



# Somatotypological Indicators of Physical Development in Residents of Kyrgyzstan

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## ABSTRACT

**Aims** The purpose of this research work was to assess somatotypological indicators of physical development in the inhabitants of Kyrgyzstan, from the standpoint of the prospects for preserving the health of the nation as a whole and preventing the occurrence of diseases in the citizens of the country's corresponding to a particular type of somatotypological disorders in particular.

**Materials & Methods** The basis of the methodological approach in this research work is a combination of methods of systematic analysis of the relationship of somatotypological indicators of a person's physical development with his general state of health with an analytical study of the features of the relationship of a person's somatic type with his general state of physical health, concerning the realities of living in modern Kyrgyzstan.

**Findings** In the course of this scientific study, results were obtained indicating the presence of a relationship between some somatotypological and anthropometric parameters of the physical development of Kyrgyz residents and the presence of certain diseases in them.

**Conclusion** Among the male residents of Kyrgyzstan, the abdominal somatotype prevails, and the chest somatotype can be called the least common. For women, the most common somatotype should be considered muscular, while the chest somatotype should be considered the least common. The presence of certain diseases or disease states is reflected in the main somatotypological parameters of a person's physical development.

**Keywords** Ergonomics; Health; Population Characteristics; Diseases

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## Introduction

To date, progress in the field of public health, including general and clinical medicine is impossible without an in-depth study of medical anthropology and somatic typology of the physical development of citizens. Modern anthropometric methods of conducting research which are the basis for a comprehensive assessment of the state of health of a modern person, are essential for the development of an objective scientific assessment of both the anatomical constitution of a person and the characteristic indicators of his physical development [1]. At the same time, at the moment, the systematization and etymologization of somatotypological indicators of the physical health of a modern person are not at the proper level, which does not allow for a fully assess his state of health, relying solely on the data obtained during the assessment of his anatomical constitution and the main parameters of physical development [2]. In this context, the study of somatotypological indicators of physical development in residents of a particular geographical region is of significant scientific interest, from the standpoint of the emerging prospects for establishing the relationship between the level of these indicators and the degree of development of certain diseases in this region.

Kyrgyzstan has a high birth rate and migration activity population. Migration activity is provided mainly conditioned upon the growth of the Chinese community, the total number of representatives of which, according to the State Statistical Office of the country, ranges from 90-350 thousand people. At the same time, the employment of a significant part of the country's population, which in particular is made up, of representatives of the aforementioned Chinese community, in heavy work, in particular, in the mining industry, road construction, and harmful industrial enterprises, largely determines the low somatotypological indicators of the physical health of citizens employed in these areas. This causes the need for regular somatotypological diagnostics of the country's residents since it is an integral component of the formation of a general assessment of the level of physical development of citizens and acts as a key characteristic of the integrity of the body of the average resident of the country [3]. In addition, somatotypological indicators of the physical development of residents of Kazakhstan may well serve as an effective factor in the course of a whole list of diseases that are characteristic of certain types of the constitution of residents of the country.

Until now, the concept of a person's physical condition has not received proper understanding and expression, since even many well-known healthcare professionals continue to confuse it with the concept of physical development [4]. In this context, a consistent increase in anthropometric and morphometric parameters is often perceived as a

positive phenomenon, while the conclusion regarding changes in the functional reserves of the human body is often realized based on determining the degree of deviation of several characteristic anthropometric features from the accepted average normative parameters [4]. At the same time, recently there has been an increasing number of scientific researchers who tend to consider a specific physical condition of a person as a set of closely related indicators, such as gender, age, features of the functional state of the main body systems, the ability to prolonged physical activity, working capacity, etc. This indicates the gradual development in modern society of a system of ideas about the existence of a structural relationship between the key somatotypological indicators of human physical development and the general state of his health at a particular time.

