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Review Article

Judo Wrestling: Sex Somatotypes and The Anatomical-Morphological Profile Identified in Them in Young Female Athletes

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Abstract

In this research article, its author presents comparative results of the conducted study, to determine the existing changes, both in anatomical indicators, and in a number of morphofunctional index values, in the identified sexual somatotypes, to which belong female athletes of adolescent age, practicing judo.

Key words: female athletes; judo; weight categories; youthful age; bone pelvis; sexual dimorphism; sexual somatotypes; inversion; adaptation

Introduction

The study of various aspects of modern women's sports, including its medical and biological issues, is always very relevant and in demand everywhere. This applies to all, without exception, sports that women of different age groups are involved in [1, 3-22]. When analyzing the available scientific and scientific-methodological literature and Internet sources on the issue under study, we found that the issues of anatomical and anthropological changes and ongoing inversions in sexual somatotypes in female athletes of different age groups, including adolescence, involved in judo and other types of martial arts, were studied by such domestic and foreign researchers as: Piskov, 2008; Yagello & Volovich, 2009; Martirosov, Rudnev & Nikolaev, (2010); Nadeina, Klots, Zvyagintseva & al., 2011; Nerobeev & Tarakanov, 2012; Lopatina, Serezhenko, & Anokhina, 2013; Martirosov, Semenov, Martirosova, Romanova, & Baluchi, 2013; Zaitsev & Ivonina, 2013; Kochetkova & Oparina, 2014; Nenenko, Abramova, Chernitsyna, & Kuchin, 2014; Zubareva, Rudaskova, & Adelshina, 2015; Mandrikov, Samusev, Zubareva, Rudaskova, & Adelshina, 2015; Semenov, Martirosova, & Martirosov, 2016; Mankevich, 2016; Semenov & Nikityuk, 2018; Oleynik 2019, 2020; Bugajewski, 2019, 2020-2024.

When organizing the study, we took into account that according to the data of V. Jagiello et al. [21], who have been studying the morphological changes in the body of female athletes in various sports for many years, including athletes involved in martial arts and, in particular, judo, an important point in conducting anatomical, anthropological and morphofunctional studies, with the determination of index values, must be carried out in the corresponding weight categories of athletes, which gives the studies greater scientific value.

Recent years have shown a worldwide growth in the interest of young women in various types of martial arts and, in particular, in such a modern type as judo, which has its own history and its own specific rules and features in preparation for performances and in the fights themselves. The specificity of the training and competition period, the intensity of physical loads that require the development and improvement of strength, endurance, agility, excellent coordination, psychological stability and many other somatic and psychological indicators, require further, painstaking study by researchers involved in women's sports and, in particular, the problems of adaptation of the female body in athletes of different age groups and different sexual somatotypes to such loads. Close study is required for further study of adaptive, incl. and inverse somatic changes, primarily with the formation of sexual somatotypes in young female athletes that are opposite to their physiological state - a transitional, mesomorphic sexual somatotype and, polar opposite to the female (physiological), gynecomorphic sexual somatotype, andromorphic sexual somatotype [1,3-22]. In addition to changes in the functioning of all organs and systems, both individually and in their close functional interaction, intensive, long-term sports activities by women lead to serious, often irreversible pathological changes in the functioning of their endocrine and reproductive systems. Somatic and neuroendocrine changes that occur under the influence of various types of loads, sometimes excessive and inadequate for a young female body, lead to new, individually adaptive models, including multi-vector changes in the ovarian-menstrual cycle, which is an indicator, predictor of the functioning of the reproductive process in the body of each female athletes [1, 3-22]. In this regard, this work is one of the stages of a multifaceted study of adaptive changes in the body of female athletes, under the influence of intense physical and psycho-emotional loads on their body, in different age periods. In our opinion, the problem of adaptive changes, with dynamic somatic and psycho-emotional shifts, both in sexual somatotypes and in gender self-identification of the personality of female athletes, in masculine sports, is one, not fully studied problem of medical and biological research, modern women's sports [1, 3-22].

Aim of study

The purpose of this scientific study is to present an analysis of the results of the conducted study, based on the results of a number of anatomical-anthropometric and morphofunctional index values, reflecting adaptive changes in sexual somatotypes, in this group of adolescent female athletes involved in judo.

Hypothesis of the study

In the process of preparing and conducting this study, its author came up with a working hypothesis, the essence of which was as follows: with regular, intensive training in this type of sport, with intensive and long-term, permanent physical and psycho-emotional loads, young athletes experience various, individual, adaptive changes, often combined, both anatomical-anthropometric and morphofunctional.

