



Research of Peculiarities of Formation of Inversive Sexual Somatotypes in Different Age Groups in Women Sambo

 Konstantin Bugaevsky¹,  Lina Rybalko² and  Walery Zukow^{3*}

1. Faculty of Physical Training and Sports, Petro Mohyla Black Sea State University, Nikolaev City, Ukraine.
2. Faculty of Physical Education and Sports, Yuri Kondratyuk National Technical University, Poltava, Ukraine.
3. Nicolaus Copernicus University, Torun, Poland.

* Corresponding author

ARTICLE INFORMATION

Original Research Paper

Doi:

Received October. 2019

Accepted December. 2019

Keywords:

portswomen,
sambo wrestling, age groups,
sexual dimorphism, sex somatotypes,
inversion of sex somatotypes,
adaptation.

ABSTRACT

Purpose: to present comparative results of the study, to determine the existing changes in the individual indicators of sex somatotypes, and the inverse values obtained for athletes of different age groups involved in female sambo. Material and methods: analysis of scientific and methodological literature; anthropometry, pelviometry, questioning; methods for determining morphological index values, the method of mathematical statistics. Results: the data on the identified individual somatic and morphological changes in the revealed sex somatotypes, in the process of medical and pedagogical observations in ontogenesis, among athletes of different age groups involved in female sambo are considered. Conclusions: According to the results of the study, it was determined that in the study group there are manifestations of inversions of sexual somatotypes, the number of which increases with the duration of training in this type of martial arts and an increase in physical and psycho-emotional stress in the training and competitive process. We believe that the revealed changes on the part of the anatomical and morphofunctional indicators, including and the values of the J. Tanner index of sexual dimorphism, determined among athletes of all three age groups and inversions in sexual somatotypes, are caused by individual adaptive changes in the athletes' bodies, directly related to the physical and psycho-emotional stresses experienced by them, when they engage in this sport. The obtained results indicate how there are problems in the state of health of this group of athletes, which require increased medical supervision over them. Identified somatic changes in inverse sex somatotypes require a review by the coaching team of individual loads when planning training-competitive algorithms in micro-, meso- and macrocycles.

1. Introduction

Women's sports, especially those that were previously considered exclusively male, are the subject of special attention of scientists dealing with their biomedical aspects in female athletes of different age groups. The subject of research are anatomical, morphological, somatic, psychological and other changes in the body of a woman with intense, professional sport.

An important point in current research is the relationship between different types of loads in sportswomen of different age groups, and adaptation processes that are associated with the formation of changed female sportswomen, non-physiological sex somatotypes, leading to the restructuring of all organs and systems of the female body, changes in endocrinology balance, impairment of female reproductive function.

2. Literature Review

Analyzing the available scientific, scientific and methodological literature and internet sources for the problem, we found that the issues of reversing gender somatotypes in athletes of different age groups, in various types of modern women's sport, including and female sambo, involved in such domestic and foreign researchers, such as: S.A. Nadeina, W.M. Kłoc, L.A. Zwiagincewa i in. (2011); N. Ju. Nierobiejew i B.I. Tarakanow, (2012); D.A. Zajcew, Ju.P. Iwonina, (2013); L.A. Łopatina, N.P. Sereżenko, Ż.A. Anochina, (2013); W.B. Mandrikow, R.P. Samusiew, E.W. Zubariewa, E.S. Rudaskowa, G.A. Adelszyna (2013); E.F. Koczetskowa, O.N. Oparina, (2014); N.D. Nenenko, O.A. Abramowa, N.W. Czernicyna, R.W. Kucin, (2014); W.B. Mandrikow, R.P. Samusiew, E.W. Zubariewa, E.S. Rudaskowa, G.A. Adelszyna, (2015); K.A. Bugajewski, A.W. Czerkasowa (2016); M.M. Siemionow, K.E. Martirosowa, E.G. Martirosow, (2016); K.A. Bugajewski & E.N. Olejnik, (2017); K.A. Bugajewski, (2018a); K.A. Bugajewski i E.N. Olejnik, (2018b).

