

## Anthropometric Profile and Special Judo Fitness levels of Indian Judo Players

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### Abstract

**Purpose:** Judo is a complex sport where different anthropological parameters determine performance. Judo, as a sport is not well known in India. There is evident lack of data concerning the anthropological determinants of judo players. This study was conducted to determine the anthropometric profile and Special Judo Fitness levels of judokas.

**Methods:** This cross sectional study was conducted on 31 judo players. Anthropometric profile was assessed by measuring height, weight, body mass index, body circumferences at seven sites, seven site skin fold thickness and body fat percentage as per standard accepted protocol. Special Judo Fitness Test – a specific test to evaluate the judo athlete's physical condition was applied. Statistical analysis done using Student's unpaired 't' test and correlation by Karl Pearson's correlation coefficient.

**Results:** Out of 31 judo players 20 had  $\leq 5$  yrs of judo practice (A group) and 11  $> 5$  yrs of judo (B group). Anthropometric findings of both the judo groups were the same. Body fat has negative correlation ( $r = -0.690$ ,  $P < 0.05$ ) with performance in SJFT. Observations during and after special judo fitness test were also similar.

**Conclusions:** Long term training has a minimal effect on anthropometry. Judo athletes of similar age when submitted to the same training type tend to show equal performance in the game and fitness levels after certain years of training. We also confirm existence of negative correlation between body fat and performance.

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## INTRODUCTION

Judo is a Japanese art and an Olympic sport, in which besides technical skill and tactical strategies, conditional (physical and physiological) characteristics are also indispensable for success in competition and for training<sup>[1]</sup>. Competitive judo can be described as a combative, high intensity sport in which the athlete attempts to throw the opponent onto his back or to control him during groundwork combat. Both attempts depend on specific techniques and tactical skills with the support of good physical fitness<sup>[2]</sup>. Being aware of the anthropometric and physiological characteristics of an elite athlete will pave the way for his success<sup>[3]</sup>. As judo is a weight-classified sport, high level judo

players should have low body fat. It has been suggested that percentage of body fat may be a discriminator for success<sup>[2]</sup>.

Judo is the sport in which movements are powerful, delivered in a short period of time, usually against the force of the opponent. It is a sport of changeable intensity of effort. During contest, the non-stop periods of maximum or submaximum intensity are separated by longer or shorter breaks<sup>[4]</sup>. Fitness levels in judokas are evaluated based on special judo fitness test (SJFT) which gives effort tolerance levels in them. This test is of intermittent character with breaks between the test and uses a specific movement (throw) of the game called ippon-seoi-nage. The evaluation of physical characteristics is an important part of the training

process because it gives information about the variables that need to be improved and about the effectiveness of a given training program. Hence, this study was undertaken to define and interpret the possible anthropological determinants, and special judo fitness levels in Indian judo practitioners.

## METHODS AND SUBJECTS

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### *Participants and procedures:*

The present study was a cross sectional study conducted in the Department of Physiology, Jawaharlal Nehru Medical College, Belgaum between January 2009 and December 2009. Using universal sampling, data was collected from 31 Judo players practicing regularly for a minimum period of 3 years and who were in the age group of 18-25yrs. Information about their practice schedule, number of players and their availability was collected from the Judo coaches. Descriptive data of the participant's age, medical history, training schedule regarding number of years of judo practice, number of days in a week, number of hours per day, dietary history were obtained by interviewing the participants. The study was approved by the Ethical and Research Committee of the institution. Players were briefed about the nature of the study and written informed consent was obtained.

