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Short Communication

Finger Index 2D: 4D Digit Ratio as an Indicator of Masculinization in Female Weightlifting Athletes

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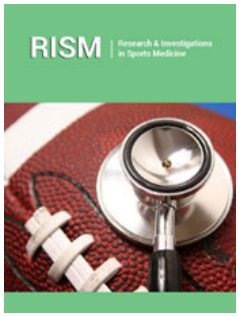

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Abstract

Based on the analysis and generalization of literary sources, as well as the results of a pedagogical experiment, the article provides data on the features of the 2D:4D Digit Ratio finger index in young female athletes involved in weightlifting. A significant group of athletes who participated in the study noted the inverse changes in sex somatotypes towards mesomorph and even andromorph.

Keywords: Female athletes; Adolescence; Weightlifting; Finger index 2D:4D digit ratio; Morpho functional changes, Sexual somatotypes, Masculinization

Abbreviations: SDI: Sexual Dimorphism Index; SW: Shoulder Width; PW: Pelvic Width; CMS: Candidate Master of Sports; MS: Master of Sports

Aim of Study

The purpose of this study and research article is to identify, analyze and present the results of the study to identify the values and features of the 2D:4D Digit Ratio finger index in female adolescent athletes involved in weightlifting, taking into account their gender somatotypes, and also-to determine changes in existing anatomical and morpho functional indicators, the phenomenon of masculinization and inversion of sexual somatotypes in female athletes involved in weightlifting.

Research Hypothesis

When conducting this study, a working hypothesis arose, the essence of which was the assumption that young and young female athletes who, as a result of prolonged and excessively intense physical and psycho-emotional stress, and their training and competitive process, develop permanent adaptive-compensatory physical changes towards the development of somatic changes in their sexual somatotypes. Towards masculinization and androgenization. This process, although it leads to an improvement in their athletic performance, is inherently inverse and pathological for their body.

Introduction

In modern women's sports, for researchers of its medical and biological problems, it is of significant interest to study adaptive processes in female athletes, in athletic sports, with their loads and specific requirements for female athletes of different age groups [1-12]. For several decades now, interest in studying various aspects of women's sports, including issues of masculinization among women in various types of martial arts, has not decreased. In the developing sport of pankration, as in other types of martial arts, female athletes are subject to intense physical and psycho-emotional stress, leading to adaptation of their body with a tendency towards morphological and psychological masculinization [1-3]. These changes concern the endocrine system and affect the reproductive function of female athletes, forming

the phenomenon of masculinization, with a concomitant decrease in the amount of adipose tissue and an increase in muscle mass, disturbances of the ovarian-menstrual cycle, and the formation of mesomorphic and andromorphic sexual somatotypes. Modern principles of selecting female athletes in initially male sports, which can safely include pankration, also imply the use of such an important diagnostic method as determining the finger index "2D:4D" according to Manning JT [11] i.e. the ratio of the length of the index (second) finger and ring (fourth) finger [4,10-12].

It has been determined that the growth of the index finger is influenced by the "female" sex hormone estrogen and the growth of the ring finger by the "male" hormone testosterone. One of the factors influencing this proportion can be considered the intrauterine development of a female fetus under conditions of increased androgen content, which is typical for women involved in sports before and during pregnancy [4,5]. For women, the 2D:4D ratio is 0.99-1.1 [4,10-12]. Values determined below this standard indicate an increase in testosterone levels in the women studied, incl. female athletes The use of this method in modern sports medicine and morphology provides an additional opportunity in the sports selection and training process to identify female athletes with congenital signs of masculinization [1-3,5]. The predominance of women in sports, with various signs of acquired and congenital masculinization, is noted by many researchers [3,5]. The multi-stage process of sports selection contributes to the concentration of females with individual characteristics approaching male parameters in sports that require masculine traits, which gives these female athletes a number of advantages in these sports [1-12].

Material and Methods

To achieve the goal of the study, we used a set of scientific methods, including analysis of available scientific and scientific-methodological sources of information, determination of anatomical, anthropometric and morpho functional values in female athletes and interviewing. The experimental basis of the study was sports sections in which youth athletes involved in weightlifting trained. Activities were carried out aimed at determining the values of the Sexual Dimorphism Index (SDI) in the studied groups of female athletes, with the determination of anthropometric indicators of Shoulder Width (SW) and Pelvic Width (PW), with the subsequent distribution of athletes into sexual somatotypes according to the classification of Tanner J [11]. We also measured the index (II) and ring (IV) fingers of both hands for each female athletes in the group, in strict accordance with the methodology proposed by Manning JT [1-12]. A variant of the norm for women of the reproductive period (including adolescence) was considered indicators from 0.99 to 1.1. Values less than normative were assessed as characterizing manifestations of increased levels of male sex steroids [1-3,6,9-12].