Kyrgyz are characterized by the almost complete absence of any significant changes in the somatotypological profile in the male and female parts of the population during the sequential transition from adolescence to adulthood, which indicates the absence of any cardinal changes of the somatic type throughout postnatal osteogenesis, including the modified nature of all such changes [5]. In this research, an urgent task is set to study the key somatotypological indicators of physical development of Kyrgyz residents, to determine the relationship of these indicators with the general level of health of citizens of the country as a whole, and to identify the main features of the influence of the dynamics of changes in the studied parameters on the main trends in the development of a healthy and able-bodied population of the country, with the realities of everyday life of Kyrgyz citizens. Therefore, this research aimed to assess somatotypological indicators of physical development.

## Materials and Methods

The basis of the methodological approach in this research work was a combination of methods of systematic analysis of the relationship of somatotypological indicators of a person's physical development with his general state of health, and the probability of having certain diseases with an analytical study of the features of the relationship of a person's somatic type with his general state of physical health, about the realities of living in modern Kyrgyzstan. The research was preceded by the development of qualitative information and a theoretical base, which is the results of studying a series of research publications of several domestic and, mainly, foreign research scientists who considered problematic issues of the relationship of somatotypological parameters of individual individuals with the general state of their health at a certain point in time. To ensure the highest quality and objective picture of scientific research, and to

facilitate the perception of the information provided in it, all the practical developments of foreign authors [1-7], taken in the order of citation and presented in this research paper, have been translated into Russian.

This study was carried out in three stages. In the first stage of this research work, the theoretical basis of scientific research was prepared, which determines the main directions of studying the declared topic. Also, at this stage of the research work, a systematic analysis of the relationship between somatotypological indicators of the physical development of a person and his general state of health was carried out, which is of key importance in the context of assessing somatotypological indicators of physical development in relation specifically to the residents of Kyrgyzstan.

In the second stage of this research, an analytical study of the features of the relationship between the somatic type of a person and his general state of physical health was carried out, concerning the realities of living in modern Kyrgyzstan. In the course of this scientific study, 450 male and 450 female residents of Kyrgyzstan were examined, who were aged 35-45 years and do not have pathological diseases that can have a significant impact on key somatotypological indicators of their physical development. The main results of the conducted studies were presented in the corresponding tables displaying the key somatotypological indicators of the physical development of the subjects. The data on the main somatotypes that have become most widespread among the residents of Kyrgyzstan and the revealed relationship between the main somatotypological and anthropometric parameters of the persons who participated in the survey and the presence of certain diseases were also presented. In addition, at this stage of the research work, an analytical comparison of the results obtained in the course of it with the results and conclusions of other researchers on the somatic parameters of the physical health of individuals and their systemic relationship with changes in the state of health of a modern person in different periods of his life was carried out. Conducting such an analytical comparison allows for obtaining results of a higher degree of accuracy and significantly expands the prospects for further research in this direction.

## Findings

The main somatotypes among Kyrgyz of both sexes of adolescence and adulthood should be considered:

1. Abdominal (35.5-36% of the male population and 27-29% of the female).
2. Thoracic (8-12% of the male population and 17-19% of the female).
3. Muscular (26.8-28% of the male population and 31-32% of the female).

4. Indeterminate (22-24% of the male population and 18-20% of the female).

In fulfilling the tasks set out in this scientific study, 450 male and 450 female residents of Kyrgyzstan who were aged 35-45 years and do not have pathological diseases that can have a significant impact on key somatotypological indicators of their physical development were examined. Table 1 showed the main results obtained during the implementation of this comparative study.

**Table 1)** The mean±SD somatotype of Kyrgyz men and women

Somatotype	Abdominal	Thoracic	Muscular	Indefinite
<b>Wrist diameter</b>				
Male	6.0±0.1	5.2±0.1	8.1±0.1	5.5±0.1
Female	5.4±0.1	4.6±0.1	7.0±0.1	5.0±0.1
<b>Width of the shoulder</b>				
Male	39.5±0.3	32.5±0.6	45.2±0.3	40.4±0.5
Female	38.4±0.2	32.0±0.4	44.8±0.2	39.1±0.4
<b>Pelvic diameter</b>				
Male	37.6±0.4	23.5±0.2	39.2±0.4	31.5±0.3
Female	35.5±0.3	21.0±0.1	36.5±0.3	28.5±0.3
<b>Transverse diameter</b>				
Male	57.6±0.3	55.5±0.5	60.2±0.5	48.5±0.2
Female	55.6±0.2	50.0±0.4	56.5±0.4	41.5±0.2

