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SOMATOTYPE OF TOP SERBIAN JUDOKAS

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Original scientific paper
UDC: 572.5:796.853.23-055.1(497.11)

Abstract
Judo is a dynamic and demanding martial art which can contribute to a physical and psychological development of a person. Research into the performance requirements of judokas has suggested the existence of the correlation between anthropometric and physical attributes and the demands of this sport. The purpose of the present investigation was to assess the somatotype characteristics of top male judokas in Serbia.The study of elite athletes (judokas, in this case) may provide valuable information on the morphological requirements for achieving success in this sport.Present research ofsomatotype characteristics in 20 top Serbian male judokas (12 juniors and 8 seniors) aged 19.32±4.02 years was measured. Anthropometric variables included height, mass, selected diameters, girths and skinfolds, and a Health-Carter anthropometric somatotype. All the anthropometric data were collected following the International Biological Programme and then processed by the Somatotype 1.2 programme. The obtained results show a similar profile and endomesomorphic mean somatotype (3.29-5.23-2.88), as in many previous studies.

Key words: **judo, selection, constitution, body composition**

Introduction

In selection of athletes for a particular sport discipline, the focus should be on those traits and abilities which have the most significant influence on the performance, and on those which are predominantly genetically determined. One of the most important genetically determined factors,which is taken into account when evaluating a person's readiness to undergo certain physical and mental strain, is their physique.Human physique, that is somatotype, is a particular set of structural and morphological, physiological and functional, psychological cognitive and conative factors of an individual, which are under the influence of hereditary traits and some exogenous factors as well (Tucker & Lessa, 1940), such as diet, socio-economic conditions, physical activity and sport.
In elite judo competitors physique is an important factor affecting performance, exhibit the greatest similarity in morphological traits and motor abilities. Those traits of athletes, achieving highest results in a particular sport, create a somatic and physical "model" for that discipline.Determining a somatotype in judo as a martial art is a useful procedure in selecting sportsmen who have the propensity to become successful and achieve top results. Most authors (Gualdi-Russo & Graziani, 1993; Romero et al., 1996; Romero Collazos et al., 1996; Benavent et al., 2004; Lewandowska et al., 2011; Sterkowicz-Przybycień et al., 2012**)** have come to one, the most prominent somatotype model of judokas: endomesomorphic (with mesomorphy being more dominant and endomorphy less). This can also be viewed as a different distribution of three somatotype components depending on the weight category: the higher the weight category, the more dominant endomorphy becomes(Claessens et al., 1987; Grosso et al., 2007; Lewandowska et al., 2011); when it comes to the level of competition,the value of mesomorphy increases with the increase in the levels of competitors, while the value of endomorphy decreases (Kuźmicki&Charzewski, 1987; Fagerlund&Häkkinen, 1991); and when it comes to the age category, the higher the age category, the higher the values of the meso and endo components become (Benavent et al., 2004).
In spite of the fact that judo has gained popularity all over the world, there is a lack of data on somatotype studies of Serbian judokas, even though there is a large number of them in this country. Consequently, the purpose of the present investigation was to assess the somatotype characteristics of top male judokas in Serbia.

Methods

Subjects

Twenty male judokas (age 19.32±4.02 years, body height 177.27±5.07 cm, body mass 71.38±11.13 kg) volunteered to participate in the study and were members of judo club 'Kinezis' (Niš, Srbija), competing at national and

international level. They were national team members, regularly participating and winning medals inage categories at World and European tournaments (championships), universiadesand European cups.Commonly, subjectswere placed in top three at Balkan Championship.

Table 1. Baseline characteristics of top Serbian judokas (N=20)

Variable	Mean±SD	Median	Range
Age	19.32±4.02	17.94	13.71 – 26.51
Height	177.27±5.07	178.45	169.4 – 185.2
Weight	71.38±11.13	70.35	54.7 - 91.6

Legend:SD – standard deviation.

Set of measuring instruments

The measurements were taken during the peak of the competition season,just before the national competition. All the examinees underwent identical research protocol, which they had been introduced to and which they had agreed to beforehand. An anthropometric method was used for obtaining the judokas' somatotype. Anthropometry included 10 following variables: body height (in cm), body weight (in kg), four skinfolds (over triceps, subscapular, suprailiac, medial-calf; in mm), biceps girth (flexed 90° and tensed; in cm), standing calf girth (in cm), bicondylarhumerus and femur breadth (in cm).

The testing was done before noon, in the room with optimal microclimatic conditions (temperature values from 21°C to 23°C, humidity 55-60%)with participants in underwear, by the same investigator according to the methods proposed by the International Biological Programme (Weiner and Lourie, 1969). Body mass was measured with Omron BF 511.

Statistical data analysis

For the research purposes we used descriptive statistics. Descriptive statistics deals with the measures of central tendency (mean, median and mode), measures of variability (range, standard deviation, variance and average deviation), as well as graphical and tabular presentation of basic statistical values.

