

## *Effects of a Major Taper Training Program on some Physical Variables and Specific Fitness for Judokas*

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The current research aims to design a recommended training program using major taper and to identify its effects on some physical variables under investigation and special judo fitness tests (SJFT). Six judokas represented the main sample of this research. They were purposefully chosen from Tanta University Judo Team (weight categories: 73kg – 81kg – 90kg). They used the following tests for some specific physical qualities: Vertical jump for speed strength of leg muscles - Wide jump for speed strength of leg muscles - Grip strength (lift/right) with a manometer for hand grip strength - Back and leg muscles strength with a dynamometer. Results indicated that the recommended major taper program indicated statistically significant differences between pre - and post-measurements of physical tests as improvement percentage ranged from 4.49% and 8.04% and the effect size ranged from 0.78 to 2.91. The recommended major taper program indicated statistically significant differences between pre - and post-measurements of SJFT the improvement percentage was 9.99% and the effect size (0.96) was high. It also improved physical performance and SJFT for judokas as the training volume decreased by 75% with fixed intensity (strength – speed – duration) and mixing positive and negative rest. Post-measurement of SJFT (12.53) was a good indicator of the high level of specific fitness for judokas.

**Key words:** Pre-competition preparation – Performance – sport training.

### **Introduction**

Most coaches do their best to prepare their athletes for scheduled competitions as they high volume, high intensity exhaustive training loads to improve their athletes' physical and technical abilities according to competitive needs. They continue that way till the day of competition as they believe that this may maintain their athletes' abilities and efficacies improved during preparation stage. But they are not aware of the importance and need of their athletes to a suitable amount of taper that allow them to restore all their abilities before competition.

Several authors indicated that most athletes – including judokas - continue their hard training till the day before competition to achieve the best possible performance level to beat their opponents although they need to reduce their training volume during inter-competition/inter-matches training. Athletes should reach the peak performance during weeks three and two before major competition then reduce their training volume gradually till week one before competition.

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Generally, training loads should be decreased during week two to be less than week one as the number of training sessions and repetitions should decrease with the increase of rest intervals, this helps athletes to get rid of metabolic wastes and fatigue byproducts before competition (Abdulzahr, 2014 ; Alsayed, 2014 ; Nishioka, 2000).

The importance of taper for the success of training programs as training loads decrease to less than 50% and this enables athletes to restore their physiological abilities depleted due to previous training stages. In addition, this enables athletes to restore their training endurance, recover and improve their physical and technical qualities for the optimum competitive performance (Abd El-Fattah, 2013; Mujika and Padilla, 2003).

Taper can be categorized into three types according to the type of competition. Major taper aims to prepare the athlete for major competition as it include 2-4 weeks. Minor taper usually takes one week or less and is used in the middle of the season when athletes reach good performance level. Re-taper is used for two major consecutive competitions with 3-5 weeks between them to maintain and improve performance after major taper followed by a major or a minor competition (Al-Qot, 2013).

For the purposes of this research, the researchers used major taper to organize the gradual training loads used for preparing Tanta University Judo Team for the Egyptian Universities Championship. This is consistent with (Al-Qot, 2013) in that this type of taper is a very effective and positive type during the preparation for competition stage.

Training loads at the period preceding major competitions (nearly 7-14 days before competition) should be tailored according to the individual qualities of each athlete as it is closely related to various variables like the functional and training status of each athlete, stability of competition technique, psychological status of the athlete and individual characteristics of training loads (Al-Beek, Abu Zaid and Khalil, 2009) .

Taper is of major importance before competitions to improve physical, technical, psychological and mental status at the end of violent training for competition. In addition, Previous literature indicated the importance of taper for improving physical performance and metabolic/anabolic hormonal status (Fukuda et al., 2013; Karimi, Keshavarz, Ansari and Etaati, 2013; Karimi, Bakht, and Mk, 2014).

Not surprisingly, the researchers noticed that results of competitions came lower than the actual performance level of athletes during training. This is due to the lack of taper during preparation stage. Judo requires high physical and technical demands as competitions are highly dynamic and intense in addition to its short durations. The judoka fights more than one match in each competition. Each match may end in a few seconds with a full point or may be longer if not. Each judoka does his/her best to win the best possible medal. Physical variables that vary greatly among athletes are the basis for planning and initiating training programs in judo to achieve the best competitive level (Shaddad, 1996).

