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# ESTIMATION METHODS AND RATE OF ONTOGENETICALLY DISHARMONIC BONE COMPONENT OF HUMAN BODY MASS IN VARIOUS AGE AND GENDER GROUPS

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*On the basis of direct anthropometry the regularities of formation of human body mass bone component at the stages of postnatal ontogenesis, which become apparent by different rate of body mass disharmony due to bone component. The development of traditional methodology of anthropometry, valid advanced methodology, in particular, provides with estimation of ontogenetically disharmonic body build due to body mass bone, taking into account the ontogenetic and gender peculiarities. The findings can explain the age and gender differences as for the rate of initiation of functional disorders, prenosological, as well as nosologically defined pathological conditions as manifestations of general process of growth and development in postnatal ontogenesis.*

Key words: anatomy, anthropometry, ontogenesis, body mass bone component.

The findings, presented in the paper, have been obtained during the field anthropometric studies, provided for the interstate research scientific work, entitled “ Study of structural and functional state of osseous tissue in children and adolescents, living in ecologically unfavorable regions” (2004-2006) [13, 14], during the regional population examinations in compliance with the KNMU’s research scientific work program: “Validation and implementation of system of regional monitoring of children and adolescents’ health in conditions of the reformation of Primary Health Care for Ukrainian population” [6] with public financing (State registration No 0107U001392) and are followed up within the initiative research scientific work.

## Introduction

It has been proved that data of anthropology – a science of variability of human physical type in time and space – are the source of valuable information, enabling to reconstruct some aspects of ethnogenetic and ontogenetic processes [20]. Anthropometric data store their information properties even when it comes to very late historical periods, illustrated by the conservatism of intrinsic physical traits, which are little changed in time [18]. One of the first who elucidated the problem was a prominent Ukrainian ethnologist F. Vovk [17] who concluded the prevalence among the population of Ukrainian ethnic lands of quite homogeneous complex of features, called a "Ukrainian anthropological type." The scientist gave reasons for the opinion as for the belonging of this type to the Adriatic, or Dinaric race, prevailing mainly among the southern and western Slavs – Serbs, Croats, Czechs, Slovaks, etc. [17]. The recent findings suggested a comprehensive anthropological characteristic of the Ukrainians on the basis of the analysis of the variability of features of several morphological systems: somatological, odontological and dermatoglyphical; four anthropological zones of Ukraine: Northern, Western, Central and Southern, which were formed under the influence of socio-ecological factors on the basis of interaction of morphological components of various origin, were also defined [17]. In addition, the place of the Ukrainians in the anthropological classifications of peoples of Eastern Europe was defined, and the main lines of their anthropological connections were elucidated, accounting for the complex of morphological markers [19, 20].

Generally, osteogenesis, initiating in the antenatal period, continuing for 25-30 yrs, and age changes of bone component are the most apparent at the initial stage of postnatal ontogenesis [2, 7]. Change in bone mass can be transient or persistent that is determined by the state of metabolic processes in the corresponding period of ontogenesis, regionally – by ecological differences, alimentary supply of nutritional homeostasis, regimen of movement activity, state of somatic health and human somatotype [14, 25, 26]. Therefore, the regard for factors, contributing to formation of body mass bone component requires integral approach, as there are no such physiological and pathological processes, clinical course of which could have impact on the dynamic of metabolism and, subsequently, micto- and macro architectonics of bone and body build [24, 26]. Study of regularities of the physical development in different age groups is crucial in determining of sequence of stages of stature development, pubescence, and body size measurement. Bunak V.V. stated that the level of physical development of human individual should be determined by the overall body size and absolute value of its mass. While analyzing the variability of the total body size, the famous morphologist defined three stages of the development: progressive, persistent and regressive. Determination of regularities in the process of growth and development of the human organism is one of the major tasks of study about ontogenetic development [4, 22].

The purpose of the work was to enhance the accuracy of estimation of body mass bone component, taking into account absolute amount of bone tissue and ectomorphic component, considering the regional age-and-gender indices.

