

Study of Gender Somatotype Variants in Women Engaged in Powerlifting

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Abstract

The article presents the results of a study devoted to the study of the prevalence of different variants of sexual somatotypes, including their inverse types in female athletes professionally involved in powerlifting. The analysis of their anthropometric and morpho functional indicators is presented, the values of which indicate the somatic adaptive processes occurring in their bodies, directly related to their intense physical activity. As a result of the analysis of the obtained results of the study, its author reliably established that in female athletes, as a result of intense physical activity, inverse values of the masculinization index, the index of sexual dimorphism of the pelvic-humeral index are formed. It was established that in the studied group of female athletes, as the sports experience, intensity of frequency and volume of physical activity increase, a change in the differentiation of their somatic sexual somatotype adaptively occurs, both towards mesomorphy and, to a significant extent, andromorphy.

Aim of the article

The aim of the study was to determine and analyze a number of individual anthropometric indicators (shoulder and pelvic width) in the studied group of young female athletes, based on the results of which the values of the sexual dimorphism index (SDI) were calculated, with the subsequent identification of gynomorphic, mesomorphic and andromorphic sexual somatotypes.

Hypothesis of the article

During the preparation for this study, the author came up with a working hypothesis, the essence of which was as follows: in female athletes involved in one of the original, strength sports, such as powerlifting, under the influence of long-term and intense, physical and psycho-emotional loads, during their training and competitive processes, the growth of sports skills, over time, in their body, adaptive-adaptive processes occur, which gradually lead to significant changes in almost all organs and systems of their body. First of all, this concerns the endocrine, reproductive, cardiovascular systems, which ultimately leads to the formation of an adaptive-transitional, mesomorphic sexual somatotype, and in some cases - an inverse, reverse physiologically determined - gynomorphic sexual somatotype, a pathological, andromorphic sexual somatotype.

Method and materials of the study

In writing this research article, the author used the method of literary-critical analysis of available materials, both domestic and foreign, on the issue under study. In addition, the study used the anthropometric method, as well as the index method with the calculation of the masculinization index (MI), pelvic-humeral index (PHI), sexual dimorphism index (SDI), body mass index (BMI). Statistical processing of the obtained data and comparative, theoretical analysis of all available literary and scientific-methodological sources on the issue under study and comparison of the data obtained by the author with the results of other studies were carried out. Also, the author of the study studied the available medical documentation of the athletes who took part in the study. In addition, all athletes participating in the study gave their voluntary, as well as written consent, to participate in it. Also, the method of mathematical statistical processing of the obtained research results was used.

Key words: female athletes, powerlifting; sexual dimorphism; sex somatotype; inversions; anthropometric indicators; adaptive processes

Abbreviations

MI - masculinization index;

PHI - pelvic-humeral index;

SDI - sexual dimorphism index;

BMI - body mass index.

Introduction

Recently, there has been a trend towards people of different genders and different age groups becoming interested in strength sports [1, 2]. Strength sports and powerlifting in particular are a prestigious form of active leisure, which for many subsequently becomes a professional activity. This also applies to the interest of young women in obviously male types of sports, which include powerlifting. In training halls, female athletes of adolescence and early reproductive age actively train together with men, trying to keep up with their male colleagues in conquering the heights of this popular sport. At the same time, under the influence of long and intensive training, which takes place over significant periods of time both during training and performance, a complex somatic restructuring occurs in the body of young

women with a change in the muscle and fat mass of their body. There is also a neuroendocrine, adaptive restructuring of their hormonal system, which controls this actively changing body with the involvement of all organs and systems in this complex adaptation mechanism [1, 2]. Medical and biological processes that occur during the period of adaptation of the female body to conditions of long-term and active overload, leading to varying degrees of expression of somatic changes in the sexual somatotypes of athletes and their somatic sexual differentiation, have been a close object of study for many specialists around the world in recent years [1-7].

Results of the study and discussion

The material for the study was collected at the sports bases of clubs and sections where young female athletes of average age 23.47 ± 1.24 , involved in powerlifting from a number of regions of Ukraine (Kherson, Nikolaev, Zaporizhzhya), are trained. The total number of participants was 27 people with sports skills indicators from a candidate for master of sports (CMS) and master of sports (MS). The training regime was at least 5-6 times a week and lasted 2.5 - 3 hours per training session. The duration of sports experience of female athletes in this sport was 5-10 years.