According to review of literature, no previous local study dealt with the use of taper, especially major taper, during preparation stage of judo competitions as most Egyptian programs use only one week of taper in the form of limited training units immediately before competitions. In addition, taper is not applied to judokas who did

not regulate their weight and this led them to perform lower than their physical, technical, tactical and mental potentials. The researchers recognized the importance of major taper for judokas before major competitions. This led the researchers to try to identify the effects of major taper on some physical variables and special judo fitness tests (SJFT) for judokas. The current research aims to design a recommended training program using major taper and to identify its effects on:

- a. some physical variables under investigation
- b. Special judo fitness tests (SJFT).

#### **We hypothesized the following**

- a. There are statistically significant differences between the pre- and post-measurements of some physical variables in favor of post-measurements.
- b. There are statistically significant differences between the pre- and post-measurements of special judo fitness tests (SJFT) in favor of post-measurements.

### **Method**

#### **Participants**

Research community included judo team of Tanta University (n=14) under preparation for the Egyptian Universities Championship 2014-2015. All athletes were registered in the Egyptian Federation of Judo. Six judokas represented the main sample of this research. They were purposefully chosen from Tanta University Judo Team (weight categories: 73kg – 81kg – 90kg). Another (8) judokas represented the pilot sample for calibrating and verifying the validity of tests.

#### **Measures**

The researchers used the following tools to collect data: A medical balance for weights – A restameter for heights – A manometer for grip strength – A dynamometer for leg and back strength – A stop watch – A measuring tape - Polar watch with its chest belt for heart beats, including the following tests:

#### **Physical tests**

Previous research works indicated that components of judo motor aspects include general and specific physical qualities. These include max arm strength – max leg strength – arm muscular power – leg muscular power – leg velocity – muscular endurance – pulmonary endurance – agility – flexibility – balance (Inokima and Sato 1986; Shaddad, 1996; Torfa, 2001).

According to previous studies, the researchers used the following tests for some specific physical qualities: Vertical jump for speed strength of leg muscles -Wide jump for speed strength of leg muscles - Grip strength (lift/right) with a manometer for hand grip strength -Back and leg muscles strength with a dynamometer (Hasanain, 2004).

#### **Special Judo Fitness Test (SJFT):**

Strekowitz (1995) designed this test and Franchini, Vecchio and Sterkowicz (2009) developed its index to categorize athletes and record physical fitness progress. Drid, Trivić and Tabakov (2012) indicated that several studies verified the validity and reliability of this test as a sufficient tool for all levels of judokas. The researchers used this test according to Strekowitz's protocol (three rounds of 15, 30 and 30 seconds with 10 sec rest interval between each two rounds). The judoka is required to throw two opponents for as many times as possible using shoulder throw technique (Ippon Seoi Nage) and heart

rate is measured immediately after and one minute after the test using Polar watch. To calculate Special Judo Fitness index, Strekowitz used the following equation: (heart rate immediately after exercise + heart rate one minute after exercise) / number of throws. Lower index value indicates better performance level.

### Procedure

#### Pilot Studies

**First pilot study** was performed to verify the validity and reliability of physical and technical tests. To calculate validity of tests, the researchers applied the tests on two (distinct – non-distinct) groups of judokas. Results are shown in table (1).

**Table 1 Difference between Distinct and Non-Distinct Groups for Physical Tests under Investigation (N1 = N2 = 4)**

Variables	Groups	No.	Rank mean	Rank sum	Z valu	Error potential P
Vertical jump (cm)	Distinct	4	6.5	26.00	2.31	0.02
	Non-distinct	4	2.5	10.00		
Wide jump (cm)	Distinct	4	6.5	26.00	2.31	0.02
	Non-distinct	4	2.5	10.00		
Right grip strength (kg)	Distinct	4	6.5	26.00	2.31	0.02
	Non-distinct	4	2.5	10.00		
Lift grip strength (kg)	Distinct	4	6.5	26.00	2.31	0.02
	Non-distinct	4	2.5	10.00		
Thigh strength (kg)	Distinct	4	6.5	26.00	2.31	0.02
	Non-distinct	4	2.5	10.00		
Back strength (kg)	Distinct	4	6.5	26.00	2.31	0.02
	Non-distinct	4	2.5	10.00		

Z table value on  $P \leq 0.05 = 1.96$

Table (1) indicates statistically significant differences between the distinct and non-distinct groups on  $P \leq 0.05$  in favor of the distinct group.