The somatotype was determined according to the methodology of Heath-Carter (Carter & Heath, 1990) which implied carrying out the statistical analysis of data using the computer programmeSomatotype 1.2. During the investigation we carried out the measurements according The Heath-Carter Anthropometric Somatotype – Instructional Manual, published by Department of Exercise and Nutritional Sciences San Diego State University San Diego, CA. 92182-7251. U.S.ACarter, J.E.L.,(2002).Somatotype is most commonly measured using the Heath-Carter measurement system, in which ratings for endomorphy, mesomorphy and ectomorphy are calculated using various anthropometrical measurements and also sometimes in conjunction with standardized photos (photoscopic method).There are three ways of obtaining the somatotype. The anthropometric method, in which anthropometry is used– to estimate the criterion somatotype. The photoscopic method, in which ratings are made from– a standardized photograph. The anthropometric plus photoscopic method, which combines– anthropometry and ratings from a photograph - it is the criterion method.

A somatotype is evaluated on the basis of three numbers –the first number indicates the endomorphic, the second number the mesomorphic and the third the ectomorphic component. If a component is lower than 2.5 it is considered to be low, from 3.0 to 5.0 medium and from 5.5 to 7.0 as high. Values higher than 7.5 are considered as extreme. The calculated triplenumbers are applied to a spherical triangle (a somatograph) on which the peaks are like the marginal types, the centre the balanced types and inside the medium types.

Results

The sample of 20 top Serbian judokas showed the following mean somatotype: 3.29-5.23-2.88 (values for endomorphy, mesomorphy and ectomorphy, respectively; Figure 1.) Descriptive statistics of all measurements are presented in Table 2.

Table 2. Descriptive statistics of measured anthropometric parameters

Variable	Mean±SD	Median	Range
Triceps SF	11.89±4.13	11.3	5.8 – 2.4
Subscapular SF	13.09±2.77	12.6	9 – 19.4
Suprailiac SF	8.64±1.97	8.6	4.8 – 13.2
Calf SF	7.09±1.88	6.5	4 – 10.4
Flexed arm G	33.92±3.98	34.15	25.5 – 42.1
Calf G	36.9±2.4	37.3	32 – 40.4
Humerus B	7.13±0.43	7.05	6.5 – 7.9
Femur B	9.74±0.42	9.74	9.2 – 11.1
HWR	42.93±2.02	42.93	39.53 – 47.39
SAD	1.8±1.08	1.56	0.56 – 4.24
Endomorphy	3.29±0.69	3.2	2 – 5.1
Mesomorphy	5.23±1.41	5.2	2.7 – 7.8
Ectomorphy	2.88±1.44	2.7	0.7 – 6.1

Legend: SF– skinfold, **G**– girth, **B** – breadth, **HWR**– height-weight ratio, **SAD**– somatotype attitudinal distance, **SD** – standard deviation.

Discussion

Apart from talent, the adequate body constitution is a prerequisite for achieving success in sports. Physique is to a large extent determined by thehuman genotype, but within the defined limits it is also subjectto environmental influence. The extent of sensitivity to externalenvironment is also hereditary conditioned.

The somatotype analysis of Serbian judokas proved the domination of the endomesomorphic type (3.29-5.23-2.88), which is generally the predominant type in other countries as well.A study which examined the somatotype of top athletes of a variety of sports, among which were judokas at that time the future contestants in the 2000 Olympics in Athens, placed them into the group of athletes with the highest values of the mesomorphic component