Anthropometric indicators	Results obtained
Biacromial diameter, or shoulder width, cm	40,47±1,24
Pelvic-crestal diameter/pelvic width, cm, or distantia cristarum	27,03±0,41
Intertrochanteric diameter, or distantia trochanterica, cm	30,56±1,07
Body length, cm	169,74±1,63
Body weight, kg	70,18±1,59

Table 1: Anthropometric indicators of body size in female powerlifters

The analysis of the obtained results showed that the shoulder width of female athletes is significant and similar to the dimensions of male weightlifters [1-4, 6]. At the same time, the width of the pelvis of female athletes, or distantia cristarum, is less than the standard values generally accepted in anatomy and obstetrics, at 28-29 cm [1, 2, 4]. The indicators of the intertrochanteric diameter, or distantia trochanterica, on average for the group, coincide with the standard for women of this age group - 30-32 cm [1, 2, 5]. The body type of female athletes resembles an inverted trapezoid, which is typical for the

masculine somatic type [1, 2, 4, 5]. This is confirmed by the obtained indicators of such a morpho functional index value as the pelvic-shoulder index (PSI), which is determined by the formula: % ratio of the pelvic width to the shoulder width indicator. The indicator up to 69% indicates a trapezoidal body shape of the subject [1, 2, 5, 6]. Speaking about the obtained results of other morpho functional index values, such as the indicators of the masculinization index (MI), the index of sexual dimorphism (ISD), and the body mass index (BMI), in the group. These data are presented in Table 2, at ($p \leq 0.05$).

Name of the indicator	Results obtained (cm)
Body mass index, or BMI, kg/cm ²	40,47±1,24
Masculinization index (MI), c.u.	24,25,03±0,81
Sexual dimorphism index (SDI), c.u.	97,69±0,27
Pelvic-humeral index, c.u.	65,79%

Table 2: Indicators of a number of morpho functional index values

The masculinization index (MI) characterizes the ratio of the acromial diameter to the intertrochanteric diameter (normally from 1.15 to 1.23) [1, 2, 3]. In all young athletes, its value was higher than the norm, and indicated obvious values of hyperandrogenism and, accordingly, a significant decrease in their level of estrogenization of the body. Additionally, somatotyping of female athletes was carried out and the sexual dimorphism index (SDI) was calculated using the method of J. Tanner and W. Marshall with interpretation according to the index values of sexual types: mesomorphic sexual somatotype (from 73.1 to 82.1 c.u.), as a transitional (intermediate) between the biologically characteristic for women, gynomorphic sexual somatotype (less than 73.1 c.u.) and andromorphic sexual somatotype (more than 82.1 c.u.) [2,4-6].

As a result of the correlation of sex types, according to the index values, it was revealed that the gynomorphic sex somatotype was not determined in any of the athletes. The mesomorphic, transitional sex somatotype was determined only in 5 (18.52%) young athletes, with the least sports experience and skill level - CMS. However, the remaining 22 (81.48%) athletes, who have been actively involved in powerlifting for a long time, were determined to have a pathological (inverse) andromorphic sex somatotype. The obtained results of the study allow us to conclude that as the sports experience and intensity of total physical activity increase, as well as the level of athletic skill increases, adaptive somatic shifts occur, with the formation of sex somatotypes that are not physiological for athletes of this age group - mesomorphic and andromorphic) [2, 4-6]. The TPU indicator in

the study group also informatively indicates somatic masculinization in the female athletes of the study group.

Conclusions

1. The conducted anthropometric measurements and their analysis showed that female athletes have reliable adaptive somatic changes in almost all the considered anthropometric values of body sizes, and in the results of morpho functional index values.
2. In female athletes, as a result of intense physical activity, inverse values of the masculinization index, sexual dimorphism index of the pelvic-humeral index are formed.
3. It was established that in the studied group of female athletes, as their sports experience, intensity, frequency and volume of physical activity increase, an adaptive change in the differentiation of their somatic sexual somatotype occurs, both towards mesomorphy and, to a significant extent, even towards andromorphy.
4. The anatomical, anthropometric and morpho functional changes in the obtained values revealed in female athletes can be assessed as progressive adaptive changes.
5. The indicators obtained as a result of the study and their analysis fully confirm the hypothesis put forward by the author of the study he is conducting.

Prospects for further research in this area consist of studying the process of masculinization and somatic changes in sexual somatotypes in young female athletes involved in weightlifting and kettlebell lifting, reflecting the indicators of the corresponding morpho functional index values.

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