Research objectives

1. To identify and analyze the possible, existing, individual, both anatomical-anthropometric and morphofunctional changes in female judokas of adolescence in a number of weight categories.

For this: 2. To conduct individual anthropometry and pelviometry of female athletes in their weight categories.

3. Based on the data obtained, to determine the existing anatomical-anthropological and morphofunctional changes in their sexual somatotypes and weight categories.

4. To analyze the obtained values and establish the relationship between the existing adaptive changes and inversions in the somatotypes of young judokas.

5. To try to establish the relationship between the identified anatomical-anthropological and morphofunctional changes and inversions of sexual somatotypes, with intense physical and psycho-emotional stress associated with the training and competition process, in the studied group of female judokas of adolescent age.

Material and methods

This study was conducted at a number of sports clubs and sports sections in Ukraine that train female athletes of different age groups and weight categories in the martial art of judo. The study involved female adolescent athletes (n=109) who were actively involved in this sport. In addition to age criteria, we involved female adolescent athletes in the study who belonged to the following three weight categories: juniors weighing 70 kg; juniors weighing from 70.1 to 78 kg; juniors weighing +78 kg, which corresponds to modern criteria for dividing into age and weight categories in modern judo [2]. To achieve the goal of the study, we used anthropometric methods such as determining the shoulder width (SW) and the pelvic width (PW), which are necessary to determine such a morphological index value as the sexual dimorphism index (SDI) according to J. Tanner. According to the obtained index values, somatotyping was carried out in female athletes, based on the criteria corresponding to the classification of J. Tanner and W. Marshall (Martirosov, Rudnev & Nikolaev, (2010). The values of the index of sexual dimorphism (ISD) are calculated according to their, the author's formula: 3 x biacromial sizes, or the width of the shoulders, minus the pelvic-crest size (d. cristarum), or the width of the pelvis.

We used as a basis the index values proposed by these researchers for women, namely: gynecomorphic sexual somatotype - less than 73.1; mesomorphic sexual somatotype - 73.1-82.1) and andromorphic sexual somatotype - more than 82.1 (Martirosov, Rudnev & Nikolaev, (2010). Mesomorphic and andromorphic sexual somatotypes are inversions, or pathological shifts, not characteristic of the basic gynecomorphic sexual somatotype [12]. We also assessed the state of a number of pelviometry data: determination of three transverse – d. spinarum, d. cristarum, d. trochanterica and 2 longitudinal (c. externs and c. vera – external dimensions of the bony pelvis of female athletes, in all three weight groups of judokas. In addition, the indicators of such morphofunctional index values were determined as the sexual dimorphism index (SDI), according to the method of J. Tanner and W. Marshall, as modified by E.P. Sharaikina (2005); the index of relative shoulder width (IRSW), or the morphological index for women; the index of relative pelvic width (IRPW), according to the method of E.N. Khrisanfova and I.V. Perevozchikov (1991); the andromorphy index (AI); the masculinization index (MI); the pelvic-humeral index (PHI) [3-22].

Abbreviation

- **ISD** - index of sexual dimorphism, according to the method of J. Tanner and W. Marshall, as modified by E.P. Sharaikina;
- **RSWI** - relative shoulder width index – morphological/morphjfuncional index for women;
- **IRPW** - index of relative pelvic width, according to the method of E.N. Khrisanfova and I.V. Perevozchikov (1991);
- **AI** - andromorphy index;
- **MI** - masculinization index;
- **PHI** - pelvic-humeral index;
- **GUNP** - generally uniformly narrowed pelvis;
- **SFP** - simple flat pelvis

In addition, the author of this study actively used the method of literary-critical analysis of both domestic and foreign sources of information available at the time of this study, including scientific articles and various scientific and methodological literature. When processing and analyzing the obtained digital data of anthropometry, pelvimetry, as well as morphofunctional/morphological index values, the method of mathematical statistics was used.

The study was conducted in compliance with the basic bioethical provisions of the Council of Europe Convention on Human Rights and Biomedicine (dated 04.04.1997), the Helsinki Declaration of the World Medical Association on Ethical Principles for Medical Research Involving Human Subjects (1964-2008), and the Order of the Ministry of Health of Ukraine No. 690 dated 23.09.2009. All athletes who took part in the study conducted by the author of this article gave both their oral and written consent.