## Materials and Methods

Findings of the direct anthropometry, involving over 1300 individuals, stratified according to characteristic of the ontogenetic period (Table 1) served as the study material. Anthropometric examination has been made according to the V.V. Bunak's chart [1] and provided for measurement of total (length, weight and calculation of body surface area), partial body sizes (longitudinal, circumferential, transversal, anteroposterior) and skinfold thickness.

Aggregated results comprised the reference database [6], and processed information formed the basis for statistical analysis and number of advanced developments [9, 11, 12] and branch innovations [5].

*Table 1*

*Quantitative characteristic of reference anthropometric database aggregation*

| Stage of ontogenetic period | Age classification of the subjects | | Anthropometry: Values of total body sizes | Values of partial body sizes | Values of skin folds thickness | Total number of individuals according to ontogenetic periods |
|---|---|---|---|---|---|---|
| VI | Late Childhood | boys 7-12 yrs. | 226 | 226 | 226 | 400 |
| | | girls 7-11 yrs. | 174 | 174 | 174 | |
| VII | Adolescence | boys 12-16 yrs. | 202 | 202 | 202 | 421 |
| | | girls 11-15 yrs. | 219 | 219 | 219 | |
| VIII | Youth | young boys 16-21 yrs. | 156 | 156 | 156 | 322 |
| | | young girls 15-20 yrs. | 166 | 166 | 166 | |
| IX | Adulthood (I period) | men 21-35 yrs. | 114 | 114 | 114 | 230 |
| | | women 20-35 yrs. | 116 | 116 | 116 | |
| Total | | male | 698 | 698 | 698 | 1372 |
| | | female | 674 | 674 | 674 | |

Anthropometry has been performed directly in the living conditions utilizing calibrated devices, obtaining the following parameters: body height (H, cm), was measured by versatile anthropometer to the nearest 0,1 cm; body mass (BM, kg) was measured using balance scale to the nearest 0,1 kg. Sliding caliper was used to measure (to the nearest 0,01 cm) width of distal epiphysis of arm ($s_1$, cm; the biggest horizontal distance between the outer and inner epicondyles of humerus); forearm; forearm width ($s_2$, cm; the biggest horizontal distance between the styloid process of radius and styloid process of ulna); hip width ($s_3$, cm; the biggest horizontal distance between the inner and outer epicondyles of femur); shin width ($s_4$, cm; the biggest horizontal distance between the outer and inner ossicles of the shin). Ones anthropometry was finished the height-and-weight index was calculated for particular individual by the equation: ($I_{BM}=H/BM^{-3}$), mean value of circumferential parameters was calculated by the equation: $δ=(s_1+s_2+s_3+s_4)$ /4, absolute bone tissue mass ($M_{BA}$, kg) was calculated by the equation: $M_{BA}$ = $δ^2×H×1,2$ / 1000 and ectomorphic index ($M_{BT}$) was calculated by the equation: $M_{BT}= I_{BM}×X_1-X_2$. At the same time $X_1$ and $X_2$ coefficients and variability (SD) of ectomorphic index ($M_{BT}± SD_{BT}$), as well as absolute amount of bone tissue ($M_{BA}± SD_{BA}$) for age-and-gender group, assigned to particular individual were taken from the reference database [6]. In case when the $M_{BT}$ index was out of the range of $M_{BT}±SD_{BT}$, and $M_{BA}$ is out of the range of $M_{BA}± SD_{BA}$, bone component of the individual was assessed as ontogenetically disharmonic and vise versa [12].

The research has encompassed the common morphometric and medical statistical methods, namely, variation statistics, probabilistic distribution of features with certainty value of results; the licensed software has been used for database maintenance and its statistical processing [23]