### *Protocols and equipment:*

The participants were divided into two groups depending on number of years of judo training. Judo A group consisted of players with  $\leq 5$  years of Judo and Judo B group consisted of the senior players with  $> 5$  years of training. Both groups had been exposed to similar training regimens and the diet given to them was similar as all of them resided in the same sports hostel. Anthropometric measurements included: Height (m) was measured by a commercial stadiometer, Weight (kg) was recorded by digital scale with an accuracy of  $\pm 100$ g, body mass index (BMI) was calculated from height and weight using Quetelet's equation:

$$\text{BMI} = \text{body weight in Kg} / (\text{height in meters})^2$$

Body Circumferences (cm) at seven sites (relaxed arm, flexed arm, forearm, wrist, thigh, calf and chest) were identified and measured using measuring tape as per standard protocol [5]. Skin fold thickness (mm) was measured by Herpenden skin fold calipers (Anand agencies, Pune). Seven sites (triceps, subscapular, midaxillary, abdomen, suprailiac, medial calf and proximal thigh) were identified on the right side of the body and body density was calculated. Body fat % was calculated using SIRI'S EQUATION [6,7].

$$4.950 / \text{Body density} - 4.500 \times 100$$

### *Special judo fitness test:*

Two judokas (*uke*) of similar stature and body mass of the performer are positioned at 6m of distance of one another, while the performer of the test (*tori*) is three meters of distance from the judokas that will be thrown. The test is divided into three periods of 15s (A), 30s (B) and 30s (C) with intervals of 10s. During each one of the periods the performer throws the partners using the *ippon-seoi-nage* technique as much as possible. Immediately after and 1 minute after the end of the test, the athlete's heart rate is verified. The total of throws accomplished in this period is added and an index is calculated.

$$\text{Index} = \text{final HR (bpm)} + \text{HR 1min after the end of the test (bpm)} / \text{total number of throws} [8]$$

### *Data and Statistical analysis:*

Statistical analysis involved quantitative variables summarized through mean and standard deviation. Difference between the mean of the two groups was tested using Students unpaired 't' test, where significance of the p value was  $< 0.05$ . To evaluate strength of association between performance (number of throws) in special judo fitness test and body weight/body fat among Judo players Karl Pearson's correlation coefficient was calculated.

## RESULTS

In this study out of 31 players 20 fall in group A and 11 in group B, depending on number of years of Judo

**Table 1:** Anthropometric profile of Judo players

VARIABLES	JUDO A ( $\leq 5$ yrs)	JUDO B ( $> 5$ yrs)	P Value	
Height (m)	1.66 (7.09)	1.58 (15.34)	0.047*	
Weight (kg)	61.8 (8.53)	59.7 (11.53)	0.6	
Body density	1.07 (0.01)	1.06 (0.01)	0.4	
Body fat %	11.9 (5.65)	13.8 (6.44)	0.4	
Body Mass Index	22.4 (1.90)	24.1 (4.88)	0.2	
Skinfold thickness (mm)	Triceps	10.5 (3.91)	9.6 (2.63)	0.5
	Subscapular	10.6 (2.70)	11.2 (4.00)	0.7
	Midaxillary	9.7 (3.04)	9.9 (3.49)	0.9
	Abdomen	11.2 (4.15)	10.3 (3.84)	0.5
	Suprailiac	10.4 (3.55)	11.1 (3.47)	0.6
	Proximal thigh	12.4 (3.32)	12.9 (4.95)	0.7
	Medial Calf	12.0 (3.12)	12.3 (4.01)	0.8
Circumferences (cm)	Relaxed arm	28.1 (1.84)	28.7 (2.62)	0.5
	Flexed arm	31.2 (2.19)	31.7 (2.50)	0.6
	Forearm	25.3 (1.41)	25.4 (2.51)	0.8
	Wrist	16.6 (0.78)	17.1 (1.04)	0.2
	Thigh	48.8 (3.39)	47.6 (4.95)	0.4
	Calf	34.9 (2.39)	33.5 (3.08)	0.2
	Chest	88.3 (4.76)	88.9 (7.78)	0.8

training. Table 1 shows the anthropometrical results from group A compared to group B which shows that no significant difference was found for these variables, Except that the height of players of A group was higher than B group players with statistically significant difference ( $P= 0.047$ ).

