

Original empirical article

**THE BODY COMPOSITION AND SOME CONDITIONAL
FEATURES OF WOMEN JUDOISTS OF THE TURKISH
NATIONAL TEAM**

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**Cem Kurt¹, İlknur Kobaş¹, Serpil Ayas¹, Mustafa Deniz Dindar¹,
İmran Kurt Ömürlü²**

¹Trakya University Kırkpınar Physical Education and Sports Academy, Edirne, Turkey

²Adnan Menderes University, Faculty of Medicine, Department of Biostatistics and
Medical Informatics, Aydın, Turkey

Abstract. *In this study, which aimed to evaluate the body composition and some conditional features of the women judoists of the Junior National Team who took part in the 2009 World Championship, Anthropometric (Femur and Humerus Bi-epicondylar diameter, Flexed arm and calf girth, skinfold measurements etc.) and conditional tests (vertical jumping, anaerobic power, right and left hand grip strength) were applied on 19 athletes (age: 20.58±1.87 years, weight: 65.32±21.13 kg and height: 165.26±6.17 cm). Holtain brand calipers (Holtain Ltd, Crosswell, Crymych, UK) were used for the measurement of the diameter and thickness of skin curves, Takei brand (Takei Physical Fitness Test, T.K.K.5106, Made in PRC) jump meter and dynamometer were used for the measurements of the vertical jump and handling power. The somatotype was detected by Heath-Carter's Anthropometric method. The data gathered were analyzed by SPSS 15.0 packet program. Respectively, the BMI: 23.57±5.85 kg/m², WHR; 0.76±0.06, RPI; 41.70±2.54 cm/kg^{0.333}, body fat percentage 13.26±3.22 %, femur bi-epicondylar diameter 8.12±1.04 cm, Humerus bi-epicondylar diameter 5.04±0.51 cm, calf girth 35.68±5.28 cm, flexed arm girth 30.26±5.36 cm., vertical jump height 40.44±3.72 cm., anaerobic power 91.07±26.75 kgm/sn, right and left hand grip strength were found 35.16±5.11 kg and 33.54±5.22 kg. The endomorphy, mesomorphy and ectomorphy of our athletes were found to be 3.36, 3.19 and 2.06 respectively. Similarities were observed between the gathered data and the data on our athletes.*

Key words: *body composition, conditional features, junior women judo, turkish national team.*

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Corresponding author: Cem Kurt

Trakya University, Kırkpınar School of Physical Education and Sports, Balkan Campus, Edirne, Turkey

Tel: +90 284 236 04 36 • Fax: +90 284 236 04 35 • E-mail: cemkurt35@gmail.com

INTRODUCTION

Judo is an Olympic sport branch that includes forcefulness, short interval exercises and requires the perfection of conditional, technical and tactical features for success. On the basis of these features, judo is classified among the sports that require explosive power of an anaerobic character (Radovanovic, Bratic & Milovanovic, 2008). In judo, it depends upon the length of the competition whether the energy required is met in the alactic anaerobic way or lactic anaerobic way. Studies carried out on match length showed that in judo the average match length is 3.30 minutes for men and 3.14 minutes for women (Pulkkinen, 2002). In the games, which are successively carried out in tournaments and championships, success is dependent on the ability of regeneration and fatigue toleration of the athlete. The ability of regeneration and fatigue toleration depends on the level of aerobic capacity. At the same time, judo is both an aerobic and anaerobic characterized branch of sport (Franchini, Nunes, Moraes & Vecchio, 2007; Degoutte, Jouanel & Filaire, 2003).

As in most branches of sport, the perfect performance of the technical and tactical abilities in judo is also bound to the composition of the body. Therefore, the determination of body composition is important in terms of a training plan as well as success in the game. The most common technique for the determination of the body composition is somatotyping (Chaouachi et al., 2005; Pieter, Bercaddes & Kim, 2006; Mathur, Toriola & Igbojwe, 1985). A somatotype is the definition of the morphological structure of the body in terms of muscularity, fatness and slimness (Kamanlı, Özmerdivenli, Karacabey, Kutlu & Ardiçoğlu, 2003; Carter, 2003). The evaluation of the somatotype is done with anthropometric measurements. According to the data taken from these measurements, the morphological structure of the body is defined as; Endomorphy, Ectomorphy and Mesomorphy (Carter, 2003; Kamanlı, Özmerdivenli, Karacabey, Kutlu & Ardiçoğlu, 2003; Uluöz, 2007). The element endomorphy defines the roundness, fatness and softness of the body. Ectomorphy indicates the slimness and fragility of the body, while mesomorphy indicates the muscularity and durability of the muscular skeleton system (Carter, 2003; Akça & Müniroğlu, 2006).