The experiment involved female youth athletes involved in weightlifting (n=67). The average age of the female athletes was 19.51±1.17 years, which corresponds to adolescence [1]. The experience in these sports ranged from 2 to 10 years. The level of sports qualifications of female athletes is from category III-I to Candidate Master of Sports (CMS) and Master of Sports (MS). The intensity and frequency of classes is 4-6 times a week, from 1.5 to 3 hours per lesson. The finger index was calculated as the ratio of the lengths of the second and fourth fingers of the hand according to Manning JT [11]. Direct measurements of the length of the 2nd and 4th fingers on both hands were taken from the inner edge of the basal ridge at the base of the finger to the tip of the finger without pressure in each participant. Each finger was measured twice using an electronic caliper (with an accuracy of 0.01mm). It was considered that if the finger index "2D:4D" was less than 0.99, it was a male type of hand and values from 0.99 to 1.1 were a female type. All young athletes who took part in the study gave both oral and written voluntary consent.

Results and Discussion

As a result of anthropometric measurements of Shoulder Width (SW) and Pelvic Width (PW), we obtained the following values: SW was 38.38±0.73cm, PW was 27.43±0.51cm. According to the obtained data, SW and PW calculations of SDI values were made according to J. Tanner's classification, with the determination of sexual somatotypes in female athletes in the study group. As can be seen, from the obtained values of the anthropometry performed, the average values of the SW indicators in the group ($p \leq 0.05$) significantly exceed the obtained values of the PW, with values less than the anatomically acceptable value of 28-29cm [1-5,7,8]. This type of SW/PW ratio indicates a masculine body type in female athletes [1-5,7,8]. The distribution of female athletes by gender somatotype is as follows: Among weightlifters (n=67), girls with a gynecomorphic gender somatotype were not identified. The number of athletes with a mesomorphic sexual somatotype in this group is 61 (91.04%), with an andromorphic somatotype-6 (8.96%) weightlifters. In this group of young weightlifters, the following SDI value was obtained: 80.47±1.03 ($p<0.05$), which corresponds to the values of the mesomorphic sexual somatic type, at the level of its upper threshold values [1-5,7,8].

After taking measurements of the II and IV fingers of weightlifters, mathematically processing the results obtained and analyzing them, the following results were obtained: values at which the length of the index finger would exceed the length of the ring finger (2D>4D) were not determined for any of the female athletes At the same time, in 7 (10.15%) female athletes, "male" proportions of the relationship between the lengths of the 2nd and 4th fingers were determined, according to the androgynous type-less than the normative values of 0.99-1.1, which corresponds to the number of representatives of the andromorphic sexual somatotype in the study group of female athletes was 6 (8.96%), with symptoms of hyperandrogenism. For the rest of the group of female weightlifters-61 athletes, the values of the digital index were determined, corresponding to the values of the mesomorphic transitional sexual somatotype, which was within 2D≥4D, which reflects a shift in morphological somatic indicators from basic gynecomorphy to inverse andromorphy and indirectly, indicates an increase in them the level of androgenic steroid hormones [1-3,6,9-12]. These proportions, as well as the shift in gender somatotypes,

can be regarded as the result of intense, sometimes inadequate training physical activity, and as a consequence of intense adaptive processes in young weightlifters, which increase with their sports experience.

Conclusion

A. Thus, according to the finger index indicators, among female athletes involved in weightlifting and weightlifting, female athletes with genetically determined masculinization predominate.

B. The finger index, which is quite simple to use, can be used in the practice of sports activities as one of the informative criteria for the masculinization of the female body.

C. The indicators we have identified of anatomical and morphofunctional changes in the bony pelvis and the degree of their narrowing, against the background of inversions of the values of sexual dimorphism in all three groups, towards mesomorphic and andromorphic sexual somatotypes in female athletes involved in athletic sports, gives reason to think about significant adaptive changes in the bodies of young female athletes with morphological changes in their sexual somatotypes, caused by intense physical activity for them, with a tendency towards masculinization and andromorphy.

D. The hypothesis of this author's research, when analyzing the results obtained, was completely confirmed.

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