

Review

## The correlation of somatotype of person with the development and course of various diseases: results of Russian research

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Received 19 January 2018, Revised 20 May 2018, Accepted 22 June 2018

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**Abstract:** Currently there is an increased interest in medical anthropology, the study of constitutional features of the human body and their correlation with the manifestations of various diseases. Modern anthropometric techniques are increasingly used in scientific researches in clinical practice. This review article is devoted to the issues of interrelation between the type of the human constitution and manifestations of various diseases.

**Keywords:** somatotype, constitution, anthropometry, personalized medicine.

Cite as Kukes VG, Nikolenko VN, Pavlov CS, Zharikova TS, Marinin VF, Gridin LA. The correlation of somatotype of person with the development and course of various diseases: results of Russian research. *Russian Open Medical Journal* 2018; 7: e0301.

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Recently an increasing interest in medical anthropology and anthropometry has been observed among anatomists and clinicians throughout the world [1-6]. In our country, it is largely due to the development of personalized medicine which is one of the priority areas of the "Strategy for the development of medical science in the Russian Federation until 2025" [7]. The introduction of methods of personalized medicine implies the application of the individual approach to the treatment and prevention of diseases necessary for each patient. Personalized medicine will help to increase the effectiveness of therapy, reduce the frequency of side effects and the cost of medical care and improve quality of medical care [8]. Constitutionally and anatomically the population is heterogeneous [9, 10]. This fact shows that we need to take into account the human somatotype in the diagnosis, prevention, and treatment of various diseases. Thus, the use of the newest methods of personalized medicine (phenotyping of cytochrome P450 isoenzymes, genotyping, evaluation of the activity of various human functional systems) [11] combined with somatotyping in clinical practice will increase the safety and efficacy of pharmacotherapy as well as overall treatment outcomes and the patient's quality of life. The term "constitutional medicine" is used in Japan, China, and South Korea. It means that medicine focused on the clinical application of theoretical knowledge of the human constitution. Simultaneously in Japan, the canons of medicine prescribe to be based only on the human constitution [12].

Particular attention to constitutional anatomy is also caused by revising the limits of the normal range for some anthropometric indicators in different age groups [13] or to obtain for the first

time this information e.g. for people of elderly and senile age long-livers [14, 15]. For example, the somatotype specificity of the body mass index was first proved by the analysis of length and body weight depending on the type of the girls' physique [1].

The need to update and supplement anthropometric data is caused by such processes as temporal variability of parameters, acceleration, gracilization of the constitution, retardation of development, etc. [16-20].

The anthropometric analysis was integrated into clinical practice by using not only the usual algorithms but also high-tech methods such as computer optical topography and bioimpedancemetry which allows estimating the component composition of the human body [21-24]. In addition, the use of anthropometry in clinical practice has already made possible to identify correlations between the somatic constitution and certain diseases [1], somatic parameters and features of the functioning of the immune system [25, 26].

It should be noted that there is no single classification of types of constitution. Variety of methods and criteria for determining somatotype has been used in medical research over the years but in Russia it is used the scheme by Bunak in determining the constitutional types of men. According to this scheme, the thoracic, muscular, abdominal and indeterminate somatotypes are distinguished as well as intermediate subtypes (thoraco-muscular, muscular-thoracic, musculo-abdominal and abdominal-muscular; see Table 1) [27, 28].

**Table 1. Constitutional types of men (Bunak, 1941) [27]**

Type of constitution	Description
Thoracic	Small fat deposition, average muscle tone
Muscular	Average fat deposition, strong muscle tone
Abdominal	Strong fat deposition, average muscle tone