Results and discussion

In the group of female adolescent athletes (n=109) involved in judo, after processing and analyzing the obtained research materials, we obtained the following results: the sports qualification of the athletes who took part in the study ranged from III-I rank to candidate for master of sports (CMS) and master of sports (MS). The length of practice in this sport ranged from 2.5 to 9 years. The frequency of training was 4-6 times a week, from 1.5 to 3 hours. The average age of female adolescent athletes was 19.11±0.34 years. The athletes were divided into 3 weight categories: juniors (under 21 years old), weighing 70, 78 and +78 kg [2]. Of these (n=109), there were 35 junior female athletes (32.11%) with a body weight of 70 kg, 38 (34.86%) joung female athletes from 70.1 to 78 kg, and 36 (33.03%) athletes up to + 78 kg.

The obtained anthropometric values in these three weight groups of female athletes are presented in Table 1, with $p \leq 0.05$:

Name of the indicator	Group with body weight 70 kg (n=35)	Group with body weight from 70.1 to 78 kg (n=38)	Group with body weight +78 kg (n=36)
Body length (cm)	167,13±0,76	169,67±0,98	171,53±1,03
Shoulder width - interacromial size (cm)	38,54±0,63	39,36±0,77	40,85±1,12
Pelvic width – intercrestal size (cm)	27,04±0,46	27,48±0,77	27,89±0,45
d. trochanterica (intertrochanteric size), (cm)	29,78±0,91	29,03±0,43	29,45±0,74
d. spinarum (interspinous size), (cm)	24,56±0,67	24,78±0,33	25,03±056
c. extena (external conjugate), (cm)	19,56±0,73	19,87±0,41	20,02±0,23
c. vera (true conjugate), (cm)	10,78±0,44	10,89±0,36	10,97±0,15

Table 1: Anthropometric and pelvimetric indices in 3 study groups of joung female judokas (n=109)

From the obtained data it follows that the girls of the presented groups are tall and above average [4, 11, 12]. At the same time, taking into account the pelviometry data, they have a narrow pelvis, with a decrease in its three transverse and two longitudinal external dimensions. The obtained calculations and comparisons of the size ratios in the entire group (n=109) made it possible to determine that normal (physiological) pelvic dimensions are present in 5 (4.59%) of all young judokas.

Generally, uniformly contracted pelvis (GUCP) was determined in 43 (39.45%) athletes, simple flat pelvis (SFP) – in 27 (24.77%), and transversely contracted pelvis – in 34 (31.19%) judokas. In 49 (44.95%), the first degree of pelvic contraction was determined, and in 21 (19.27%) – the second degree of narrowing of the bony pelvis.

After conducting the mandatory anthropometric measurements necessary for the mathematical determination of the SDI for each athlete, the shoulder width (SW) and pelvic width (PW) indicators were determined. The values of the sexual dimorphism index (SDI) are calculated using the author's formula of J. Tannera, W. Marshalla (2004): 3 x biacromial sizes, or SW minus the pelvic-crestal size (d. cristarum), or PW. We obtained the following values in the entire study group: SW - 30.76 ± 0.89 cm, and PW - 27, 14 ± 0.85 cm. The obtained data indicate the predominance of the SB sizes over the PW sizes in the group of volleyball players, which is not typical for the feminine figure type, with the pelvic width prevailing over the shoulder width. The obtained results of the somatotyping in the three studied weight groups of judokas are presented in Table. 2, at $p \leq 0.05$:

Name of the indicator	Group with body weight 70 kg (n=35)	Group with body weight from 70.1 to 78 kg (n=38)	Group with body weight +78 kg (n=36)
Gynecomorphic sex somatotype (less than 73.1) conventional units	3 (8,57%) female spotsmens	absent	absent
Mesomorphic sexual somatotype (somatotype – from 73.1 to 82.1) conventional units	28 (80,00%) female spotsmens	31 (81,58%) female spotsmens	25 (69,44%) female spotsmens
Andromorphic sexual somatotype (from 82.1 and above) conventional units	4 (11,43%) female spotsmens	7 (18,42%) female spotsmens	11 (30,56%) female spotsmens

Table 2: Identified sex somatotypes in a group of junior female judokas (n=109)

In general, in the studied group of young female judokas (n=109), the following value of the IPD was determined: 79.51±0.67, which corresponds to the values of the mesomorphic sexual somatotype in women [1, 3-22]. At the same time, in the entire studied group of adolescent female athletes (n=109), in the three studied groups, only 3 (2.75%) judokas had a physiological sexual somatotype; in the majority of the total number of athletes - 84 (77.06%), in three weight categories, a transitional, mesomorphic sexual somatotype was determined; In almost every fifth female judoka of adolescence, out of 109 athletes, in 22 (20.18%) athletes from the total number, we determined the indicators of the inverse, reverse physiological, andromorphic sexual somatotype [1, 3-22]. Based on the results of the calculation and analysis of the obtained results, it was established that together, mesomorphic (transitional) and inverse, andromorphic, were determined in 106 (97.25%) young judokas, in all three weight groups presented.