To calculate reliability, the researchers used test/retest procedure on a pilot sample (n=8) with time interval of one week between test and retest. Table (2) shows these results.

**Table 2 Correlation Coefficient between Test and Retest for Physical Tests under Investigation (N=8)**

Physical tests	Test		Retest		R
	Mean	SD±	Mean	SD±	
Vertical jump (cm)	39.98	2.44	41.34	2.27	0.96
Wide jump (cm)	2.37.40	11.52	243.67	12.46	0.88
Right grip strength (kg)	40.35	6.34	42.85	4.78	0.90
Lift grip strength (kg)	34.58	2.24	36.11	2.59	0.92
Thigh strength (kg)	120.90	5.95	122.00	6.33	0.89
Back strength (kg)	90.48	4.67	91.26	5.61	0.91

R table value on  $P \leq 0.05 = 0.70$

Table 2 indicated statistically significant correlation between test and retest and this proved the tests reliable.

**Second pilot study** was performed for:

- Trying one unit of the recommended program
- Measuring responses of participants to the recommended program

- Validating tools and equipment
- Measuring the suitability of program duration to students' academic time
- Identifying any difficulties that may occur during min application

Results of this pilot study indicated that the program was suitable for participants and the problem of academic time was resolved.

**The recommended training program:**

The researchers developed the recommended training program according to individual differences among participants as their academic studies and sports clubs were different. The program included (5) weeks as a preparation stage for the Egyptian Universities Championship. The program consisted of (15) training units (3 units per week). Judokas' weights were carefully monitored and healthy food was provided to reach competition weight without any extra loads or fat accumulation during taper. Training volume was decreased. Table (3) shows the recommended program data.

**Table 3 the Recommended Training Program**

Load formation	High	Submaximal		Taper	
Week before competition	5	4	3	2	1
Unit duration	120 min	120 min	120 min	120 min	120 min
Load level	High	Submaximal	Submaximal	Moderate	Moderate
Load intensity	90-100%	90-95%	80-90%	70-80%	50-70%
Weekly distribution of main content	Specific – specific with max speed in specific time + throwing more than one teammate consecutively + variable training (technical / tactical) for complex, attack/defense skills and fake (Fatigue is clearly present. Judoka requires longer rest intervals for recover)	Specific – specific with max speed in specific time + throwing more than one teammate consecutively + variable training (technical / tactical) for complex, attack/defense skills and fake (Fatigue is clearly present. Judoka requires longer rest intervals for recover)	General – specific for each judoka. Variable training (technical – tactical) and mat moves. (Fatigue is present. Judoka requires longer rest intervals for recover)	Specific – specific with max speed in 10 sec + variable training (technical / tactical) for complex and attack/defense skills (flight strategies using complex and fake skills) (fatigue is moderately present)	Specific – specific with max speed in 5 sec + variable training (technical / tactical) for complex and attack/defense skills (fatigue is moderately present)
	Competitive (Randori)	4x6min upper 3x4 min lower 2min rest interval	3x6min upper 3x3 min lower 3min rest interval	3x5min upper 3x3 min lower 3min rest interval	2x5min upper 2x3 min lower 5min rest interval

**Main Experiment**

**Pre-Measurements**

Pre-measurements were taken before main application to assure the stratification of data. Table (4) shows stratification of data for participants.

**Table 4 Descriptive Data of Participants on all Research Variables (n=6)**

Variable	Mean	Median	SD	Kurtosis	Squewness	
<b>Growth factors</b>	Age (year / month)	19.81	19.72	0.87	1.78	0.23
	Height (cm)	180.50	181.00	8.17	-0.51	-0.03
	Weight (kg)	83.15	82.20	7.96	-1.073	0.30
	Training experience (year / month)	7.38	7.15	2.34	-0.94	0.07
<b>Physical tests</b>	Vertical jump (cm)	38.37	38.70	1.31	-0.20	-0.38
	Wide jump (cm)	228.81	227.59	3.89	2.47	1.58
	Right grip strength (kg)	42.33	41.14	2.62	00.44	1.29
	Lift grip strength (kg)	33.79	32.83	1.73	-0.41	1.20
	Thigh strength (kg)	116.39	116.32	1.84	-0.06	-0.46
<b>SJFT</b>	86.90	86.52	1.31	2.65	1.48	
	13.92	13.92	0.27	1.71	0.86	

Table (4) indicated that all kurtosis and squewness values ranged between  $\pm 3$ . This indicates the stratification of data and homogeneity of sample.

