

Analysis of the Values of Sexual Somatotypes in Youth Female Athletes in Martial Arts and Athletic Sports

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Abstract

The article presents research materials on the determination of sexual somatotypes in 162 female youth athletes in 10 types of martial arts and athletic sports. It has been determined that female athletes in all represented sports have inverse sexual somatotypes - mesomorphic and andromorphic. We believe that the identified inverse sexual somatotypes are a consequence of adaptive processes that arise in female athletes of this age group under the influence of intense physical activity.

Key words: sportswomen; youthful age; martial arts; athletic sports; sexual dimorphism; sexual somatotypes; inversion; adaptation

Introduction

Problems related to the peculiarities of women's activities, many sports that were initially considered "male" sports, the construction of the training and competitive process at all its stages and, naturally, medical and biological problems associated with this - this is a far from complete list issues that coaches, sports doctors and psychologists are working on today in many countries around the world [1-15]. Martial arts, boxing, athletic sports for women and different age groups have become a practical reality today and are active and widespread. The study of somatic adaptive changes that occur in the ontogenesis of the female body, under the influence of frequent and intense physical and psychological stress, adaptive modifications in the work of all organs and systems of the female body, a reflection of the influence of professional sports on female bodies of different ages, possible complications and consequences of such, often inadequate loads [1-5,10-13]. All this is an object of study for today's medical science, pathological anatomy and physiology, psychology, sports medicine and sciences related to women's physical education and sports [1-15].

Aim of study

Based on the results of individual values of the sexual dimorphism index and the performed somatotyping, to determine the presence and prevalence of inverse sexual somatotypes in female adolescent athletes in the presented types of martial arts and athletic sports.

Abbreviations

- **WP** - width of the pelvis;
- **WS** - width of the shoulders;
- **SDI** - sexual dimorphism index, according to J. Tanner;

Material and methods

The study was carried out in accordance with the theme of the research work of the Black Sea National University named after Peter Mogila, Nikolaev: "Study of the medical and biological features of adaptation of the female body when practicing strength sports and martial arts" and the National Technical University "Dnepr Polytechnic", Dnepr: "Valeological foundations of physical education of students."

This study was conducted on the basis of sports clubs and sports sections of a number of regions of Ukraine (Zaporozhye, Dnepropetrovsk, Kherson), which train athletes of different age groups, in various types of women's martial arts, women's boxing, in a number of athletic sports, in the period 2017-2019. During this period of time, female athletes of adolescence (n=162) actively involved in these sports took part in the study. Of these: athletes involved in women's boxing (n=13), kickboxing (n=14), Kyokushin-karate (n=24), pankration (n=12), freestyle wrestling (n=16), taekwon-do (n =14), sambo (n=33), weightlifting (n=11), powerlifting (n=12), kettlebell lifting (n=13).

To achieve the goal of the study, we used such anthropometric methods as determining shoulder width (WS) and pelvic width (WP), necessary to determine such a morphological index value as the sexual dimorphism index (SDI) according to J. Tanner's classification. According to the obtained index values, through mathematical recalculation, somatotyping was carried out in female athletes, based on the criteria corresponding to the classification of J. Tanner and W. Marshall [3,8,9,14,15]. The values of the index of sexual dimorphism (SDI) are calculated according to their own formula: 3 x (multiply) by the indicator of individual biacromial size, or shoulder width (WS), minus the pelvic-crestal size (d. cristarum), or pelvic width (WP). We took 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 [3,8,9,14,15]. Mesomorphic and andromorphic sexual somatotypes refer to inversions, or pathological displacements that are not characteristic of the basic

gynecomorphic sexual somatotype [3,6,8,14,15]. Also, the method of literary analysis of available sources of information and extensive interviewing of participants in the study, and the method of mathematical statistics were used.

Results and discussion

After carrying out the anthropometric measurements necessary to determine the index of sexual dimorphism (SDI), including obtaining the values of shoulder width and pelvic width, as well as subsequent mathematical calculations of individual values for each athlete in her age group, somatotyping was carried out [3,8,9, 14,15]. In the group of female youth athletes (n=162), after processing and analyzing the received research materials, we obtained the following results, which are presented in the table, with $p \leq 0.05$:

