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Research paper

Characteristics of finger indices of hand 1D:3D and 2D:4D in dependence on gender and type of the constitution

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Abstract

1D:3D and 2D:4D finger ratios of a hand are widely used for research in the field of predisposition of the individual to certain somatic diseases. 299 young people were surveyed in total with the calculation of the Pignet index, using a flatbed scanner and the author's program HandScaner. As part of the study, it was identified that the finger indices of 1D:3D in young men is significantly greater than that of girls in the hypersthenic group by 2% ($p<0.05$). Finger index of 1D:3D is more by 1% in young men in the normosthenic group, in the asthenic group, the finger index of 1D:3D is more in girls by 1% ($p>0.05$). When studying the index 2D:4D, there were no statistically significant differences between the left and right hands in young men and women ($p>0.05$), as well as the relationship with the type of body build. Despite this, many foreign authors note the presence of this connection in males and females in other age groups. In addition, according to foreign authors, this index, as well as in our study, is more in girls in comparison with young men.

Key words: *1D:3D and 2D: 4D finger indices, somatotype, bilateral dissymmetry.*

1. Introduction

The study of anatomical and physiological parameters of the hand in its interrelation with somatotypological peculiarities of the person is essential for assessment of the illness condition and forecasting the risks of its development, and also for finding and correcting the methods of medical treatment [1]. The study of morphology and functions of the hand is realized in everyday practice in various medical spheres. It is the subject of peculiar interest for different specialists.

Many international authors emphasize the importance of studying the finger indexes which depend on the proportion between oestrogens and androgens during hand shaping in the embryonic period [2]. Low meaning of the finger index is explained by the high level of androgenic influence or by the increased perceptibility of some tissues to androgens. Prenatal androgenic influence onto the fetus defines a number of factors of postnatal life, such as anatomical and physiological features as well as the risks of diseases [3]. The study of finger indexes makes it possible to carry out research in the field of predisposition of the individual to certain somatic diseases, and also to mental deviations. There is evidence of a link between the finger index and genes that affect the formation of limbs and the reproductive system. Determination of the finger index (FI) 2D:4D in the postnatal period with the identification of its low values as a risk factor in comparison to standard parameters can serve as screening diagnostics for patients with autism, prostate cancer, coronary heart disease (in case of men), sporadic amyotrophic lateral sclerosis and a number of other diseases [4].

The purpose of our research is to determine finger indexes of the hand 1D:3D and 2D:4D in adolescent people considering typological aspects, sexual dimorphism and bilateral asymmetry.

2. Materials and methods of the research

The study involved 299 people of adolescent age, of which 140 are young men, 159 are girls. The criteria for inclusion in the research were the absence of pathology in the musculoskeletal system and the youthful age (16-20 years of the girls, 17-21 years of the young man).

Young men and girls were divided into three groups according to M. Chernorutsky's classification by calculating Pignier (body mass) index. These are: asthenics, normostenics and hypersthenics. To calculate the Pignier index the following formula is used: Height (cm) - (Body weight (kg) + chest circumference (cm)). The index is evaluated according to the following criteria: for asthenics, the value of the Pignier index is greater than 25, for normosthenics it is from 10 to 25 and for hypersthenics it is less than 10.

To study the morphological parameters of the hand an original technique has been developed. It consists in the use of a flatbed scanner, which provides the digital image of the palm surface of the hand, and the author's program HandScaner (certificate of state

registration of the computer program No. 20105616988 dated June 26, 2015), which allows processing the resulting image.
Finger indexes 1D:3D And 2D:4D were determined by calculating the ratio of the length of the finger I to the length of the finger III and the length of the finger II to the length of the finger IV, respectively. Computer processing of the scanned picture of the hand allows higher accuracy in determining the basic morphofunctional parameters of the hand as well as collecting and systematizing other data, which makes this palmography method less expensive than the classical method of examining the hand.
Statistical processing of the data was carried out on IBM PC using Microsoft Office Excel 2007® and Statistica 10® applications.

3. Results

Based on the results of the research, significant differences in the 1D:3D index between the left and right hands in girls in the hypersthenic and asthenic groups were found, where its right hand value is greater by 2.4% ($p<0.05$). In young men and in the group of normosthenics in girls, there are no significant differences between this parameter of the left and right hand ($p>0.05$).
Differences in the parameter among girls are as follows: in normosthenics, it is less by 0.3% ($p>0.05$) than in hypersthenic patients and 0.3% less (0.35%) than in asthenics ($p>0.05$). In hypersthenics, it is more than in asthenics by 0.01% ($p>0.05$) (Fig. 1).