The problems of the impact of intense physical and psychological loads on the body of female athletes and problems with adapting the body of athletes to these loads have been studied by such researchers: I.W. Dutowa, (2002); S.N. Bielik, I.W. Podgorny, Ju.W. Możyńska (2014); A.N. Korzeniewski, B.A. Podliwajew, B.A. Smirnowa, B.I. Tarakanow, (2014); K.A. Bugajewski, A.W. Czerkasowa (2016); K.A. Bugajewski & E.N. Olejnik, (2017); K.A. Bugajewski, (2018a); K.A. Bugajewski i E.N. Olejnik, (2018b).

3. Method

The aim of the article: to present comparative results of the study, to determine the existing changes in individual indicators of sex somatotypes and the inverse values obtained for sportswomen in different age groups participating in the women's sambo.

Research tasks: identification and analysis of changes available to sportswomen involved in sambo wrestling. To achieve this, it is necessary:

1. Carry out the anthropometric measurements necessary to calculate the individual indicators of sexual dimorphism (hereinafter referred to as SDI) and, respectively, the values of sex somatotypes in all three examined groups of sportswomen.
2. To analyze the SDI values obtained and establish the relationship between existing adaptive changes in somatotypes that affected the identified inversions of sambo sportswomen from all three age groups.
3. Establish the relationship between the identified inversions of sex somatotypes in sportswomen, with intense

physical and psycho-emotional stress associated with the training and professional process, in the studied groups of sportswomen-sambo wrestlers.

3.1. Participants

The study was conducted on the basis of a number of sports clubs and sports sections of Ukraine: Kherson region (Kherson, Nowa Kachovka), Poltava, Mykolaiv, Zaporozhye, involved in training sportswomen of all ages, in this form of martial arts, as sambo supplies. The study included sportswomen from three age groups (n = 89): adolescence (n = 29), adolescence (n = 33), and reproductive age (n = 27) actively involved in this type of martial arts.

3.2. Materials

To achieve the purpose of the study, we used anthropometric methods, such as determining shoulder width (SW) and pelvis width (PW), necessary to determine the value of the morphological index, such as the index of sexual dimorphism (SDI) according to J. Tanner. According to the obtained index values, somatotyping was carried out in athletes based on the criteria corresponding to the classification of J. Tanner and W. Marshal [4, 5, 7, 9, 10, 13].

3.3. Procedure

Values of the sexual dimorphism index (SDI) are calculated according to their own formula: triple value of biacromial size (or SW) minus pelvic crest size (d. Cristarum) - (or PM) [4, 5, 7, 9, 10, 13]. As a basis, we adopted the values of indicators proposed by these researchers for women, namely: gynecorphic sex somatotype - less than 73.1; mesomorphic sex somatotype - 73.1–82.1) and andromorphic sex somatotype - over 82.1 [4, 5, 7, 9, 10, 13]. Mesomorphic and andromorphic sexual somatotypes refer to inversions or pathological displacements that are not characteristic of the basic gynecorphic sex somatotype [4, 5, 7, 9, 10, 13].

4. Results

In all three age groups of sportswomen (n = 89), after processing and analyzing research materials, we obtained the following results: sports qualifications of sportswomen taking part in the survey - from category III-I to the candidate for the title of Master of Sports (KMS) and Master of Sport (MS). Experience in practicing this sport is from 1.5-2 to 10 years. The training frequency is 4-5 times a week, from 1.5 to 2.5 hours. Average age of sportswomen in the studied groups: sportswomen of adolescence - 13.69 ± 1.38 years; young sportswomen - 18.47 ± 1.69 years; sportswomen in the 1st reproductive age - 24.76 ± 1.26 years. The age periods of the surveyed sportswomen were determined in accordance with generally accepted age periods of ontogenetic development for women: adolescence - girls aged 12-15; adolescence (girls) - 16-20 years old; in the first reproductive age (young women) - 21-35 years [1, 6, 15]. After compulsory anthropometric measurements necessary for the mathematical determination of SDI, shoulder width (SW) and pelvis width (PW) were determined for each sportswoman. The obtained measurement data in the three examined groups of sportswomen (n = 89) are presented in Table 1, with a p value of ≤ 0.05 :