#### Post-measurements:

Post-measurements were taken after the program following the same protocol of pre-measurements.

#### Statistical treatment:

The researchers tabulated data and treated it using SPSS software to calculate the following: Mean – Median – SD – Kurtosis – Squewness – Correlation coefficient – Z value – T.test – Improvement percentage –  $\eta^2$  – effect size according to Cohen's equation.

### Results

Table (5) shows significant difference between pre- and post-measurements of physical tests and SJFT

**Table (5): Difference between Pre- and Post-Measurements of Physical Tests and SJFT (N=6)**

Physical Variables	Pre-		Post-		Means difference	Standard error	T	P	Improvement Percentage (%)
	Mean	SD±	Mean	SD±					
Vertical jump (cm)	38.48	1.31	41.25	1.48	2.78	0.58	4.78	0.00	7.22
Wide jump (cm)	22.881	3.89	247.20	1.67	18.39	2.16	8.52	0.00	8.04
Right grip strength (kg)	42.33	2.62	44.77	1.53	2.44	0.64	3.78	0.00	5.76
Lift grip strength (kg)	33.79	1.73	35.31	1.91	1.52	0.56	2.73	0.04	4.49
Thigh strength (kg)	116.39	1.84	125.29	1.82	8.90	0.98	9.05	0.00	7.65
Back strength (kg)	86.90	1.31	92.63	3.64	5.73	1.56	3.67	00.01	6.60
SJFT	13.92	0.27	12.53	0.52	1.39	0.20	6.85	0.00	9.99

(T) Table value on  $P \leq 0.05 = 2.01$

Table (5) indicated statistically significant differences between pre- and post-measurements of physical tests and SJFT as (T) calculated value was higher than its table value for all tests and improvement percentage ranged from 4.49% and 9.99%

Table (6) shows Significance of effect size (corrected) for physical tests and SJFT

**Table (6): Significance of Effect Size (Corrected) for Physical Tests And SJFT According to Cohen's Equation (N=6)**

Physical Variables	T	P	ETA <sup>2</sup>	Effect Size	Significance
Vertical jump (cm)	4.78	0.00	0.82	0.91	High
Wide jump (cm)	8.52	0.00	0.94	2.37	High
Right grip strength (kg)	3.78	0.00	0.74	0.86	High
Lift grip strength (kg)	2.73	0.04	0.60	0.78	Moderate
Thigh strength (kg)	9.05	0.00	0.94	2.91	High
Back strength (kg)	3.67	0.01	0.73	0.83	High
SJFT	6.85	0.00	0.90	0.96	High

Effect size levels: Low = 0.20 – moderate = 0.5 – high = 0.8

Table (6) indicated that effect size ranged from moderate for lift grip strength to high with all other tests.

### Discussion

Table (5) indicated statistically significant differences between pre- and post-measurements of physical tests and SJFT as (T) calculated value (2.73: 9.05) was higher than its table value (2.01) for all tests and improvement percentage ranged from 4.49% and 9.99%. This indicates the positive effects of the major taper program on all research variables in favor of post-measurements. Table (6) indicated that effect size ranged from moderate for lift grip strength to high with all other tests. The lowest effect size was (0.78) for lift grip strength. Researchers think that this is due to the fact that all participants are right-handed judokas and this affects the lift grip strength especially during preparation stage. The highest effect size (2.91) was for leg muscles strength. The researchers think that gradual loading of taper program had positive effects on leg muscles as judokas regularly use their legs in all skills. Legs skills (ASHI-WAZA) are used as specific skills to initiate attack. This indicates the clear positive effects of the recommended major taper program.