Gynecomorphic sexual somatotype	Mesomorphic sexual somatotype	Andromorphic sexual somatotype
Women's boxing (n=13)		
2 (15,39%) women athletes	7 (53,85%) women athletes	4 (30,77%) women athletes
Kickboxing (n=14)		
2 (14,29%) women athletes	9 (64,28%) women athletes	3 (21,43%) women athletes
Kyokushin - karate (n=24)		
3 (12,5%) women athletes	16 (66,67%) women athletes	5 (20,83%) women athletes
Pankration (n=12)		
4 (33,33%) women athletes	7 (58,33%) women athletes	1 (8,33%) women athletes
Freestyle wrestling (n=16)		
9 (56,25%) women athletes	5 (31,25%) спортсменок	2 (12,5%) women athletes
Taekwon-do (n=14)		
2 (14,29%) women athletes	9 (64,28%) women athletes	3 (21,43%) women athletes
Sambo (n=33)		
5 (15,15%) women athletes	24 (72,73%) women athletes	4 (12,12%) women athletes
Weightlifting (n=11)		
1 (9,09%) women athletes	6 (54,55%) women athletes	4 (36,36%) women athletes
Powerlifting (n=12)		
1 (8,33%) women athletes	6 (50,00%) women athletes	5 (41,67%) women athletes
Kettlebell lifting (n=13)		
No	9 (69,23%) women athletes	4 (30,77%) women athletes

Table: Variants of sexual somatotypes in adolescent female athletes (number of people, %)

As the analysis of the performed somatotyping showed, based on the results of the obtained IDI values, the gynecomorphic sexual somatotype was determined in 29 (17.90%) female athletes of adolescence, the mesomorphic sexual somatotype - in 98 (60.49%) athletes, and the andromorphic, inverse sexual somatotype, in this age group, was determined in 35 (21.61%) female youth athletes. In the group of female adolescent athletes, representatives of inverse (mesomorphic and andromorphic) sexual somatotypes, 133 (82.10%), or the overwhelming majority of all female athletes, were identified. Our additional extended interviewing of female athletes showed that the least number of somatic changes in gender somatotypes were observed among female athletes of adolescence, with little sports experience - from 1.5 to 2.5 years. As the

biological age of female athletes and their sports experience increased, not only their physical and psychological stress increased, but also the frequency and intensity of training and competitions. In parallel, somatic changes occurred in the form of a decrease in adipose tissue, its replacement with muscle mass, changes in the activity of the respiratory, cardiovascular, reproductive endocrine systems, with changes in the frequency, volume and duration of the ovarian-menstrual cycle of female athletes [1,2,4,5, 7]. Also, these athletes, as a result of adaptive processes, experienced changes in their sexual somatotypes, gradually shifting

towards a transitional, mesomorphic sexual somatotype with the subsequent formation of an inverse, andromorphic sexual somatotype.

The data obtained on the identified sexual somatotypes in 162 female adolescent athletes representing 10 types of martial arts and athletic sports, as well as their analysis, allows us to assert that the practice of adolescent girls in traditionally male sports leads to adaptive deformations of their basic, gynecomorphic sexual somatotype, which, as a result of the adaptive adaptation occurring in them, leads to a shift in somatic indicators of IPD. Additional interviewing and data on psychological disorders, which were not included in the results of this study, allow us to draw preliminary conclusions about the existing psychological changes in a number of female athletes: manifestations of anxiety, aggressiveness (situational and personal), violations in gender identification of personality type (GIPT), mainly in athletes with andromorphic and, partly, with mesomorphic sexual somatotype at maximum, "upper" values of SDI.

In our study, inverse somatotypes, mesomorphic and andromorphic, were most often found in female adolescent female athletes: mesomorphic sexual somatotype - in kickboxing, taekwon-do, kettlebell lifting - 9 female athletes each, Kyokushinkai karate - 16, sambo - 24 female athletes. The andromorphic sexual self-type was most often found among

athletes in women's boxing, sambo, weightlifting and kettlebell lifting - 4 each, Kyokushinkai karate and powerlifting - 5 female athletes each.

Conclusions

1. In all types of martial arts and athletic sports, changes occur in the basic (initial) sexual somatotypes.
2. According to the results of the study, it was established that in all the presented sports, among female athletes of adolescence, inverse, non-physiological sexual somatotypes dominate: mesomorphic - in 98 (60.49%) female athletes, and inverse andromorphic sexual somatotype - in 35 (21.49%). 61% were female athletes, in total – in 133 (82.10%) girls of adolescence.
3. We believe that the identified individual shifts of sexual basic somatotypes towards inversely changed ones are a forced adaptive (adaptive) process in their bodies, as a response to intense and, at times, inadequate stress, both physical and psychological.
4. Somatic inversion changes, especially in the presence of an andromorphic sexual somatotype, negatively affect the body of female athletes, with severe changes in the functioning and restructuring of their endocrine and reproductive systems.
5. All athletes with inverted gender somatotypes need enhanced medical supervision by sports and specialized doctors (endocrinologist and gynecologist, reproductive specialist), and if psychological problems are identified, also by a psychologist, as well as a review by the coaching team of the frequency and intensity of the training and competitive process.

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