Table 1. Anthropometric indicators in sambo wrestlers in age groups

Indicator names	Shoulder width (cm)	Pelvis width (cm)
-----------------	---------------------	-------------------

Sportswomen in adolescence (n = 29)	29.14 ± 0.35	26.97 ± 0.11
Youth sportswomen (n = 33)	31.36 ± 0.53	27.04 ± 0.35
Sportswomen reproductive I age sportswomen (n = 27)	32.78 ± 0.64	27.93 ± 0.71

5. Discussion

The obtained results of anthropometric results in all three examined groups clearly indicate the advantage of the size of SW of sportswomen over their pelvis width, which is not physiological for women. The obtained values of the SW / PW ratio indicate masculinization processes, reversal of sex somatotypes in the mesomorphic and andromorphic direction, their values, and manifestation of androgenic symptoms in the hormonal balance of sex steroids in sportswomen in the somatotype [2, 3, 8, 14, 16]. Values of the sexual dimorphism index (SDI), calculated according to the formula of authors J. Tanner, W. Marshał (2004) [4, 5, 7, 9, 10, 13].

The obtained data on the SzR / SzM ratios, given in Table 1, indicate the advantage of the shaft size in all age groups of sportswomen-sambo wrestlers over the size of the shaft, which is not typical for the female body type, with the pelvic width prevailing over the shoulder width [2, 8, 11, 12, 16]. In each age group of sportswomen, after receiving anthropometric values of their shoulder and pelvic widths, the necessary mathematical calculations were carried out and somatotyping was carried out in order to create the appropriate sex somatotypes of female sambo sportswomen in each examined group. The somatotyping results obtained in the three studied age groups of female sports wrestlers (n = 89) are shown in Table 2, with a p value of ≤ 0.05 :

Table 2. Gender somatotypes defined in age groups

Indicator names	Gynecorphic sex somatotype	Mesomorphic sex somatotype	Andromorphic sex somatotype
Sportswomen in adolescence (n = 29)	10 (34.48%) sportswomen	19 (65.52%) sportswomen	—
Youth sportswomen (n = 33)	5 (15.15%) sportswomen	24 (72.73%) sportswoman	4 (12.12%) sportswoman
Sportswomen reproductive I age sportswomen (n = 27)	2 (7.41%) sportswoman	17 (62.96%) sportswomen	8 (29.63%) sportswomen

Generally, the following sex somatotypes were determined in all three groups of sambo wrestler sportswomen (n = 89): in 17 (19.10%) sportswomen, the values of the sexual dimorphism index were obtained, corresponding to the physiological, gynecorphic sex somatotype. His number was steadily decreasing in each age group, which correlated with the duration of training and experience of sportswomen and the increase in their duration and intensity of physical and psycho-emotional stress. In 72 (80.90%) of all female sportswomen practicing sambo, inverse, pathological sex somatotypes corresponding to the values of mesomorphic and andromorphic sex somatotypes in women were determined, as well as inverse, mesomorphic (transient) and andromorphic (not physiological for women) sex somatotypes [2, 8, 11, 12, 16].

As a result of additional interviews, it was established that reverse, mesomorphic and andromorphic sex somatotypes were determined in athletes who actively engage in wrestling from 3.5 to 10 years. These girls participated as often as possible, both in the training process and for as long as possible, in periods of micro-, meso- and macrocycles. Athletes with physiological gynecological sex somatotype (17 (19.10%) and initial boundary values of mesomorphic (transient) sex somatotype - 19 (21.35%), according to interviews, had little training and competitive experience, and moderate, less than in the group athletes with pronounced reverse sex somatotypes, physical and psycho-emotional stress.

6. Conclusions

1. Based on the results of determining the SDI value, it was found that in each age group of sportswomen engaged in sambo wrestling there is a reversal of sex somatotypes that correlate with the sports experience of these sportswomen, the duration and intensity of their training time.