The data obtained in the course of the conducted research indicate a significant predominance of individual minimum and maximum values of all studied parameters of representatives of the muscular somatotype of both sexes over all other somatotypes of men and women who participated in the comparative study. In particular, the individual parameters of the shoulder girdle width of men and women belonging to the muscular somatotype were comparable with similar indicators of representatives of the abdominal somatotype, but at the same time significantly exceed similar parameters of representatives of the thoracic and indeterminate somatotypes. When conducting a comparative assessment of the average wrist diameter of Kyrgyz men and women, and the average pelvic diameter, the predominance of these parameters in residents of the country with a muscular somatotype was more pronounced, compared with residents with abdominal, thoracic, and indeterminate somatotypes. At the same time, certain patterns were found concerning the successive changes in somatotypological indicators of Kyrgyz residents of both sexes, depending on the age at which the persons participating in the experiment stayed. Thus, the diameter of the pelvis in adolescent men of all somatotypes, except the muscular type, has no differences from the same size of men who were at the age of the first maturity, although in women these indicators have noticeable differences conditioned upon a gradual increase in the width of the pelvis in women with age. At the same time, in Kyrgyz men, it was the abdominal somatotype that was predominant among the total

number of subjects, which determines the main features of changes in their anthropometric parameters throughout life. Thoracic somatotype was much less common, and this applies to men of all ages. In women, the most common somatotype was muscular, while the thoracic somatotype was the least common among women in Kyrgyzstan.

The main somatotypological indicators of physical health among the residents of Kyrgyzstan were of key importance from the standpoint of forming a qualitative assessment of the health of citizens against the background of not the most prosperous demographic situation in the state as a whole. Based on the results obtained in the course of this scientific study, it was noted that persons suffering from various forms of gastrointestinal diseases and belonging to various somatotypes had pelvic and shoulder girdle diameter indicators close to the minimum parameters, which negatively affects their physical endurance and ability to work and, in general, was evidence of the presence of tendencies to premature aging. In addition, it was noted that overweight subjects, regardless of gender and somatotype, had higher indicators of the width of the pelvis and shoulder girdle, often significantly exceeding the maximum allowable obtained in this study among all groups of subjects. Thus, the results obtained indicate that there was a clear relationship between the main somatotypological and anthropometric parameters of the subjects who participated in the survey and their physical condition, including their state of health at a particular time.

For example, in the course of this scientific study, it was found that for people suffering from diseases of the cardiovascular system, a uniform increase in the total length of the body was characteristic, combined with a certain reduction in the diameter of the hand, and this was in no way related to gender or a specific somatotype.

As follows from the data presented in Table 1, representatives of the muscular somatotype, regardless of gender, have more pronounced indicators of the diameter of the distal epiphyses of the forearm bones compared with representatives of other somatotypes. Notably, in persons suffering from various diseases of the digestive system, this indicator was significantly increased, against the background of a general increase in body length, and body weight was significantly reduced at the same time.

## Discussion

To date, the issues of increasing the value of human life and preserving his health are of high importance in the context of the need to shift the focus to the individual characteristics of human development living in a specific environment or a given geographical region, and the prerequisites for the occurrence of certain diseases in a resident of this

region. Constantly changing environmental conditions, combined with abrupt changes in economic and social living conditions, often hurt the numerical composition of the population, with a gradual increase in the number of older age groups in it. These categories of citizens traditionally require increased attention, both from the state and society and from employees of the modern healthcare system [8].

The doctrine of "healthy people", which is relevant today in many countries, implies mandatory attention to the problems of "genetic markers" as factors determining the human constitution. At the same time, genetic approaches are essential from the point of view of forming a qualitative assessment and long-term forecasting of the health of an individual and the nation as a whole. In this context, genetic markers that reflect the hereditary characteristics of an individual, and his phenotypic constitution, are becoming increasingly important [9].