In the light of this information, our aim is the determination of the anthropometric, somatotype and anaerobic power levels of the judoists on the Turkish Junior National Women's Team.

2. MATERIALS AND METHODS

2.1. Participants

A total of 19 Young National Women Judoists participated in this study. The ages, heights and weights of the athletes were determined to be 20.6 ± 1.58 year, 165.3 ± 6.17 cm. and 65.32 ± 21.13 kg respectively. The athletes were given information about the unwanted consequences that will occur during these measurements and about the aim of the study, the measurements that would be applied and the probable benefits. In addition, their written consents were also obtained. All the measurements were completed in the same day during the training camp of 2009 World Championship (September 2009, Kırklareli) in a sports hall of the hotel where the athletes were staying.

2.2 Measuring tools

Measurement of Height and Weight: Measurements were made using the electronic bascule (Angel, 150 MA, Istanbul/Turkey) which had been used to measure the weights and heights of the athletes in the sports salon before the competition.

Measurement of Body Fat Percentage: In the measurement of body fat percentage, the Holtain brand, skinfold caliper with 0.2 mm sensitivity (Holtain Ltd, Crosswell, Crymych, UK) was used. The skinfold thicknesses were taken from the tricipital, bicipital, subscapular, suprailiac, calf, chest, thigh, and abdominal area. Yuhazs formula was used to determine the fat percentage.

Measurement of Width: The measurements were carried out by using a slide caliper (Holtain Ltd, Crosswell, Crymych, UK).

Measurement of Circle: Made by inelastic tape.

The skinfold thicknesses, circle and radius measurements were made on the right part of the athletes.

The determination of the Somatotype: Made with the Anthropometric Somatotype method of Heath-Carter, by using a formula.

Measurements of Hand Grip: Made with hand strength dynamometer (Takei Physical Fitness Test, Hand Strength Dynamometer, Japan). The test was repeated two times for both hands with 30-minute breaks. The mean of the values gathered was accepted as the value of hand grip strength.

Measurements of the Vertical Jump: Made by Takei brand (Takei Physical Fitness Test, T.K.K.5106, Made in PRC) vertical jump-meter. Two vertical jumps with 30-minute breaks were done by the athletes. The mean of the values was accepted as the height of the vertical jump. $P = (\sqrt{4.9} (\text{body weight}) \sqrt{D})$ formula was used to determine Anaerobic Power. Body weight was calculated in kg, while $D =$ jump height.

2.3 Statistical analysis

The mean and standard deviations of the values were determined by SPSS for Windows 15.0 package.

3. RESULTS

Table 1 Physical features data

	Mean (n=19)	Standard Deviation
Age (years)	20.58	1.87
Height (cm)	65.32	6.17
Body Weight (kg)	65.32	21.13
BMI (kg/m ²)	23.57	5.85
WHR (%)	0.76	0.06
RPI (cm/kg ^{0.333})	41.70	2.54

Table 2 Anthropometric features data

	Mean (n=19)	Standard Deviation
Fat Percentage (%)	13.26	3.22
∑ 6 Skinfold (SF) (mm)	61.70	29.69
Tricipital Skinfold (mm)	12.68	5.55
Bicipital Skinfold (mm)	6.16	5.86
Suprailiac Skinfold (mm)	10.15	5.86
Subscapular Skinfold (mm)	10.98	4.65
Chest Skinfold (mm)	6.57	2.96
Abdominal Skinfold (mm)	14.59	6.56
Femur Epicondylar Diameter (cm)	8.12	1.04
Humerus Epicondylar Diameter (cm)	5.04	0.51
Medial Calf Circumference (cm)	35.68	5.28
Contracted Arm Circumference (cm)	30.26	5.36
Waist Circumference (cm)	73.79	14.65
Hip Circumference (cm)	96.34	11.73
Endomorphy	3.36	1.37
Mesomorphy	3.19	1.99
Ectomorphy	2.06	1.22