**Table 2. Constitutional types of women (Galant, 1927) [29]**

Category	Type of constitution	Description
Leptosomal	Asthenic	Thin body; flat, narrow, elongated chest; drawn inside the abdomen; narrow pelvis; long thin limbs; pale, narrow, elongated face; musculature is poorly developed; body fat is not expressed
	Stenoplastic	Thin body; flat, narrow, elongated chest; drawn inside the abdomen; narrow pelvis; long thin limbs; pale, narrow, elongated face; muscle and adipose tissue are well developed
Mesosomal	Picnic	Moderate or slightly increased severity of subcutaneous fat; shortened limbs; rounded head and face; full shortened neck; relatively broad round shoulders; cylindrical chest; wide pelvis with characteristic fat deposits; rounded hips; full leg closure
	Mesoplastic	Squat figure; significant development of the tendons of the muscles; moderately well-developed and hard muscles; massive skeleton; sufficient development of subcutaneous fat; broad face; a strong development of the cheekbones
Megalosomal	Athletic	Exceptionally strong development of muscles and skeleton; weak development of subcutaneous fat; usually the male type structures of the pelvis; male facial features
	Subatletic	Tall slender women; moderate development of muscles and subcutaneous fat
	Euryplastic	Strong development of subcutaneous fat; exceptionally strong development of muscles and skeleton

The scheme of women's constitutions by Galant [29] is commonly used in establishing of constitutional diagnosis of women. There are three categories of constitutional types according to this scheme: leptosomal including asthenic and stenoplastic types; mesosomal including picnic and mesoplastic types as well as megalosomal constitutions that combine athletic, subatletic and euryplastic types (Table 2) [30]. Qualitative and quantitative criteria exist for determining each type of body constitution [31] and the frequency of occurrence of different types of constitution in scientific research may differ [27, 30, 32].

Somatotyping is actively used in clinical practice to identify phenotypic predictors of the disease development. So Kapustina et al. found in their study that the majority of women with osteoarthritis had a megalosomal constitution and older patients had smaller values of anthropometric parameters such as height, body weight, and body mass index [33].

Traumatologists and osteopaths also use anthropometric research methods in their practice to individualize the approach to

the treatment of diseases in terms of the concept of personalized medicine. Rudenko et al. revealed that the intensity of neurological manifestations and the results of treatment in women with osteochondrosis is affected not only by the size of the hernial protrusion but also by anatomical features of the structure of the spinal column that depends on the somatic constitution. It was noted that the best results of therapy were observed in patients with stenoplastic, indeterminate and subtleties types of physique since it corresponds to intervertebral foramens of a larger size [34].

It should be noted by identifying and preventing of cardiovascular diseases that men with abdominal and abdominal-muscular types of body constitution are predisposed to obesity as they have a strong development of the fat component [35]. Cardiac rhythm and conduction disorders are most often observed in men with muscular somatotype (34% of cases) and women with euryplastic somatotype (58%) [36, 37].

The incidence of primary heart attack in men does not depend on the constitutional type, however transmural acute myocardial infarction in men with abdominal (30%) and indeterminate (33%) somatotypes is more common than with thoracic somatotype (14%). Meanwhile, abdominal somatotype leads to recurrent heart attack more frequent [38, 39]. The hypertrophy of the left ventricle occurs in men with a muscular type of constitution in 79% of cases, abdominal – in 66%, thoracic – in 37% of cases [40].

At the first time, it was shown in the process of studies of phenotypic predictors of asthma that women of the leptosomal type of constitution and men with the chest somatotype predominate among the patients with this disease [41].

The frequency of diseases of the hepatobiliary zone also correlates with the features of the human physique. Thus, chronic cholecystitis and biliary dyskinesia in women develop most often in patients with the megalosomal somatotype [42]. Also people with increased body weight and abdominal obesity are susceptible to these diseases [3].

Study devoted to dependence of gall bladder motility on the type of constitution in women found that hypokinesia with expressed dyspeptic phenomena predominates are in women with leptosomal somatotype, and hyperkinesia is in women with megalosomal (athletic, subatletics) somatotype, while pain syndrome prevails in persons with euryplastic somatotype, and hypo- and hyperkinesia were selected depending on the fat component [42, 43].

The study of clinical-anthropometric parallels in patients with liver cirrhosis found that about 50% of women have a picnic body type and 50% men have an asthenoid-thoracic type [44].

Polismak described that chronic gastritis, peptic ulcer of the stomach and duodenum are most often (in 27.6% of cases) observed in patients with an indeterminate type of constitution. Peptic ulcer disease develops in patients with thoracic and muscular somatotypes at a young age, and in patients with abdominal somatotype develops later but with more expressed dyspeptic phenomena. It is interesting to note that patients with asthenic and thoracic somatotypes in this study were almost half as likely as in the population [45].