The urgent relevance of the issues of determining the actual level of physical development of a person, to assess the quality of health and well-being of both a single person and the entire population of the state in a complex, according to anthropometry in general and somatotype in particular, has long been noted by the authors of research in various areas of anthropomorphology and medical science. To date, research in the field of somatometry is mainly focused solely on identifying regional differences in the anthropometric parameters of residents of certain geographical regions, to establish ethnic, including specific territorial and environmentally conditioned conditions of existence, body structure features of people historically living in a particular area [10]. At the same time, somatotypological indicators of physical development in residents of a particular area can vary significantly, which is often explained, among other things, by the peculiarities of life in a particular geographical region.

The physiological constitution of a person is one of the most integrative anthropometric and anatomical characteristics of his body. A full-fledged study of the features of the human structure in the context of a holistic study of the features of the structure of his body involves a consistent transition from the human anatomy as a whole to the specific features of his anatomical structure, considering the constitution of a single person as a whole. This is the prognostic value of the constitution factor of a single individual since a consistent assessment of the measure of changes in his organs in accordance with individual constitutional features is formed with mandatory consideration of his main somatotypological parameters [11].

The somatic type of a person is one of the main features of his general constitution, while it has a clear correlation with particular constitutional features, acting as a marker of a purely genetic

nature that reflects the dynamics of morphological and functional characteristics of a single individual. The somatic type is exclusively external, simplest in research and measurement, having relative stability in ontogenesis and a genetically determined auxiliary system of the general constitution at the same time displays the key characteristics and properties of the dynamics of ontogenesis, metabolism, general reactivity of the organism and the biological typology of a single personality. At the same time, the somatic type should be considered the main aspect from the standpoint of determining the constitution of a particular person, including the development of a qualitative assessment of his general health. The key concept of the establishment of a modern approach to assessing the systemic relationship between the type of human constitution and its specific somatic type, and between this type and a specific disease, considering the specific features of its occurrence and course, is precisely to establish the main relationships and interdependencies between the characteristic features of the human constitution and its diseases or trends towards their occurrence and development in certain situations [12].

Conducting a scientific study of the physical condition of people of mature age, considering the influence on their health of the main environmental factors, primarily of a social nature, on the morphological status of citizens living in cities and rural areas clearly demonstrates the fact of the presence of heterogeneities in the overall indicators of physical development of citizens of both sexes belonging to the same age group, and the dependence of key the parameters of the constitution depend on the living conditions specifically in cities and rural areas.

In the current XXI century, integrative anthropology has received rapid development, which has contributed to the unification within this scientific discipline of a whole range of other sciences and scientific disciplines, which very convincingly and consistently prove the fact of human unity, both morphofunctional and somatopsychic, and personality-social, unity and structural interrelation of key forms of its variability, including some interrelated factors affecting this variability. All the fundamental factors of functional development can be attributed with good reason to the creation of biologically determined and socially determined functional systems. The most important conclusion from all of the above should be considered the statement of the fact that the social environment is dominant in the human population, and this dominance is expressed both in relation to specific individuals and to the system of the biological organization itself [13]. The social relations that have developed in the modern information environment are beginning to acquire a completely different meaning for a person when organizing his behavior.

The physiological systems of the human body, which make up its internal environment and affect the main aspects of its sequential development, gradually occupy a subdominant position, while functional systems, whose main task is to ensure a social attitude to the educational process in the bulk of modern individuals, gradually acquire a dominant position, which causes a gradual suppression of functional (physiological) biological-level systems whose tasks include determining the biological health of a person, which is primarily associated with the suppression of his motor activity [14].

The fact of socialization of a modern person, as the main characteristic of his modern natural state, often becomes decisive when identifying the causes of his diseases, including the nature of their course. Painful conditions that contain a cause that is not related in any way to the effects of certain infections are one of the most eloquent confirmations of this circumstance. Signs of the presence of pathologies in the development of the modern human body, and its quite normal conditions, are largely determined by the influence of factors directly related to the hereditary predisposition of a person to the emergence and development of certain conditions in him. Environmental factors that directly affect the change in a person's physical condition and his exposure to certain diseases are also of significant importance [15]. The development and realization of numerous pathological genotypes that cause changes in key somatotypological indicators of physical development can largely be explained by the peculiarities of the social nature of a person, expressed in certain circumstances.