Special judo fitness test results depicted in Table 2 show no significant difference in performance. Figure 1 and 2 shows relationship between Body weight, body fat % and number of throws in the Special Judo fitness test. Pearson correlations ( $r$ ), number of subjects ( $n$ ). Body fat had a significant negative correlation with the performance in SJFT.

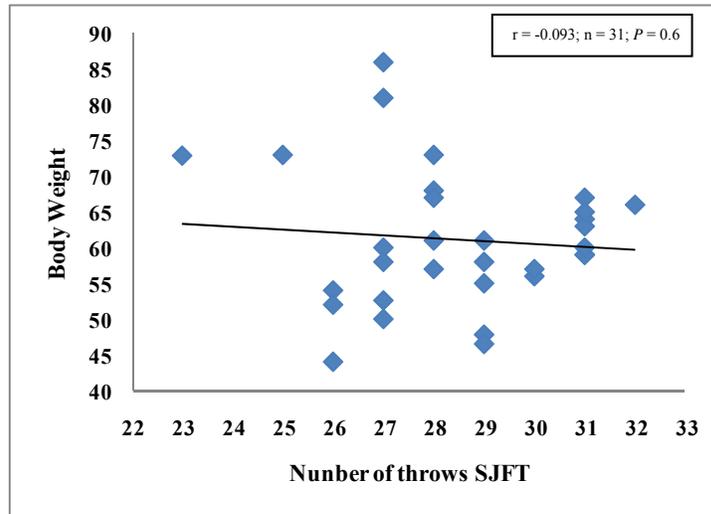
## DISCUSSION

In the present study the height of A group was higher than B group judo players with a statistically significant difference. A study done on Polish judo players concluded that the body height of the fighters was moderately connected with the preferred techniques in combat. Hand techniques were preferred by short and medium-height fighters and leg techniques by tall fighters<sup>[9]</sup>. In this study, there was no significant difference in body weight of the two judo groups and a non significant negative correlation ( $r = -0.09$ ) (Fig. 1) between body weight and performance in the SJFT

**Table 2:** Results [mean (Standard Deviation)] of Special Judo fitness test (SJFT) among Judo groups

SJFT parameters	JUDO A ( $\leq 5$ yrs)	JUDO B ( $> 5$ yrs)	P Value
Throws in series 'A'	6.3 (0.7)	6.2 (0.4)	0.7
Throws in series 'B'	11.4 (0.9)	11.4 (0.9)	0.9
Throws in series 'C'	10.7 (1.0)	10.8 (0.6)	0.8
Total throws (A+B+C)	28.4 (2.3)	28.4 (2.0)	0.9
HR immediately after 'C'	177.3 (9.0)	181.1 (5.7)	0.2
HR after 1 min	141.7 (21.6)	142.9 (18.2)	0.9
SJFT index	11.3 (1.4)	11.4 (1.0)	0.8

HR: Heart Rate

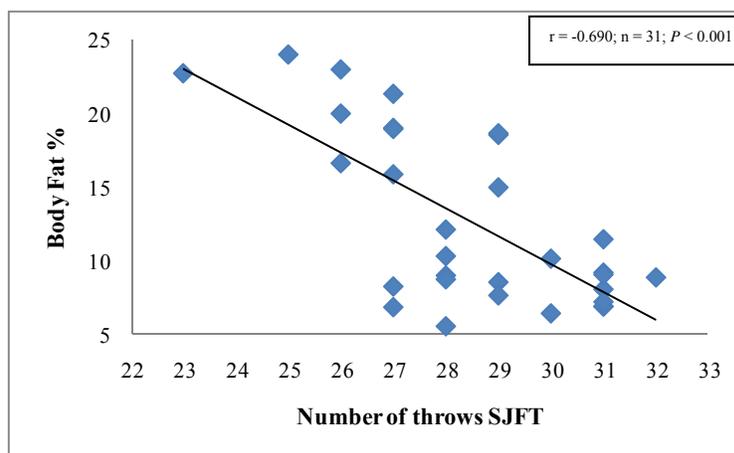


**Fig. 1:** Shows relationship between Body weight and number of throws in the Special Judo fitness test (SJFT) in all Judo players in this study. Pearson correlations ( $r$ ), number of subjects ( $n$ )

was observed. Few studies have got a significant difference indicating that heavier athletes present a lower anaerobic power in activities that involve throwing opponents from the same category<sup>[10,11]</sup>.

