

Consideration and Analysis of the Features of Indicators of Sexual Dimorphism and A Number of Reproductive Indicators in Female Sports People Participated in Athletic Strength Sports

Research Article

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Abstract

Based on the analysis and synthesis of the literature data and the results of the study, the article presents the materials related to the study of the question of values sexual dimorphism and a number of reproductive values in athletes involved in weightlifting and powerlifting. The data rates of sexual dimorphism in each somatotype in the groups studied. We describe the identification of options for menstrual disorders and symptoms of hyperandrogenism in a number of athletes in both groups.

Keywords: Female Athletes, Athletics, Weightlifting, Powerlifting, Menstrual Cycle, Sexual Dimorphism, Somatotype, Hyperandrogenism

Introduction

Relevance of the problem under study. Today, physical education, health programs and sports are in great demand among young women, who en masse attend sports clubs and master new sports, previously classified as purely male sports. Therefore, questions concerning various aspects of the influence of physical and psycho-emotional stress on the female body, as well as its adaptive reactions, are always relevant when conducting medical and biological studies of female athletes [1-5]. This also applies to the study of adaptation processes in female athletes involved in weightlifting and powerlifting [1,2,6,7]. Weight lifting, intensity of power loads, features of the structure of the training-competitive period, its compatibility with the cyclic changes of the female body, processes of adaptation to these loads - this is not a complete list of issues that determine the problem of studying this problem [1,2,6,8,9].

Aim of Study

The purpose of our study is to study the influence of intense and psycho-emotional stress on somatic indicators of a number of morphological and reproductive values in female athletes of reproductive age, to identify and analyze the changes in them.

Material and Methods

Our analysis of recent studies and publications on the issue of changes in the female reproductive system and the level of reproductive health in young athletes involved in weightlifting and powerlifting shows that the interest of researchers in this problem has increased significantly [1-10]. Among the issues related to changes in the body of women involved in weightlifting and powerlifting, in our opinion, the issue of changes in such basic indicators of reproductive health as the menstrual cycle and manifestations of hyperandrogenism is not



fully addressed. This is especially true for studies among female athletes of adolescence and first reproductive age. This was the reason for conducting our study, with an attempt to connect the identified disorders in the reproductive system of female athletes (primarily menstrual cycle disorders) with the intense physical and psychological stress present when practicing and weightlifting and powerlifting sections in Zaporozhye and Novaya Kakhovka. The study involved 11 female weightlifting athletes and 12 female powerlifting athletes. In the group of weightlifters, the average age was 21 ± 1.32 years, in the group of female powerlifting athletes- 20.14 ± 0.87 years. All athletes were classified as adolescent ($n=16$) and first reproductive age ($n=7$). Duration of training in this sport- from 3 to 5 years- 7 (30.44%), from 5 to 8 years- 12 (52.17%), more than 8 years- 4 (17.39%). 18 (78.26%) girls were students, 5 (21.74%) were working. 8 (34.78%) began practicing these sports at the age of 11-15 years, 11 (47.83%) at the age of 15-18, 4 (17.39%) of the studied athletes after 18 years. Sports qualification- I category 9 (39.13%), candidates for master of sports (CMS)-10 (43.48%), masters of sports (MS)- 4 (17.39%).