Although participants were all right-handed, the researchers think that it is important to treat the low value of lift grip strength as balance is required for judo where the performance shifts quickly and this obliges judokas to respond using their lift hand. Therefore, balance should be maintained between both sides of the body.

Measurements of back muscles strength indicated that core muscles (back – abdomen) should be improved as the center of gravity for a judoka during performance is at the abdomen. This is an indicator that the physical preparation program needs to be modified to affect the muscles of this area. Specific physical abilities of muscular strength and speed strength are of major importance due to its effects on technical performance (Ahmed, 1998; Baioumy, 2010).

It is important to improve muscular strength; flexibility, speed and motor abilities in addition to general body strength of judokas as motor abilities and muscular strength have specific significance during competition. The judoka who exerts more effort in training for improving these elements is the winner most of the times as he/she will be able to win a complete point and finish the match. He/she should throw

the opponent quickly and strongly enough to his/her back. This indicates the importance of speed strength in judo (Hegazy, 2006; Inokima and Sato, 1986).

This consistent with previous studies indicating that using taper at the end of a training program before competitions improves physical performance as it increases muscular power and strength in addition to the functions of the neuromuscular system, other vital functions and the mental aspects of athletes. These increases in competitive performance range from 0.5 to 6% and may reach 22% for some non-competitive indicators (Al-Qot, 2013; Coutts, Reaburn, Piva and Murphy, 2007; Karimi et al., 2013; Mujika and Padilla, 2003).

This is also in agreement with previous studies stating that taper improves physical performance and modifies metabolic/anabolic hormonal responses and that two week of taper improved some physical measurement and specific fitness of judokas. This indicates clearly the positive effects of the recommended major taper program (Karimi et al. 2014; Papacosta, Gleeson and Nassis, 2013).

Table (5) indicated statistically significant differences between pre- and post-measurements of SJFT as (T) calculated value (6.85) was higher than its table value (2.01) and improvement percentage was 9.99%. Table (6) indicated that effect size (0.96) was high. This indicates clearly the positive effects of the recommended major taper program as judokas may inter competition well-prepared for it.

Taper is very important for preparing junior judokas as it improved their performance level. The recommended taper program helped judokas to recover quickly and get rid of fatigue accumulated due to high intensity training loads used in regular training. The performance level of participants on SJFT was better in post-measurement as the number of throws of a teammate during second and third rounds increased in addition to improvements in heart rate (Fukuda et al. 2013).

The researchers think that these improvements on post-measurements are due to the positive effects of the recommended major taper program. This fulfills the main aim of this study and clearly indicates the importance of using major taper during pre-competition preparation programs.

It is important to decrease training loads before competitions for judokas as the peak performance should be during the third and second weeks before competition and then gradual decrease is applied to allow judokas to recover from accumulated fatigue byproducts (Nishioka, 2000).

Max loads followed by decreased loads five days before competition with speed exercises may improve the functions of the central nervous system of the athlete as neurons reach its peak performance during competitions (Al-Beek, et al 2009).

Athletes of several sports are three times vulnerable to the so-called chronic infection sites compared to non-athletes. This is due to the accumulation of training loads especially during competition. Nevertheless, low-intensity training or short taper may improve the immune status due to recovery from these high loads (Abdulzاهر, 2014; Alsayed, 2014; Nishioka, 2000).

Therefore, judokas should pass through short taper before major competitions for nearly two weeks and then return to max performance. This decrease in training loads help judokas to recover from metabolic and fatigue byproducts before major



competitions. Measurements of SJFT indicated the positive effects of the recommended program on preparing judokas for competition.

#### Conclusions

- The recommended major taper program indicated statistically significant differences between pre- and post-measurements of physical tests as improvement percentage ranged from 4.49% and 8.04% and the effect size ranged from 0.78 to 2.91.
- The recommended major taper program indicated statistically significant differences between pre- and post-measurements of SJFT the improvement percentage was 9.99% and the effect size (0.96) was high.
- The recommended major taper program improved physical performance and SJFT for judokas as the training volume decreased by 75% with fixed intensity (strength – speed – duration) and mixing positive and negative rest.
- Post-measurement of SJFT (12.53) was a good indicator of the high level of specific fitness for judokas.
- Major taper should be used before competitions due to its positive effects on the competitive performance of judokas.
- The specific fitness of judokas should be enhanced.

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