Table 3 Features of anaerobic power and strength data

	Mean (n=18)	Standard Deviation
Vertical Jump (cm)	40.44	3.72
Anaerobic Power (kgm/sec)	91.07	26.75
Hand Grip Right Hand (kg)	35.16	5.11
Hand Grip Left Hand (kg)	33.54	5.22

4. DISCUSSION AND CONCLUSION

Physical performance is affected by factors such as; genetic structure, training, nutrition, gender and age (Fuster, Jerez & Ortega, 1998). Because there is a strong relationship between body composition and physical performance, the anthropometric and physiological factors that affect the success of the athlete should be determined with care (Zar, Gilani, Ebrahim & Gorbani, 2008).

Values such as BMI, Ponderal Index (RPI), body fat percentage, waist to hip ratio (WHR), waist and hip circle, which make up the body composition, are simple data frequently used not only in determining the level of the performance but also in the evaluation of general health (Fuster, Jerez & Ortega, 1998). It has long been known that there is a strict relationship between the Somatotype and diseases that are evaluated in terms of anthropometric measurements (Kamanlı, Özmerdivenli, Karacabey, Kutlu & Ardiçoğlu, 2003; Nightingale, 2009; Ronco et al., 2008; Buffa et al., 2007; Hopper, 1997). The values of BMI (Body Mass Index), RPI (Ponderal Index), and WHR (Waist to Hip Ratio)

are frequently used to determine the risk of coronary arterial diseases due to obesity (Kazami, Casella & Perri, 2009; Pieter, Bercaddes & Kim, 2006).

Body fat percentage varies in terms of gender and the sport branch, and it is reported that the total skinfold values of women judoists are higher than that of karate and taekwondo athletes (Pieter, Bercaddes & Kim, 2006). It is also reported that the fat in the bodies of the judoists are generally accumulated in their stomach. This is evaluated as an adaptation to the structure of judo (Kazami, Casella & Perri, 2009). The total skinfold value gathered from 6 parts of our athletes was found to be 61.70mm. It is found that the total 6 skinfold values of middleweight and heavyweight Philippine women judoists are 76.00 and 136.3mm respectively (Pieter, Bercaddes & Kim, 2006). According to these data, the total skinfold value of our athletes can be accepted as normal.

Obesity, which is an important health problem for developed countries, is increasing rapidly not only among athletes but also among the public. The increasing body fat percentage damages both health and physical performance (Joyce & Hecht, 2005). Especially in sports branches that include anaerobic exercises like Judo, excess of fat mass and lack of fatless body mass affects performance negatively. The fat tissue has no benefit for ATP synthesis and resynthesis which is the fundamental energy resource of the body (Özkan, Arıburun & İşler, 2009).

The fat values of BMI, WHR, RPI and percentage of body fat, which are the parameters for both general health and physical performance, were found in normal limits for our athletes (McArdle, Katch & Katch, 2006; Joyce & Hecht, 2005).

Another factor that affects the performance and health of the athletes is the somatotype, which is shaped in terms of anthropometric data. The most important point in the somatotype features of the judoists is the mesomorphy compound, which is dominant whatever the age, gender and weight are. Although not enough data exists on the somatotype features of women judoists, in the available references, it is pointed out that the mesomorphy compound is dominant among the somatotype features (endomorph 2.84, mesomorphy 6.07 and ectomorphy 1.51) of the women judoists (Krstulovic, Zuvela & Katic, 2006; Chan, Pieter & Moleney, 2003). Another significant point in the somatotype features of the women judoists is that the endomorphy compound increases (endomorph 6.6, mesomorphy 7.1 and ectomorphy 0.3) due to obesity (>60 kg), and the somatotype is described as endo-mesomorphic (Claessens, Beunen, Wellens & Geldof, 1987; Chan, Pieter & Moleney, 2003). The somatotype of young judoists is described as meso-ectomorphy (Krstulovic, Zuvela & Katic, 2006). In our study, the somatotype of our athletes was determined as endo-mesomorphy.