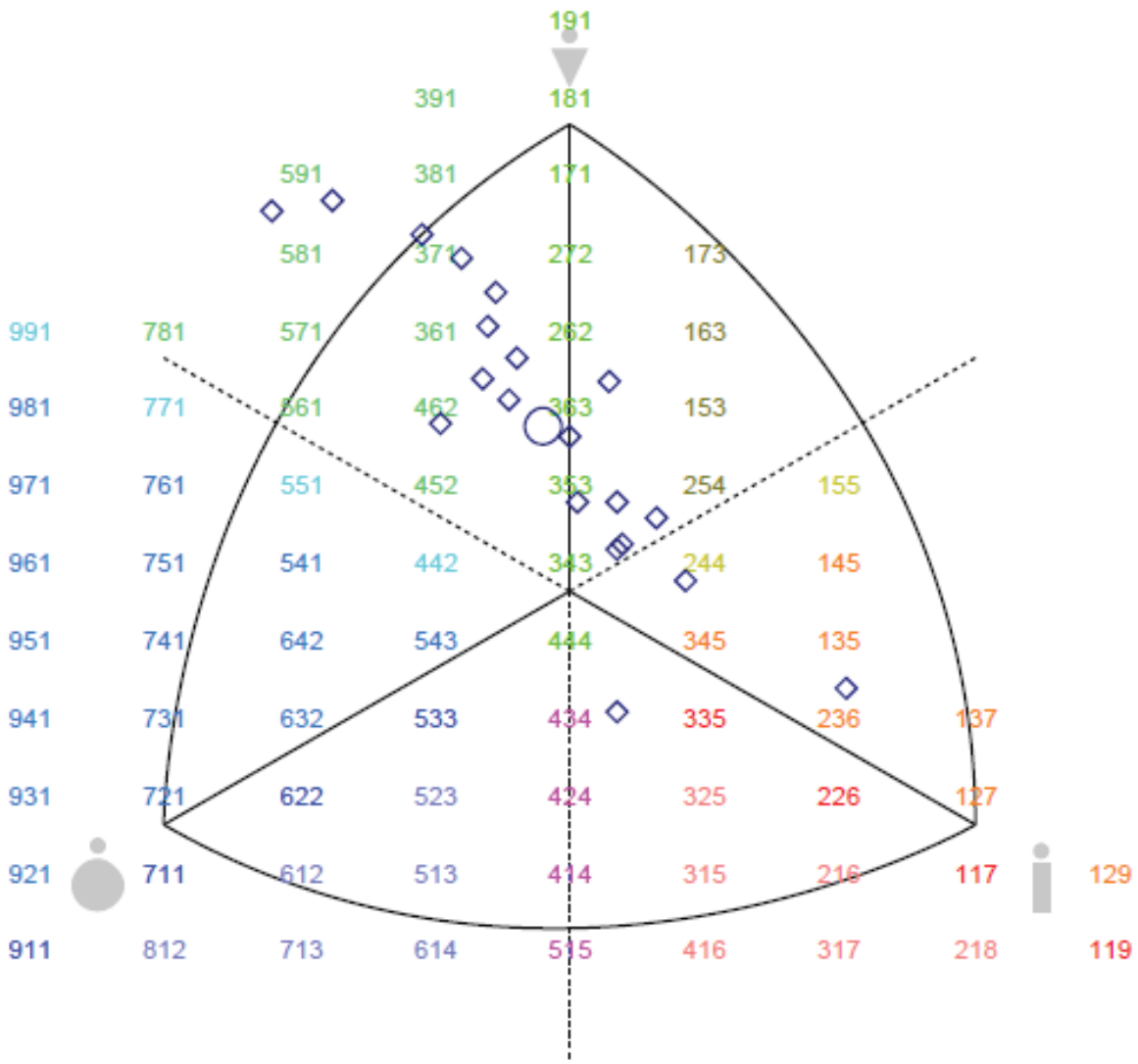

Figure 1. Somatoplot of Serbian judokas (N=20). The squares are the individual somatotypes, and the circle is the mean profile

and the significantly lower values of the ectomorphic one (2.84-5.72-1.51) (Krawczyk et al., 1997). The same thing was mirrored in our sample.

A typical somatotype of Polish junior judokas is endomesomorphic as well (3.0-5.5-2.1), and so is the one of the senior members of the Polish national team(2.6-6.4-1.8) (Sterkowicz-Przybycien et al., 2012).The higher values of the mesomorphic and the lower values of the endomorphic components can be justified by a more representative set of examinees.Our set included some competitors of the national league together with the standard ones. The national league competitors influenced the mean results of the tested group. In the sample of 13 Polish judokas aged 18.4 ± 3.1 (cadets and juniors) the mean value of the somatotype was3.5-5.9-1.8 (Lewandowska et al., 2011).The endomesomorphic type was confirmed, with slightly lower values of the third component.The identical case was with the Kuźmicki&Charzewski (1987) study (2.7-6.3-1.7), and the one conducted among the members of the Hungarian team members (3.61-6.97-1.56) (Farmosi, 1980), which was characterized by the extremely high values of the mesomorphic component and the low values of the ectomorphic one.The results of our judokas bear striking similarity to the results of Nigerian judokas: 3.6-5.1-2.6 (Mathur et al., 1985). 18 junior and senior representatives took part in that research. Their average body mass was 67.4±3.8kg, which means that there were no examinees belonging to the heavy weight categories, which, in turn, resulted in ectomorphic values being higher than in other studies.

Although, there are differences in the values of various components among the compared groups, the mesomorphic factor clearly dominated in all of them. All of these results indicate massive (mesomorphic) physique of judokas, characterized by large circumferences of muscles and developed (robust) bone bases, adapted to heavy loads. The training process leads to the transformation of the selected individuals into the aforementioned somatotype.With strength being one of the most dominant motor abilities in this sport and being prevalent in various forms (maximum, repetitive, explosive and static), the domination of the mesomorphic type then does not surprise: all the training process focused on the development of strength consequently leads to the enlargement of the muscular mass, which directly places these athletes into the mesomorphic type.

Conclusion

Serbian judokas can be described as the athletes of the endomesomorphic type, which is consistent with the somatotype of the judokas from other countries.That can point to physical equality between Serbian and other judokas in the sports arena.However, taking into account the fact that sports results do not depend solely on athlete's physical characteristics (they are just a small piece of a jigsaw), the study in itself can be said to be flawed for not having included some other important influences on any athlete's performance, such as motor ability, psychological readiness, functional ability.Apart from this, another issue is a small, appropriate and age differing sample of examinees. Therefore, the authors feel that the status of Serbian judokas should receive a more interdisciplinary attention and that further research should be conducted on a larger and more representative sample.

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Submitted: September 13, 2016
Accepted: December 21, 2016

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