When conducting this study, we used methods such as analysis of available sources of information on the issue under study, anthropometry, index method, somatotyping, questionnaires on the characteristics of the menstrual cycle in female athletes (author's questionnaire K.A. Bugaevsky, 2009©), examination, use of the Ferriman scale-Gallwey, interviewing, method of mathematical statistics. The study involved female youth athletes ($n=57$), actively involved in this sport. To achieve the goal of the study, we used such anthropometric methods as determining shoulder width (SW) and pelvic width (PW), 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 of the athletes was carried out based on the criteria corresponding to the classification of J. Tanner and W. Marshall. The values of the index of sexual dimorphism (SDI) are calculated according to their own formula: $3 \times \text{biacromial size}$, or SH minus the pelvic-crestal size (d. cristarum), or SH. 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. Mesomorphic and andromorphic sexual somatotypes refer to inversions, or pathological displacements that are not characteristic of the basic gynecomorphic sexual somatotype [4; 12; 14]. Also, we assessed the state of menstrual function using a questionnaire method, for which we used the author's version of the questionnaire (author-Bugaevsky K.A., modification 2018) [2;3], interviewing. When determining the parameters of OMC, we assessed such informative reproductive indicators as: age at menarche, timing of the establishment of OMC, its clinical manifestations, duration, duration and properties of menstrual bleeding [1,2]. The method of literary analysis of available sources of information 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 April 4, 1997), the World Medical Association Declaration of Helsinki on Ethical Principles for Scientific Medical Research Involving Human Subjects (1964-2008), as well as the Order Ministry of Health of Ukraine No. 690 dated September 23, 2009. All participants who took part in the study, both athletes and non-athletes, gave their voluntary, written consent to it.

Results and Discussion

When dividing female weightlifters ($n=11$) into somatotypes based on sexual dimorphism (J. Tanner's classification), we obtained the following indicators: the average value of the sexual dimorphism index (SDI) in the group was 81.64 ± 1.07 ($p < 0.05$). This corresponds to the values of the mesomorphic somatotype (73.1-82.1) [1,8,9]. In the group of female athletes involved in powerlifting ($n=12$), the SDI value was 81.17 ± 0.06 ($p < 0.05$), which also corresponds to the values of the mesomorphic somatotype [1, 8,9]. The distribution of sexual somatotypes according to J. Tanner in the studied groups of female athletes is shown in the Table 1:

Table 1: Values of the sexual dimorphism index in groups, (%)

Indicator Name	Andromorphic Sexual Somatotype	Mesomorphic Sexual Somatotype	Gynecomorphic Sexual Somatotype
Female athletes (weightlifting) ($n=11$)	4 female sportsmens 36,36%	6 female sportsmens 54,55%	1 female sportsmens 9,09%
Female athletes (powerlifting) ($n=12$)	5 female sportsmens 41,67%	6 female sportsmens 50,00%	1 female sportsmens 8,33%

When analyzing the results of somatotyping, attention is drawn to the fact that both groups are dominated by athletes with "non-female" gender somatotypes- andromorphic and mesomorphic [6]. Thus, in the group of female weightlifters, the total number of athletes with "non-female" sexual somatotypes was 10 (90.91%), with only one athlete with a gynecomorphic sexual somatotype. The picture is similar in the group of athletes involved in powerlifting - the total number of girls with anormorphic and mesomorphic sexual somatotypes is 11 (91.67%), while there is also only one athlete with a gynecomorphic somatotype.

It was found that both of these girls have 3-3.5 years of experience in these sports and the intensity of their physical activity is moderate. Considering the data regarding the characteristics of the ovarian-menstrual cycle (hereinafter referred to as OMC) and variants of its disorders, based on the data obtained as a result of questionnaires and anamnesis collection, we were able to obtain the following information: in the group of weightlifters ($n=11$), the time for the onset of menarche was $12.26 \pm 0,63$ years old. This is slightly lower than the average rate of menarche in girls in Ukraine, which is 12.52 ± 0.52

years ($p < 0.05$) [8]. At the same time, 3 (27.27%) athletes experienced menarche at the age of 11, 4 (36.36%) - from 11 to 12 years, and 4 (36.36%) - from 13 to 14 years, which also fits into indicators that, on the one hand, are greater than the average normative ones, and on the other hand correspond to the normative physiological values for menarche [2,5,7,8,10]. The duration of OMC in the entire group was 18.14 ± 0.53 days ($p < 0.05$), which does not correspond to the generally accepted international norm of 21-35 days ($p < 0.05$) [2,5,7,8,10]. It was found that 5 (45.46%) female athletes do not have menstruation for periods from 60 to 120 or more days, which is regarded as secondary amenorrhea [2, 3,8] and in 6 (54.55%) it is "floating" the number of days of menstrual bleeding (hereinafter referred to as MB) from 1 to 2, extremely rarely 3 days, with scanty, spotting discharge, which is typical for oligo-opsomenorea [2,5,7,8,10].

