применять для улучшения дыхательной функции у пациентов страдающих заболеваниями респираторной системы, при этом, данный метод может оказаться полезен при реабилитации пациентов перенесших пневмонию.

Выводы

Таким образом, можно отметить тот факт, что после кратковременного низкотемпературного воздействия возможности дыхательной системы увеличиваются. Это можно применять при лечении пациентов с дыхательными нарушениями и при реабилитации после перенесенной инфекции Covid-19.

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INFLUENCE OF AUTONOMIC NERVOUS SYSTEM ON BODY COMPOSITION IN HEALTHY YOUNG ADULTS

Introduction

The autonomic nervous system (ANS) is a component of the nervous system that regulatesinvoluntary physiologic processes including heart rate, blood pressure, respiration, digestion, and endocrine functions. It consists of two divisions, which are parasympathetic and sympathetic nervous systems. The ANS is in direct control of adiposity at the cellular levels. The sympathetic and parasympathetic systems provide the homeostatic regulation of adipose tissue by stimulating the catabolism and anabolism respectively.

In healthy individuals, increased sympathetic activity and decreased parasympathetic activity is correlated with an increase in the body mass index (BMI) [1]. It may be pointed out that this is controversial. Sympathetic nervous system increases energy expenditure, and some types of obesity are associated with the alteration of the sympathetic activity. On the other hand increased parasympathetic activity is observed in athletes. The relation between the ANS and body composition can give us an important understanding of the physiology of body composition and help us to prepare better policies to control obesity.

For the assessment of balance between sympathetic and parasympathetic systems the measuring of heart rate variability (the occurrence of variations in between two consecutive heart beats) is often used [2]. Bioimpedence analysis has become a popular tool in recent times for the analysis of body composition due to its relative ease, low cost of use and can be used on a wide range of subjects. It allows us to evaluate obesity class, nutritional status, training outcomes and general health [3].

Goal

To study the features of body composition by the method of bioelectrical impedance analysis in young, healthy adults (not athletes) depending upon the initial tone of the autonomic nervous system assessed by heart rate variability (HRV).

Material and methods of Research

The study was conducted in Gomel State Medical University and all the participants were students of this university. The examined group had a total of 65 participants consisting of 31 men and 34 women with ages ranging from 18 to 23 years. The examination was performed in the morning before intake of food or any physical activity. The heart rate variability (HRV) was registered by recording an electrocardiogram (ECG) in the second standard lead in horizontal position with the help of the complex "Polyspectrum" (Russia) and the body composition was assessed by bioimpedance analyzer "Medass" (Russia).

The results of the research and their discussion

According to the results of assessment of the initial tone of the ANS by the method of heart rate variability evaluation and calculation of Baevsky's Stress Index, the participants were divided into 3 groups.

1) Normotonia (Stress index 30–90) – the group consisted of 33 participants out of which 13 were males and 20 were females.

2) Sympathicotonia (Stress index 90–160) – this group consisted of 15 participants with 10 males and 5 females.

3) Hypersympathicotonia (Stress index higher then 160) – this group had 17 participants with 8 males and 9 females.

It may be noted that vagotonia (Stress index lower than 30) was not revealed in any of the participants.

The results of evaluation of body composition parameters in healthy young adults depending on the initial tone of the autonomic nervous system are presented in the table 1.The table demonstrates the amount and percentage of participants which have normal, high and low values of the examined body composition parameters (in comparision with the reference values) in each of the examined groups.

Table 1 – Body composition parameters in groups of participants with different tone of ANS

Parameter	Participants with normotonia (n = 33)			Participants with sympathicotonia (n = 15)			Participants with hypersympaticotonia (n = 17)		
	Normal values	High values	Low values	Normal values	High values	Low values	Normal values	High values	Low values
Body Mass Index (kg/m²)	24 (73 %)	5 (15 %)	4 (12 %)	11 (73 %)	4 (27 %)	–	13 (76 %)	4 (24 %)	–
Fat Mass (%)	14 (42 %)	18 (55 %)	1 (3 %)	8 (53 %)	7 (47 %)	–	10 (59 %)	7 (41 %)	–
Body Cell Mass(%)	–	33 (100 %)	–	–	15 (100 %)	–	1 (6 %)	16 (94 %)	–
Skeletal Muscle Mass(%)	21 (64 %)	-	12 (36 %)	10 (67 %)	–	5 (33 %)	7 (41 %)	–	10 (59 %)

Normotonia was revealed in 33 students or 51 % of total participants. In this group 73 % of participants had normal BMI, 15 % had high BMI and 12 % were low.At the same time, more than half (55 %) of participants with normotonia had an increased content of fat mass. Also 42 % of participants of this group had normal fat mass whereas only 1 participant had low fat mass. All participants with normotonia had high metabolically active body cell mass. No one in this group had increased skeletal muscle mass, with 21 participants (64 %) within normal values and 12 participants (36 %) with low values of skeletal muscle mass.

Sympathicotonia was revealed in 15 participants or 23 % of the total participants. Most of them (73 %) had BMI in the normal range with only 4 participants (27 %) having high BMI and none had low value of BMI. The percentage of people having normal fat mass % and high fat

mass % was almost equal with 53 % and 47 % respectively. Low fat mass % was absent in this group. Skeletal mass % was normal in 67 % and decreased in 33 % of the participants in this group, and these results are similar to those of students with normotonia.

Hypersympathicotonia was revealed in 17 participants or 51 % of total participants. Values for BMI were in normal range for 76 % of this group and high for the remaining 24 %, Low BMI was not revealed in any participants of this group. Slightly more than half (59 %) had normal fat mass and the remaining (41 %) had normal values.While no one in this group had high skeletal cell mass, 41 % had normal values. More than half of participants (59 %) with hypersympathicotonia had a decrease in skeletal mass below normal values.

From the table it can be observed that irrespective of the tone of ANS, almost all participants had high values of metabolically active body cell mass. This may be explained by the fact that it is in correlation with adequate protein intake and intensity of metabolism. It shows that no participant has decreased metabolism or inadequate protein intake.

From the table we can also see that although there are only a few participants (13) with high BMI, the number of participants with high fat mass % is quite high (32). This can be explained as BMI is only a ratio of body weight and height; it does not take into account the difference in muscle mass and fat mass. As a result, a person with low skeletal muscle and high fat mass can have a normal BMI value. Therefore it is important to calculate the fat mass % also for an accurate idea of the body composition.

Conclusions

As a result of the study the features of body composition in young, healthy adults (not athletes) depending upon the tone of the autonomic nervous system were revealed.

1. Majority of the participants had normal BMI irrespective of the tone of ANS. High values for fat mass % can be seen in normotonia and as well as in increased tone of the autonomic nervous system, i.e. in sympathicotonia and hypersympathicotonia whereas high skeletal muscle mass was not observed in any conditions. Active cell mass was also revealed to be high in all participants.

2. There were no significant differences in the frequency of detection of high BMI and high fat mass in the groups of participants with different variants of ANS tone. At the same time, in all examined groups, the percentage of participants with high fat mass content was higher than the percentage of participants with high BMI.

3. The most commonly detected pathological change in body composition in the groups of participants with normotonia and sympathicotonia was the increased fat mass, while in participants with hypersympathicotonia, it was the decrease in skeletal mass below normal values. Thus, it can be assumed that excessive activation of the sympathetic nervous system in healthy adults (not athletes) is accompanied by a decrease in muscle mass, but does not significantly influence on the fat mass content.

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