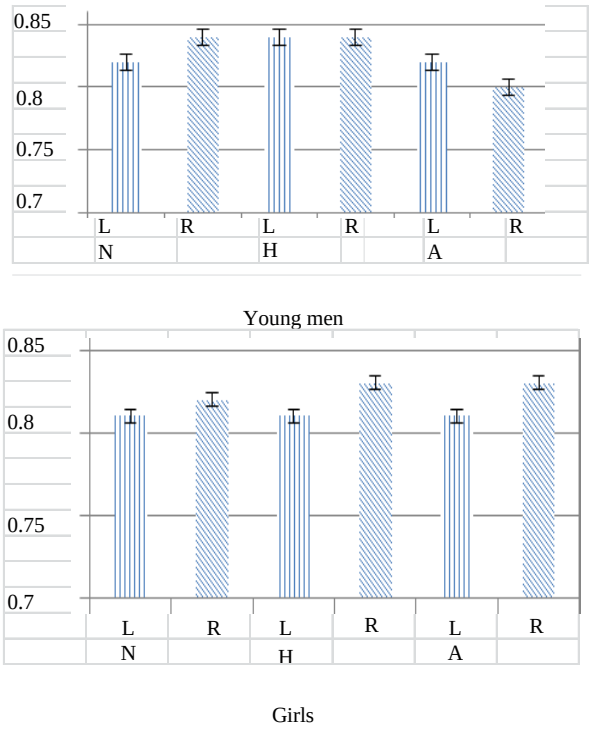

Fig. 1: Finger index 1D: 3D in young men and girls L = left hand, R=right hand, N= normosthenics, H= hypersthenics, A= asthenics

In young men-normosthenics, FI 1D:3D is less in comparison to hypersthenics by 1.3% ($p<0.05$) and more than in asthenics by 1.8% ($p<0.05$). In hypersthenics, it is 3.1% more than in asthenics ($p<0.05$).
FI 1D:3D in young men is significantly greater than in girls in the hypersthenic group by 2% ($p<0.05$). In the normosthenic group, the 1D:3D index is larger in young men. In the asthenic group, the finger index of 1D:3D is greater by 1% in girls, although the difference is not statistically significant ($p>0.05$).
When studying FI 2D:4D, no statistically significant differences between the left and right hands in young men and girls ($p>0.05$) can be found. Analysis of the dynamics of the considered aspect in girls reveals the following changes: in normosthenics, it is larger by 0.4% ($p>0.05$) than in hypersthenic patients and 0.4% ($p>0.05$) larger compared with asthenics. FI 2D:4D in hypersthenics is less than this parameter of asthenics by 0.05% ($p>0.05$) (Fig.2).
In the study of FI 2D:4D in young men, the following statistically significant difference is revealed: in normosthenics, this parameter is less by 1.2% ($p<0.05$) in comparison to hypersthenics and higher compared to asthenics by 0.3% ($p<0.05$). In hypersthenics, it is 1.5% more than in asthenics ($p<0.05$).
FI 2D: 4D in girls is significantly larger than in young men in the normosthenic and asthenic group by 3% ($p<0.05$), in the hypersthenic group by 1% ($p>0, 05$).
According to the results of our research, the FI 2D:4D does not have statistically significant interrelations ($p>0.05$) with the parameters and indices studied (body weight, height, chest circumference, body mass index, physical condition, adaptive potential of the circulatory system, hand strength). According to foreign authors [3], this index in girls is more in comparison with boys, which coincides with the conclusions made in our study. Although the study does not reveal statistically significant interrelationships of FI 2D:4D depending on the type of constitution ($p>0.05$), many foreign authors note the presence of this relationship in males and females in other age groups [2]. FI 2D:4D is also seen by many researchers as an indicator of a person's predisposition to certain kinds of sports, as well as illnesses. It is also believed to represent the adaptive capabilities of a person [5]. FI 2D:4D is used for prenatal diagnosis of fetal abnormalities [6].

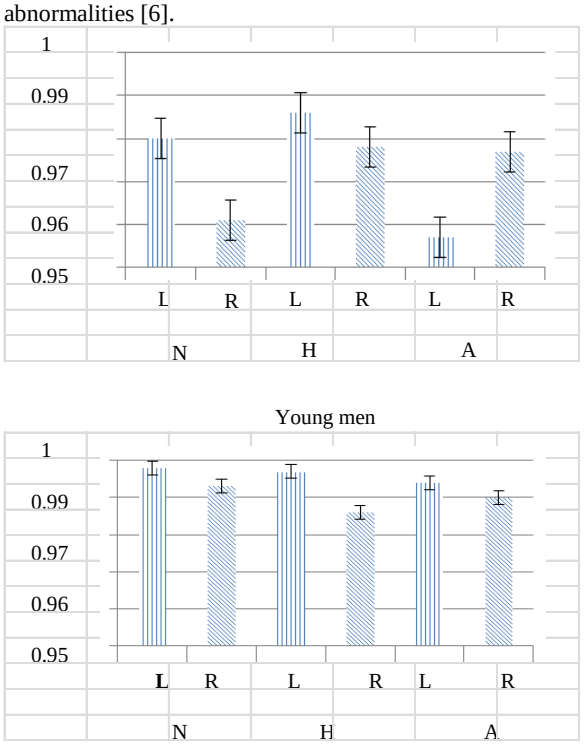

Fig. 2: Finger index 2D:4D in young men and girls: L = left hand, R=right hand, N= normosthenics, H= hypersthenics, A= asthenics

4. Conclusion

Thus, FI data can be considered as a criterion for assessing the level of the body's physical state, its adaptive capabilities, and also for predicting a person's predisposition to certain diseases.

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