The duration of MB in the group was 2.21 ± 0.24 days, which also does not correspond to the physiological norm of 3 to 7 days [2,5,7,8,10]. Also, all athletes have pain in the abdomen and lumbar region, headaches, discomfort and autonomic disorders during menstrual bleeding. In this group of female athletes, there are manifestations of hy-



pomenstrual syndrome and algodismenorrhea [2,5,7,8]. As for the group of female athletes involved in powerlifting (n=16), in this group the time for girls to reach menarche was 12.13±0.17 years. This is also lower than the average rate of menarche in girls in Ukraine, which is 12.52±0.52 years (p<0.05) [8]. At the same time, 4 (25.00%) female athletes experienced menarche at the age of 11, 10 (62.50%) from 11 to 12 years, and 2 (12.50%) from 13 to 14 years, which is also fits into indicators that, on the one hand, are less than the normative average, and on the other hand correspond to the normative physiological values for menarche [2,5,7,8,10].

The duration of OMC in the entire group was 18.14±0.32 days (p<0.05), which also does not correspond to the generally accepted international norm of 21-35 days (p<0.05) [2,5,7,8,10]. Moreover, in this group, 11 (68.75%) athletes have unstable BC, from 1 to 3 days, scanty, and 5 (31.25%) have no menstrual bleeding from 60 to 120 days and more. In this group, 13 (81.25%) had premenstrual syndrome (PMS) [2,5,7,8,10]. The duration of MC in the group was 2.23±0.14 days (p<0.05), which also does not correspond to the physiological norm of 3 to 7 days [2,8,9]. In this group of female athletes, as well as in weightlifters, the phenomena of hypomenstrual syndrome, with the phenomena of oligo-opsomenorrhea and algodysmenorrhea, were reliably recorded [2,5,7,8,10].

When determining the manifestations of hyperandrogenism in both study groups, using the Ferriman-Gallwey scale in 11 zones, we found that in the group 6 (54.55%) athletes had index values (hairiness, borderline between normal and excessive) ranging from 8 to 12 points, symptoms of acne, seborrhea [8,9]. A pronounced degree of manifestations of hyperandrogenism, with the phenomenon of male-type hair growth on the face and body, with Ferriman-Gallwey index values in the range of 12-18 points, was identified in 5 (45.45%), which indicates moderate and severe symptoms of hyperandrogenism [3,8]. In a group of female athletes involved in powerlifting, manifestations of hyperandrogenism were also identified. In 9 (56.25%) the values of the Ferriman-Gallwey index (hairiness borderline between normal and excessive) were determined by visual examination to range from 8 to 12 points [3,8]. In 5 (31.25%) female athletes, a pronounced degree of manifestations of hyperandrogenism was revealed, with the phenomenon of male-type hair growth on the face and body, with Ferriman-Gallwey index values in the range of 12-18 points [3,8]. In 1 (6.25%) athlete, no symptoms of hyperandrogenism were detected. All athletes in both groups, although they associate the deterioration in reproductive health with intense physical activity, nevertheless consider the frequency of training, the total volume and intensity of physical activity acceptable for them and do not want to reduce the level of intensity of the training process, considering participation in these sports more priority over their menstrual cycle disorders.

Conclusions

1. In both study groups, 6 (54.55%) weightlifters and 11 (68.75%)

female powerlifting athletes, various, often combined, menstrual cycle disorders were identified.

2. Data on determining the phenomena of hyperandrogenism indicate the presence of moderate and severe degrees of its manifestations in all female weightlifters, and in 15 (93.75%) athletes involved in powerlifting, manifestations of moderate and severe hyperandrogenism were determined.

3. Numerous combined disorders of a number of reproductive indicators identified as a result of the study give grounds to assert that they are directly related to intense physical and psycho-emotional stress.

Conflict of Interest

The author notes the complete absence of any conflicts, both with individuals and legal entities.

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