Somatotypological indicators of physical development in residents of specific geographical regions are directly dependent on their living conditions and are interrelated with the general indicators of their social activity. At the same time, the conditional division of the somatic type into many key characteristics, such as body length and weight, can be used as genetic markers when optimizing preventive measures, in pedagogical practice, when there is a real need to plan prospects for increasing training loads, including when making forecasts of specific stages of maturity of a single individual, physiological and somatic [16].

Such an important component that affects the physical condition of a modern person and acts as one of the main ones in the development of various pathologies, as excessively large body weight, has a significant impact on the indicators of the overall level of variation in the signs of physical development of a person. Excessively high body weight in specific social conditions and situations can be a factor in the consistent development of both monogenic and polygenic pathology, while acting as an aggravating circumstance for the development of a pathological condition of the musculoskeletal system, in particular, the spinal column [17].

Therefore, a consistent study of the physical condition of a person, especially in adulthood and old age, in the context of studying the relationship between the characteristics of his condition with the impact of various environmental factors, is essential from the standpoint of determining the relationship between the main somatotypological indicators of physical development of a modern person and his state of health in specific life periods.

The study of the peculiarities of physical development of people of different age groups in the context of improving the understanding of the influence of environmental factors on their general health, including environmental factors such as social, psychological, and their direct relationship in the context of the development of somatotypological indicators of human physical development in modern social conditions, is necessary for a qualitative understanding of the significance of the main somatotypological indicators of physical development in issues of determining the main trends in the development of diseases in modern humans [18]. The study of the main somatic types in people, starting from adolescence, allows us tracking key patterns in the degree of severity of fat mass in both sexes, which results in a pronounced asymmetry of the body structure. Violation of the functions of the body aimed at maintaining a stable body weight of a person may be a consequence of a violation of the vital activity of certain organs or systems of the body [19].

Individuals with a central type of obesity are more likely to develop hereditary factors with age, leading to an increase in excess body weight [8, 20, 21]. The ratio of the total amount of fat of visceral and somatic origin is more than half determined by the type of genetic component, in other words, about as much as the body mass index is genetically determined in different somatic types. Considering the indicators of a person's body weight in childhood and adolescence, it is possible to formulate an approximate forecast of individual variability of his body weight already in adulthood [22]. At the same time, a forecast of this kind has a lower degree of reliability than the forecast of definitive parameters of body weight and height, made based on juvenile indicators [23].

Somatotypological indicators of a person's physical development are also largely determined by his race and lifestyle directly in his natural conditions [24]. For this reason, obtaining comprehensive information about the main anthropometric and somatotypological indicators of human physical development is necessary to form an assessment of the quality of general health and physiological well-being of the population in individual geographical regions. Determination of the level of physical development based on the results of anthropometry can serve as a qualitative basis for a subsequent systematic approach in the direction of preventive

activities of medical institutions, focusing on certain groups of individuals, considering the key features of their physical development, and the peculiarities of the course of metabolic processes of the body and in general for the population of the entire geographical region.

## Conclusion

A clear relationship was found between the main somatotypological parameters of the physical development of Kyrgyz residents and their state of health at the time of the survey, which had the purpose of determining this relationship. This fact is of significant practical importance from the standpoint of the prospects for the diagnosis of various diseases by the main somatotypological parameters, including by the nature of their changes in different periods. Somatotypological parameters of physical development should be periodically monitored in the dynamics of their changes, which in general will contribute to the timely detection of certain diseases and the adoption of timely measures to prevent their further development, which is important from the standpoint of preserving the health of the entire nation as a whole. Carrying out further research in this direction will contribute to obtaining more accurate and objective information about the main trends in the development of the general health status of Kyrgyz residents, considering the most common somatotypes among them and somatotypological indicators of their physical development.

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