Judo is a sport branch that requires perfection in terms of physical features as well as in physiological and conditional features. Power and strength are the two most important features that determine success, and it is known that there is a positive correlation between anaerobic power and success (Yüksek & Cicioğlu, 2004). For that purpose, the anaerobic powers of our athletes are evaluated based on the vertical jump and body weight. The vertical jump feature is described as power generation and the jumping ability of the lower extremities (Vural, Nalçakan & Özkol, 2009). The vertical jump heights and values of anaerobic power gathered from similar exercises were 30.00 ± 2.16 cm. and 56.38 ± 4.87 kgm/sn, while they were 33.00 ± 5.22 cm. and 59.00 ± 7.18 kgm/sn. for Russian athletes respectively (Yüksek & Cicioğlu, 2004). It is significant that both the vertical jump heights and values of anaerobic power of our athletes were high in comparison to the data obtained in similar studies.

Hand grip strength is the maximal voluntary contraction that is triggered by the active flexion of the wrist, fist and all fingers (Koley & Yadav, 2009). The hand grip test is a test which not only shows the contractile capacity of the hand, but also of the other muscle groups such as the leg muscles and the strength of the whole body (Dopsaj, Ivanovic, Blagojevic & Vuckovic, 2009). For a technique to be applied better in Judo, the Judo gi of the opponent could be held tightly. In this respect, handling power is of great significance. Yüksek et al. (2004) report that the handling powers of Turkish and Russian young judoists were 25.50 ± 4.09 kg and 29.90 ± 1.10 kg. for the right and left hands respectively (Yüksek & Cicioğlu, 2004). It is noticeable that the handling power values of Turkish and Russian young judoists were lower with respect to the values of our athletes.

As in the whole world, Judo is gradually gaining importance in our country; however, there is a lack of research about the physical, physiological and conditional features of women judoists. In order to understand women's Judo better; there is no doubt that the use of technological developments, used for performance determination in sport science in this field, will be beneficial.

We observed similarities between the literature regarding data on women judoists and the anthropometric and conditional features of our athletes. This is important for the development of judo in Turkey. That the technical, physiological and biochemical features of our athletes cannot be evaluated makes up the boundaries of our study.

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SASTAV TELA I NEKE KONDICIONE ODLIKE DŽUDISTKINJA TURSKOG NACIONALNOG TIMA

**Cem Kurt, İlknur Kobaş, Serpil Ayas, Mustafa Deniz Dindar,
İmran Kurt Ömürlü**

U ovom istraživanju, koje je imalo kao cilj da proceni sastav tela i neke kondicione odlike džudistkinja juniorskog nacionalnog tima, koje su učestvovala na Svetskom prvenstvu 2009, antropometrijski i kondicioni testovi korišćeni su na uzorku od 19 sportistkinja (godine starosti: 20,58±1,87 god, težina: 65,32±21,13 kg i visina: 165,26±6,17 cm). Mereni su prečnik i debljina kožnih nabora, kao i skok u vis i snaga. Somatotip ispitnica određen je uz pomoć Hit-Karterovog (Heath-Carter's) antropometrijskog metoda. Prikupljeni podaci analizirani su uz pomoć SPSS programa. Relevantni parametri imali su sledeće vrednosti: BMI; 23,57±5,85 kg/m², WHR; 0,76 ± 0,06, RPI; 41,70±2,54 cm/kg^{0,333}, procenat masnih naslaga u telu 13,26 ± 3,22 %, prečnik butna kost – epikondil 8,12 ± 1,04 cm, prečnik rame – epikondil 5,04±0,51 cm., obim listova 35,68±5,28 cm., obim ruke 30,26±5,36 cm., visina skoka u vis 40,44±3,72 cm., anaerobna snaga 91,07±26,75 kgm/sn, jačina stiska desne i leve ruke 35,16±5,11 kg i 33,54±5,22 kg. Endomorfija i mezomorfija i ektomorfija naših sportistkinja su imale vrednost 3,36, 3,19 i 2,06, tim redosledom. Sličnosti su oučene između prethodno prikupljenih podataka i podataka o našim ispitanicama.

Ključne reči: *sastav tela, kondicione odlike, juniorski džudo za žene, turski nacionalni tim.*