga je bitan faktor uspjeha u judou. Namjera ovog istraživanja je bila da se utvrdi efikasnost metode submaksimalne kontrakcije u razvoju maksimalne snage judista.

U ovom istraživanju je učestvovalo 20 vrhunskih džudista (24,25±3,19 god; 176,35±9,24 cm; 81,48±18,28 kg) Bosne i Hercegovine. Trenažno iskustvo svih ispitanika je u rasponu 7 do 18 godina treniranja. Testirala se maksimalna snaga.

U svim izmjerenim testovima, osim u zgibovima, sportisti su na finalnom merenju imali bolje rezultate. Sledeće motoričke varijable su se statistički izdiferencirale između dva mjerenja: skok u dalj iz mjesta $p < 0.001$, benč pres $p < 0.001$, zatim nabačaj na grudi $p < 0.001$, zgibovi $p < 0.01$ i čučanj $p < 0.001$.

Može se sumirati da su posmatrani judisti Bosne i Hercegovine primjenom metode submaksimalne koncentrične kontrakcije znatno poboljšali svoje performanse.

Ključne riječi: **benč pres, nabačaj na grudi, čučanj, elitni sportisti**

Introduction

In the physical preparation of judokas strength training is very important. It is considered that amongst the different types of strength, most important is the ability to mobilize maximal energy in the time, ability to perform maximal number of resisted contractions, and the ability to produce maximal muscle strength (Sertic and Lindi, 2003). No doubt that the human strength, defined as the ability to overcome different resistance is the one of the most important and most investigated human motor dimensions. During last 30 years large number of scientific and practical research, books and other publication were published in relation to the definition, diagnostics and strength development. Sport science has several strength training method classifications. Markovic and Perusko (2003) explain two types of method and 4 basic strength training methods group within:

1. Functional method: (a) method of maximal effort; (b) method of explosive dynamic effort and (c) reactive method.
2. Structural method: method of repetition.

Besides mentioned types authors mentioned: supramaximal method, pyramidal method and method of strength endurance.

The aim of this research was to establish the efficiency of the submaximal contraction method at the development of the maximal strength in judokas.

Methods

Examinees

This investigation included Bosnia and Herzegovina 20 top level judokas (24,25±3,19 yrs; 176,35±9,24 cm; 81,48±18,28 kg). Judo experience years ranged from 7 to 18. Trainings lasted for two hours and five times a week. Besides judo training all examinees had additional strength and conditioning training during years as well in preparation and in competition period (max 5 hours per week). Investigation was performed at the beginning of the preparation period in 2009.

Testing procedure

Testing was performed between 10.00 and 13.00 two day prior to beginning and end of the experimental training treatment. Period of rest between tests lasted for 5'. All the examinees undergo 15' warm-up consisting of 5' run, calisthenics, 10 squats, 10 heel up repetitions, 10 abdominal crunches, and back extensions. Warm – up ended by 2' active stretching (15'' each large muscle group). Examinees were instructed to avoid any kind of large physical efforts two days prior to testing, as to keep the usual nutrition regime.

Maximal strength tests

Explosive strength of the leg extensors was tested by the application of the standing long jump test. As the measure of the dynamical force we used 1RM squat, bench press and snatch and clean.

During squat and bench press we used Wilson et al. (1993) warm up procedure. It consisted of 10 repetitions at 30% with 2' rest, 7 reps at 50% with 2'rest, 4 reps at 70% with 3' rest, 1 rep at 90% with 3' rest. (% of 1RM was determined by Epley's scale). Upon last set, the load increased at 100% based at the examinees feedback, so that the 1RM was determined by 3 trials the most. Examinees had 4' rest between trials. Squat technique required that examinees post a barbell at m.trapezius, squat parallel, while position of the grate trochanter of the femur has to be knee leveled. Examinee than stands up with load up to full knee extension. Bench – press position is a standard supination, where examinee touches the mid chest with weights and lifts them up vertically to full elbow extension. Spotting was not allowed.

Testing method for the snatch and clean differed, considering the nature of the movement, and in relation to squat and bench press. Warm up consisted of gradual increase of the load prior to 1RM test: 2 x 5 reps at 60% with 2' rest, 3 reps at 80% with 3' rest, 1 rep at 90% with 4'rest. Upon last set the load increased at 100% based at the examinees feedback, so that the 1RM was determined by 3 trials the most. Examinees had 4' rest between trials. Successful trial considered the one in which the examinee managed to hold the load in fixed position for 5 seconds at least.