The female athletes who were identified as having a physiological gynecomorphic sexual somatotype, according to interview data, had insignificant training and competition experience, and moderate physical and psycho-emotional loads that were smaller in volume, duration and intensity than in the combined group of athletes with pronounced inverse sexual somatotypes. After conducting all the necessary anthropometric measurements and subsequent mathematical recalculations of a number of morphofunctional index values, the results presented in Table 3 were obtained, $p \leq 0.05$:

Name of the indicator	Group, with body weight 70 kg (n=35)	Group, with body weight from 70.1 to 78 kg (n=38)	Group with body weight +78 kg (n=36)
Relative Shoulder Width Index	23,33±0,49	23,52±028	24,32±0,88
Relative pelvic width index	16,38±0,53	16,55±0,78	16,39±0,67
Masculinization Index	1,42±0,43	1,42±0,89	1,48±0,47
Andromorphy index	56,13±0,12	61,47±0,87	65,53±0,76
Pelvic-humeral index	70,21±0,23	70,40±0,34	67,38±0,92

Table 3: Indicators of morphofunctional index values in 3 studied groups of junior female judokas (n=109)

The analysis of the obtained results of a number of morphofunctional index values indicates active somatic changes in the bodies of adolescent female judokas in all three weight groups, towards masculinization and hyperandrogenism. Thus, the obtained values of the masculinization index in each of the three weight groups of athletes significantly exceed the average values for adolescent girls in the population, and equal to 1.15-1.23 [1, 3-22]. The values of the andromorphy index in all three weight groups correspond to the hypergynoid type (value less than 67.5). The indicators of the relative pelvic width index (RPWI) and the pelvic-brachial index (PBI) indicate the phenomena of eupilia (narrow pelvis) and the athletes' body type, built according to the male type: with broad shoulders and a narrow pelvis. The morphia index for women – the index of relative shoulder width (IRSW) in young judokas, clearly indicates the progressive processes of mesomorphy, with shifts in its indicators to the upper limits of this transitional indicator, actively approaching the somatic manifestations of inverse andromorphy [1, 3-22]. All this corresponds to the identified sexual somatotypes in each of the weight groups, in which representatives of the mesomorphic and andromorphic sexual somatotypes predominate.

Conclusions

1. The results obtained by the author of this study fully confirmed the hypothesis put forward by him.

2. Based on the results of determining a number of anatomical and anthropological values, it was established that in the group of young female judokas, in all three weight categories, transitional mesomorphic and inverse, andromorphic sexual somatotypes were determined in 106 (97.25%) young athletes.

3. The results and analysis of a number of morphofunctional index values determined in the study in the study group indicate intensive adaptive somatic changes in athletes of all weight categories, aimed at masculinization of athletes and their existing hyperandrogenism.

4. In 104 (95.41%) athletes, a decrease (or a group of decreases in comparison with the physiological age norm) external transverse and / or longitudinal dimensions of the bone pelvis were determined, with identified changes in its shape.

5. According to the conducted pelviometry data, it was established that a generally uniformly narrowed pelvis (UNP) was determined in 43 (39.45%) ауьфду athletes, a simple flat pelvis (SFP) - in 27 (24.77%), and a

transversely narrowed pelvis (ET3) - in 34 (31.19%) young judokas. In 49 (44.95%) of them, the first degree of pelvic narrowing was determined, and in 21 (19.27%) - the second degree of narrowing of the bony pelvis.

6. We believe that the identified somatic changes, in all their diversity and combinations, are a consequence of the ongoing adaptive changes directly related to intense physical and psycho-emotional stress in athletes (in this case, adolescents), in the three studied weight categories, modern women's judo.