2. It was established that in all three age groups, sportswomen with a preserved physiological sex somatotype - gynecological, there are only 17, or (19.10%) of the total number of all sportswomen participating in our study.

3. It was found that 72 (80.90%) of all sportswomen had reverse sex somatotypes corresponding to mesomorphic values, in 60 (67.42%) and in 12 (13.48%) women sportswomen in sambo fight – andromorphic.

Prospects for further research in this direction. In the future, it will be interesting to conduct research in this and other age groups of sportswomen, by definition, the symptoms of masculinization and hyperandrogenism, in their individual sex somatotypes.

Conflict of interest. The authors note that there is no conflict of interest.

Sources of financing. This article has not received financial support from a state, public, or commercial organization.

References

1. Belik, S. N., Podgornyj, I. V. & Mozhinskaja Ju. V. (2014). Vlijanie sportivnoj dejatel'nosti na reproduktivnoe zdorov'e devushek. [Influence of sports activity on reproductive health of girls]. Sborniki konferencij NIC Sociosfera, 33. 103–111.
2. Bugaevskij, K. A. & Cherkasova, A. V. (2016). Izuchenie morfologicheskikh i anatomicheskikh osobennostej organizma i kostnogo taza, devushek, zanimajushhiesja vol'noj bor'boj. [Study of morphological and anatomical features of the body and the pelvis, girls engaged in freestyle wrestling]. Sbornik nauchnyh trudov Vserossijskoj nauchno-prakticheskoy konferencii s mezhdunarodnym uchastiem «Strategicheskie napravlenija reformirovanija vuzovskoj sistemy fizicheskoy kul'tury». SPb. 43-45.
3. Bugaevskij, K. A. & Olejnik, E. A. (2017). Pal'cevoj indeks «2D:4D» u sportsmenok, zanimajushhiesja pankrationom i bor'boj sambo. [Finger index “2D: 4D” for athletes involved in pankration and sambo wrestling]. Vestnik Nacional'nogo gosudarstvennogo universiteta fizicheskoy kul'tury, sporta i zdorov'ja imeni P.F. Lesgafta, Sankt-Peterburg. № 12 (154). 207-210.
4. Bugaevskij, K. A. (2018a). Analiz pokazatelej polovogo dimorfizma v rjade zhenskih edinoborstv. [Analysis of indicators of sexual dimorphism in a number of female martial arts]. Aktual'nye problemy v oblasti fizicheskoy kul'tury i sporta. Materialy Vserossijskoj nauchno-prakticheskoy konferencii s mezhdunarodnym uchastiem, posvjashhennoj 85-letiju FGBU SPbNIIFK (27-28 sentjabrja 2018 goda). Federal'noe gosudarstvennoe bjudzhetnoe uchrezhdenie «Sankt-