Derevtsova et al. showed that women with the syndrome of central hemiparesis of the second period of adulthood who have asthenic and pycnic constitutional types could perform the greatest joint range of motions in the large joints of the upper limb [46]. It was found that the prevailing number of women with

autoimmune toxic thyroiditis (33.4%) has an athletic type of constitution in the study of the constitutional predisposition to endocrine diseases [47].

The study of the relationship between the constitutional type of woman and the frequency of complications of pregnancy and childbirth showed that gestosis and threatening miscarriage are most often observed in women with picnic type of constitution (63.6% and 40.5% of cases respectively) and significantly less (in 17.4% and 21.7% of cases) in women with asthenic but colpitis, bacterial vaginosis, intrauterine infection of the fetus are more often noted in women with asthenic type of constitution [48].

Grebennikova showed that the majority of patients with hyperplastic diseases of the uterus were women with the megalosomal type of constitution – 84.8%. 32.4% women had athletic somatotype, 8.6% women had subtleties and 59.0% women had euryplastic somatotypes. Mesosomal type of constitution had 11.0% of women (mesoplastic somatotype) and 4.3% women had leptosomal constitution. Women with asthenic and stenoplastic somatotypes were observed in 57.2% and 42.9% cases respectively [49].

Prokopiev showed that dimensions of the inner arch are less than the usual values only in stand-up men with asthenic somatotype after fractures of the shin bones, that's why these men are recommended to use insoles for the support of the longitudinal arch of the foot [50].

Russkikh has shown that stress urinary incontinence is more rarely seen in women with mesomorphic (normosthenic) type of physique studying the constitutional features of the structure of the urethra and the neck of the bladder in women [51]. The clinical features of chronic prostatitis are more expressed in patients with chest somatotype in combination with early onset of the disease (27.1±0.5 years). Men with abdominal type of constitution have not so expressed symptomatology and the onset of manifestations, in this case, is at the age of 28.8±0.6 years, and the minimal clinical manifestations are combined with the intermediate age between the first and second age group of the disease in persons with the muscular type of constitution [52].

Modern studies have shown that there is a high prevalence of non-alcoholic liver disease (the most severe form of which is non-alcoholic steatohepatitis) among people with type 2 diabetes mellitus and obesity particularly [53]. In the study of constitutional markers of predisposition to obesity, it was found that picnic type of the constitution is more often noted among women with obesity of the 1<sup>st</sup> degree, euryplastic type is noted in women with obesity of the 2<sup>nd</sup> and 3<sup>rd</sup> degrees; abdominal type is noted among men. Abdominal-muscular type of constitution is observed among men at the age of 22-25 years, obesity of the 3<sup>rd</sup> degree is observed mainly in 94.5±0.4%. Low probability of obesity development (in the presence of cardiovascular pathology) is combined with asthenic, stenoplastic, picnic and subtleties somatotypes in women and it is also combined with the muscular type of constitution in men [35, 54].

Body weight deficiency is noted in persons with stenoplastic type of constitution among women of the second period of mature and at elderly age [25].

It is noted that the sexual activity under the age of 40 is maximal in men with the muscular type of the constitution and minimal in men with thoracic type; men with this somatotype are at risk of developing erectile dysfunction (74% of cases) [55]. However some authors assessing the reproductive function found

that young men with a thoracic type of constitution had the highest testosterone level in the blood serum (an average of 8.6 ng/ml), the highest concentration of spermatozoa (an average of 93.5 million/ml) and their mobility (62%); the lowest values were noted for an indefinite constitutional type [56].

### Conclusion

These literature data indicate the availability of correlations between the type of the human constitution, the probability of development, severity, and prognosis of diseases. Thus, the search of phenotypic predictors of various functional and pathological conditions is a complex problem of modern personified medicine worldwide. Competent and timely use of somatotyping will allow selecting the methods of treatment and prevention of diseases more objectively.

**Conflict of interest:** none declared.

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