Despite there being no difference between the groups in anthropometrical characteristics, it is important to note that the body fat percentage was the same in both groups but, when compared to data on

non players of same age from literature there was a huge difference that indicates that judo players were lean, this supports the assumption that judo players try to maximize lean body mass and minimize fat mass. It may also be just a reflection of physiological adaptations to long-term judo training<sup>[11-14]</sup>. Previous studies give the body fat percentage values of different judo players as follows: Hungarian team(8.9%),



**Fig. 2:** Relationship between Body fat % and number of throws in the Special Judo fitness test (SJFT) in all Judo players in this study. Pearson correlations ( $r$ ), number of subjects ( $n$ )

Canadian team (12.3%), Japanese (16.2%), Brazilian team (13.7%) and North American team (8.3%) [15]. Body fat % in this study was (11.9% and 13.8%) for A and B group respectively. Negative correlation ( $r = -0.690$ ) of body fat % and motor performance (number of throws in SJFT) (Fig. 2) observed in the present study correlates with other studies [10,15,16]. Indicating that as the fat % increases the performance of the athlete comes down. Difference in mean group indices of body mass index of two judo groups turned out to be statistically insignificant. This result corroborates with a result of study done on senior and junior players of Poland [17]. One study reported that elite judo athletes had higher circumferences (flexed arm, forearm, wrist, and medial calf) than non-elite judo players [10]. In the present study both groups had similar values in all these circumference measures. This finding corroborated with one of the studies, which reported that there were no differences in circumferences between the competing vs. non-competing judokas [12]. A study on Brazilian elite and non elite players showed no difference in any skinfold measure which was a finding in this study also [10]. This might be due to similar training sessions for all the players.

The best proof of physical capacity is the practice of the sport. Therefore, the effects of endeavor in this discipline may be assessed on the basis of the competitor's maximum metabolic abilities clashing with each other during combats [8]. In this study in SJFT not much difference was seen in number of throws, heart rate or SJFT Index between two judo groups. This finding was similar to the studies done before [15,18] which indicates the same level of development and similar cardiovascular stress during this test for both groups. Recently a normative table was proposed to classify performance in the SJFT [19]. The athletes of the present study are classified as good in all variables in this test (number of throws, heart rate after, heart rate 1 min after, and index). Two studies reported a higher number of throws and a lower index in judo players (Brazilian and Polish) at the national level compared to athletes at a lower level [10,20]. A decrease in the heart rate (HR) at the end of the test with a given number of throws proves the efficiency of the cardiovascular function in the two groups. Decrease in

the same heart rate after 1 min of the test proves better regeneration and reflects the improvement in the aerobic function.

Limitations of this study are a small sample size and inability to evaluate physiological and biochemical features of our athletes. The data provides the judo player with information on ideal profile and where training might be directed to compensate for areas where the athlete is below average for successful judo players. A judo player who does not match the ideal profile can still succeed through improved or superior techniques and tactics.

## CONCLUSION

The following conclusions can be drawn from this study: long term training has a minimal effect on anthropometry. Physical components are not discriminatory to the performance of Judo athletes. The higher the fat percentage, the lower is the performance in activities involving body displacement (negative correlation). In SJFT no significant difference was found among judo groups in the performance indicating that athletes around the same age submitted to the same training type tend to have similar performance in the test after certain years of training.

Further studies with large sample size should be carried out and difference between sexes in terms of anthropometry and performance should be focused. Physiological and biochemical features which might affect performance should be studied.