Experimental treatment

Training treatment of the examinees besides standard trainings was based at the strength development. Examinees worked 3 times a week (6 weeks total) per 90' at the strength development of the large muscle groups (Table 1).

Table 1. Weekly training program

SCHEDULE			
	08:30-10:00	11:00-13:00	19:30-21:00
Monday	Training A	Rest	Training D
Tuesday	Training B	Rest	Training D
Wednesday	Training A	Rest	Training D
Thursday	Training B	Rest	Training D
Friday	Training A	Training D	Training D
Saturday	Rest	Training D	Rest
Sunday	Rest	Rest	Rest

Training A, strength development training

Training B, jogging

Training D, judo training

Method of submaximal concentric contraction was applied. Load used in this method (table 2) vary from 90% to 100%. Mostly used training represented „flat“ pyramid: 1 set of 3 repetitions at 90%; 1 set of 1 repetition at 95%; 1 set of 1 repetition at 97,5%; 1 set of 1 repetition at 100%; 1 set of 1 repetition with load larger than 100% for 1 kg (effort to set new personal record).

Table 2. Submaximal concentric contraction method

Tempo	Intensity –load	Repetitions	Sets	Rest interval (min)	No of exercises per training	No of training per week
Explosive	90/95/97/100	3/1/1/1/+1	5	3-5	3-4	2-3

Data processing

Data were processed using the Statistical Package for Social Science (SPSS). Differences between two measurements were calculated by the use of Paired-Samples T Test.

Results

The indicators of the maximal strength in judokas before and after treatment are shown in Table 3.

Table 3. Effects of the six-week long training treatment at maximal strength of judokas (N=20)

Variables	Initial	Final	t	p
Standing LJ (cm)	253,10±8,11	255,60±8,38	-4,54	0,000
Bench press (kg)	112,85±20,35	119,40±19,29	-6,38	0,000
Clean (kg)	106,75±16,40	111,55±16,13	-11,09	0,000
Chin-ups (rep.)	27,65±8,24	26,05±7,68	3,10	0,006
Squat (kg)	130,60±20,76	138,50±19,06	-7,07	0,000

At each measured test, with the exemption of chin-ups, examinees achieved better results at final testing. Motor variables statistically derived between two measurements were: *standing long jump* $p < 0.001$, *bench press* $p < 0.001$, *snatch and clean* $p < 0.001$, *chin-ups* $p < 0.01$ and *squat* $p < 0.001$.

Discussion

Based at the fact that the squat jumps performance depends on muscle contractile abilities, it can be presumed that the ability to show maximal strength through eccentric – concentric cycle (SSC) is more important in judo than maximal strength through concentric movement only as was in our investigation.

Facts on the ordinary exercises such as bench press snatch and clean and squat were not largely depicted in the judo referent literature. The results of some investigations on bench press and squat differed top level judokas (A team) from reserve (B and C team) (Thomas et al., 1989; Fagerlund and Häkkinen, 1991; Heyward, 1997; Franchini et al., 2005). This investigation shows that attention must be paid to the development of maximal strength in our judokas. We should always use those weight exercises that in a basis are similar to the movement as in judo technique. Of course we can not neglect other muscle groups but the emphasis should be at those mostly used in judo.

Muscle endurance of the upper torso (assessed by chin ups) decreased during the treatment with submaximal concentric contraction used in development of maximal strength. Considering that during the experiment less time was paid to the rope climbing as in previous stage of the preparation, there is a possibility that it produced result decrement in chin ups test a final measurement. Significant increase of the judo result is the result of the application of the new methods in strength development, because it is of most importance for the judo to overcome large outer resistance, and to develop grate force and perform large work in shortest time.

Only well shaped weight training, taking in consideration athletes condition, can be efficient mean for achievement of the goal, elite physical condition of the athlete (Pašalić and Radjo, 2003).

Conclusion

In the conclusion we can summarize that by the application of the sub maximal concentric contraction method the observed judokas significantly improved their performance.

This investigation showed that this method can be of practical importance in a view of maximal strength improvement in judokas. It is necessary to have further investigations in order to determine the effect of this method application during the period of year and real existing competition performance in judo.

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Correspondence to:

Branislav Crnogorac, Ph.D.

Judo Federation of Bosnia and Herzegovina, Mis Irbina, 8

71 000 Sarajevo, Bosnia and Herzegovina

Phone: +387 33 200 893

E-mail: brank_judo@hotmail.com