References

1. Bugaevsky, K. A, Bodnar, A. I, Tvelina, A. A, Andryushchenko, M. I, Telny, V. A, Isaenko M. V. (2018). "Women's athletic sports: the bone pelvis and its morphofunctional features in sex somatotypes". Ukrainian Journal of Medicine, Biology and Sport. Vol. 4. 1(17):276-282.
2. Weight categories in judo - Sports clubs.
3. Zaitsev, D. A. & Ivonina, Yu. P. (2013). Morphological indicators of sexual dimorphism in female athletes of different body types. Bulletin of the Magistracy, 2(17):7-9.
4. Zubareva, E. V, Rudaskova, E. S, & Adelshina, G. A. (2015). Model anthropometric profile of female athletes involved in judo. Physical education, sport, physical rehabilitation and recreation: problems and prospects for development. Proceedings of the V International Electronic Scientific and Practical Conference, edited by T. G. Arutyunyan. 38-41.
5. Mandrikov, V. B, Samusev, R. P, Zubareva, E. V, Rudaskova, E. S, & Adelshina, G. A. (2015). On the issue of inversion of sexual dimorphism indicators in representatives of masculine sports. Bulletin of VolGMU. 4 (56):76-78.
6. Kochetkova, E. F. & Oparina, O. N. (2014). Characteristics and Problems of Sexual Dimorphism in Sports. Modern Scientific Research and Innovations. 7:15-20.
7. Lopatina, L. A, Serezhenko, N. P, & Anokhina, Zh. A. (2013). Anthropometric Characteristics of Girls According to J. Tanner's Classification. Fundamental Research. 12-3:504-508.
8. Mandrikov, V. B, Samusev, R. P, Zubareva, E. V, Rudaskova, E. S. & Adelshina, G. A. (2013). The Impact of Sports on Somatic Indicators of Sexual Dimorphism in Girls with Different Body Types". Bulletin of VolGMU. 2 (46):17-19.
9. Mandrikov, VB & Samusev, RP, Zubareva EV, Rudaskova ES & Adelshina GA (2015). On the issue of inversion of sexual dimorphism indices in female representatives of masculine sports. Bulletin of VolGMU. 4 (56):76-78.
10. Mankevich, EA (2016). Morphological and psychological indices of sexual constitution in female representatives of masculine sports. Youth Scientific Forum: Natural and Medical Sciences: elec. collection of articles on mat. XXXIX int. student scientific-practical. conf. 10(38):30-37.
11. Martirosov E. G, Semenov M. M, Martirosova K. E, Romanova T. F. & Baluchi R. (2013). Morphological characteristics of female freestyle wrestlers. Moscow University Bulletin. Series 23. Anthropology. 2:63-85.
12. Martirosov E. G, Rudnev S. G. & Nikolaev D. V. (2010). Application of anthropometric methods in sports, sports medicine and fitness. Study guide. Moscow: Physical Education. 144.
13. Nadeina, S. A, Klots, V. M, Zvyagintseva, L. A. & al. (2011). Determination of morphofunctional features in athletes with different somatotypes according to J. Tanner's classification. Bulletin of Altai State University. 3-2:26-29.
14. Nenenko, N. D, Abramova, O. A, Chernitsyna, N. V. & Kuchin, R. V. (2014). A study of gender-dependent characteristics of female athletes representing feminine, macular and neutral sports. Modern Problems of Science and Education. 6:15-25.
15. Nerobeev, N. Yu. & Tarakanov, B. I. (2012). Theoretical and practical aspects of women's sports training in freestyle wrestling, taking into account sexual dimorphism: Monograph. St. Petersburg: "Olimp-SPb". 140.
16. Oleynik, E. A. & Bugaevsky, K. A. (2020). A study of the prevalence of sexual somatotype inversions in women's artistic gymnastics. Scientific Notes of the P.F. Lomonosov University. Lesgaft. 4 (182):325-328.
17. Piskov, S. I. (2008). The influence of somatotype on adaptive reactions in female wrestlers". Siberian Medical Journal. T. 80:5: 72-75.
18. Piskov, S. I. (2009). Features of the physique of female wrestlers of various qualifications". Vestn. Tom. state University. 319:195-197.
19. Semenov M.M, Nikityuk D.B. (2018). Factor structure of female wrestlers' physique and construction of centile scales. Sports Medicine: Science and Practice, 8, 4:8-33.
20. Semenov M.M., Martirosova K.E., Martirosov E.G. (2016). "Somatotype of highly skilled female wrestlers of different weight categories in terms of sexual dimorphism". Bulletin of Moscow University. Series XXIII. Anthropology, 4:92-110.
21. Jagiello W, Wołowicz J. (2009) Body structure of representatives of the Polish youth judo team. PPMBPFS, 12:196-201.
22. Bugajewski, K. A. (2020). Sporty walki kobiet: inwersje w samoidentyfikacji płci i somatotypach płciowych. POLISH SCIENCE JOURNAL. ISSUE 3(24). Warsaw: Sp. z o. o. "iScience", 60-65.