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## REFERENCES

1. Poceceo E, Burtscher M. Physiological profiles of judo athletes. Institute of Sports Science - University of Innsbruck (Austria) 2005. Available at: [www.ftvs.cuni.cz/pds/konference05/data/sbornik.pdf](http://www.ftvs.cuni.cz/pds/konference05/data/sbornik.pdf). Access date: Dec 2006.
2. Ali PN, Hanachi P, Nejad NR. The Relation of Body Fats, Anthropometric Factor and Physiological Functions of Iranian Female National Judo Team. *Modern Appl Sci* 2010;4:25-9.
3. Singh S, Gaurav V, Malhotra V. A Study of Physical and Physiological characteristics of male judokas. *Indian Streams Res J* 2011;1:1-4.
4. Drapsin M, Drid P, Grujic N, Trivic T. Fitness level of male competitive judo players. *J Combat Sports Martial Arts* 2009;1: 27-9.
5. Drinkwater DT, Ross WD. Anthropometric fractionation of body mass. In: M.Ostyn, G.Beunen, J.Simon (eds.) *Kinanthropometry II*. Baltimore: University Park Press; 1980; Pp:177-89.
6. Balady JG, Berra AK, Golding AL, et al. *ACSM'S Guidelines for Exercise Testing and Prescription*. 7<sup>th</sup> ed. Philadelphia: Lippincott Williams and Wilkins; 2006.
7. Johnson BL, Nelson JK. *Practical Measurements for Evaluation In physical Education*. 3<sup>rd</sup> ed. New Delhi: Surjeet publications; 1988.
8. Sterkowicz S. The special judo fitness test. *Anthropomotoryka* 1995;12-13:29-44.
9. Lech G, Sterkowicz S, Rukasz W. Significance of body height in martial arts (as exemplified by judo fighters). *Hum Mov* 2007;8:21-6.
10. Franchini E, Takito MY, Dal MAP, Kiss M. Anthropometric differences between elite and non elite judo players. *Biol sport* 2005;22: 315-28.
11. Callister R, Callister RJ, Staron RS, et al. Physiological characteristics of elite Judo athletes. *Int J Sports Med* 1991;12:196-203.
12. Kubo J, Chishaki T, Nakamura N, et al. Differences in fat free mass and muscle thickness at various sites according to performance level among judo athletes. *J Strength Cond Res* 2006;20:654-57.
13. Callister R, Callister RJ, Fleck SJ, Dudley GA. Physiological and performance responses to overtraining in elite judo athletes. *Med Sci Sports Exerc* 1990;22:816-24.
14. Drid P, Maksimovic N, Matic R, et al. Fitness profiles of elite female judokas of the Serbian national team. *Medicina dello Sport* 2009; 62:251-63.
15. Franchini E, Alexandre VN, Morisson JM, Vecchio FBD. Physical fitness and anthropometrical profile of the Brazilian male Judo team. *J Physiol Anthropol* 2007;26:59-67.
16. Sterkowicz S, Zuchowicz A, Kubica R. Levels of anaerobic and aerobic capacity indices and results for the special fitness test in judo competitors. *J Human Kinetics* 1999;20:1-22.
17. Jagiello W, Beata W, Walery S. Physical preparation of female judo competitors at selected stages of long-standing sports training. *Arch Budo* 2009;5:47.
18. Franchini E, Nakamura FY, Takito MY, Kiss MAPDM, Sterkowicz S. Special judo fitness test in juvenile, junior and senior Brazilian judo player. Poland. Judo information site research. Available at: <http://www.judoinfo.com/research5.htm>. Access date: Mar 1998.
19. Franchini E, Del Vecchio FB, Sterkowicz S. Classificatory norms to the Special Judo Fitness Test. Proceedings of 1st World Scientific Congress of Combat Sports and Martial Arts in Rzeszow, Poland. Sep 22-24, 2006. Proceedings, 64.
20. Sterkowicz S, Franchini E. Specific fitness of elite and novice Judoists. *J Human Kinetics* 2001;6:81-98.