- Peterburgskij nauchno-issledovatel'skij institut fizicheskoj kul'tury», SPb: FGBU SPbNIIF. T. 1. 185-188.
5. Bugaevskij, K. A. & Olejnik, E. A. (2018b). Sravnenie znachenij indeksa polovogo dimorfizma u sportsmenok junosheskogo vozrasta, zanimajushhihsja raznymi vidami sportivnyh edinoborstv. [Comparison of the values of the index of sexual dimorphism in young athletes involved in various types of martial arts]. Aktual'nye voprosy rehabilitacii, lechebnoj i adaptivnoj fizicheskoj kul'tury i sportivnoj mediciny: Materialy Vserossijskoj nauchno-prakticheskoj konferencii. Cheljabinsk : UralGUFK. 40-45.
 6. Dutova, I. V. (2002). Bor'ba sambo kak jeffektivnoe sredstvo fizicheskogo vospitanija devocek-podrostkov. [Sambo wrestling as an effective means of physical education for teenage girls]. Avtoref. dis. ... kand. ped. nauk / I. V. Dutova. Tula. 24 s.
 7. Zajcev, D. A., & Ivonina, Ju. P. (2013). Morfologicheskie pokazateli polovogo dimorfizma u sportsmenok raznogo teloslozhenija. [Morphological indicators of sexual dimorphism in athletes of different physiques]. Vestnik magistratury, № 2 (17). 7-9.
 8. Korzhenevskij, A. N., & Podlivaev, B. A, Smirnova, N. V., & Tarakanov B. I. (2014). Osobennosti adaptacii k nespecificheskoj nagruzke borcov vol'nogo (muzhchiny i zhenshhiny) i greko-rimskogo stilja, otlichajushhihsja razlichnym urovnem sportivnyh dostizhenij. [Features of adaptation to the non-specific load of freestyle wrestlers (men and women) and Greco-Roman style, differing in different levels of sports achievements]. Nauchno-teoreticheskij zhurnal «Uchenye zapiski universiteta imeni P.F. Lesgafta», 12 (118). 110-117.
 9. Kochetkova, E. F., & Oparina, O. N. (2014). Osobennosti i problemy polovogo dimorfizma v sporte. [Features and problems of sexual dimorphism in sports]. Sovremennye nauchnye issledovanija i innovacii, 7, 15-20.
 10. Lopatina, L. A., Serezhenko, N. P., & Anohina, Zh. A. (2013). Antropometricheskaja harakteristika devushek po klassifikacii Dzh. Tannera. [Anthropometric characteristics of girls according to the classification of J. Tanner]. Fundamental'nye issledovanija, 12-3, 504-508.
 11. Mandrikov, V. B., Samusev, R. P., Zubareva, E. V., Rudaskova, E. S. & Adel'shina G. A. (2013). Vlijanie zanjatij sportom na somaticheskie pokazateli polovogo dimorfizma u devushek raznyh tipov konstitucii. [The influence of sports on the somatic parameters of sexual dimorphism in girls of different types of constitution]. Vestnik VolgGMU, 2 (46), 17-19.
 12. Mandrikov, V. B., Samusev, R. P., Zubareva, E. V., Rudaskova, E. S., & Adel'shina, G. A. (2015). K voprosu ob inversii pokazatelej polovogo dimorfizma u predstavitel'nic maskulinnyh vidov sporta. [On the issue of inversion of sexual dimorphism in representatives of masculine sports]. Vestnik VolgGMU. 4 (56). 76-78.
 13. Nadeina, S. A., Kloc, V. M., & Zvjaginceva, L. A. (2011). Opredelenie morfofunkcional'nyh osobennostej u sportsmenov s razlichnymi somatotipami po klassifikacii Dzh. Tannera. [Definition of morphofunctional features in athletes with different somatotypes according to the classification of J. Tanner]. Izvestija AltGU, 3-2, 26-29.
 14. Nenenko, N. D., Abramova, O. A., Chernicyna N. V. & Kuchin, R. V. (2014). Issledovanie polozavisimyh harakteristik sportsmenok, predstavitel'nic feminnyh, makulinnyh i nejtral'nyh vidov sporta. [Research polozavisimyh characteristics of female athletes, representatives of feminine, makulina and neutral sports]. Sovremennye problemy nauki i obrazovanija, 6, 15-25.
 15. Nerobeev, N. Ju. & Tarakanov, B. I. (2012). Teoreticheskie i prakticheskie aspekty sportivnoj podgotovki zhenshhin

v vol'noj bor'be s uchetom polovogo dimorfizma: monografija. [Theoretical and practical aspects of women's sports training in freestyle wrestling taking into account sexual dimorphism: a monograph]. SPb. : Olimp. 140 s.

16. Semenov, M. M. & Martirosova, K. Je., Martirosov Je. G. (2016). Somatotip zhenshin-borcov vysokoj kvalifikacii razlichnyh vesovyh kategorij v aspekte polovogo dimorfizma. [Somatotype of highly qualified female wrestlers of various weight categories in the aspect of sexual dimorphism]. Vestnik Moskovskogo universiteta. Serija XXIII. Antropologija. № 4. 92-10.