## Results and Discussion

Common clinical approaches for estimation of human bone mass (BM) are based on the evaluation of bone mineral density, particularly, bioenergetic x-ray absorptiometry, radiography, ultrasound bone densitometry, absorptiometry, quantitative computer tomography are applied for indirect assessment of BM [10]. In this case, photon and x-ray densitometers are divided into mono-and bichromatic. Monochromatic densitometers provide with the analysis of only the cortical bone tissue, while bichromatic ones provide with the analysis of its cortical and trabecular components, enabling to determine mineral density of bones of peripheral and axial skeleton, after which the index of bone mass for particular individual is calculated by the specific equation [8]. However, application of photon and x-ray densitometers promotes to get only a relative idea as for the absolute amount of bone component and is rather expensive and technically complicated, unabling to be used in screening examinations [3]. The listed methods were not widely applied due to the technical complexity and high cost of the procedure [15]. These methods are not effective in the work of a practitioner for a number of reasons: high cost, a significant dose of radiation, a significant range of data variability, as well as lack of standardization in ontogenetic and clinical groups of patients [16].

The common way of morphometric assessment of bone component is based on the direct anthropometry with further application of specific computational algorithm [29]. The essence of abovementioned technique of anthropometric estimation of absolute amount of bone component is in the measurement of body height and mass with further calculation of height-and-weight index, as well as measurement of values of distal epiphysis of arm, forearm, hip, shin, and having calculated its mean value, the absolute bone mass is determined by the specific equation. In this way the index of absolute amount of bone tissue, using the direct anthropometric measurements, is determined. However, application of this technique implies the assessment of bone component, not accounting for body build that reduces the accuracy of the estimate and do not fully consider the peculiarities of children's age. Body build can also be estimated according to a specific chart [27, 28], when the body build is measured by the integral criterion, combining three constituents: endomorphic, mesomorphic and ectomorphic. In this way bone component by ectomorphic index is estimated accouting for the relevant age-and-gender factors, obtained by the results of anthropometric studies. Application of such technique provides with determination of ectomorphic component of body build, however, not accounting for its regional peculiarities [26].

The main objective of the technique [9, 11] for assessment of human body mass composition, including anthropometry by the linear and circumferential indices with subsequent calculation of relative content of body bone component, according to a useful model, is achieved by the measurements of body height (H, cm) and its weight (BM, kg) with further calculation of the height-and-weight index ($I_{BM}$=H/BM$^{-3}$); once the measurements of width of distal epiphyses of arm ($s_1$, cm), forearm ($s_2$, cm), hip ($s_3$, cm), shin ($s_4$, cm) were taken and its mean value was calculated by the equation $\delta=(s_1+s_2+s_3+s_4)/4$, the absolute bone tissue mass ($M_{BA}$, kg) is calculated by the equation: $M_{BA} = \delta^2 \times H \times 1,2 / 1000$, followed up with the estimation of bone component by the ectomorphic index ($M_{BT}$), calculated by the equation: $M_{BT}= I_{BM} \times X_1 - X_2$, accounting for corresponding regional age-and-gender coefficients ($X_1$-$X_2$) and variability (SD) of ectomorphic index ($M_{BT}$±$SD_{BT}$) and absolute amount of bone tissue ($M_{BA}$± $SD_{BA}$); and when the $M_{BT}$ index of particular subject is out of the range of $M_{BT}$±$SD_{BT}$, and $M_{BA}$ index is out of the range of $M_{BA}$± $SD_{BA}$, a child's bone component is estimated as ontogenetically disharmonic and vise versa.

Enhancement of the accuracy of estimation of body mass bone components is achieved by the simultaneous consideration of the absolute amount of bone tissue and ectomorphic component of body build according to the regional index and age-and-gender group of individual. The latter is crucial for the enhancement of the accuracy of estimation of body bone components, since the influence of integrated informative factors is considered.

While performing a comprehensive medical examination, directly in living environment, of senior high school students of school No. 94 in Kharkiv city the anthropometric measurements were taken for Olena M., 15 years old; particularly, measurements of girl's body height (H=152,0 cm) were taken, using a versatile anthropometer; body weight (BM = 46,7 kg) was measured using balance scale; Width of distal epiphysis of arm i.e., the biggest horizontal distance between the outer and inner epicondyles of humerus ($s_1$= 6,2 см), forearm width, i.e., the biggest horizontal distance between the styloid process of radius and styloid process of ulna ($s_2$ = 4,7 см), hip width, i.e., the biggest horizontal distance between the inner and outer epicondyles of femur ($s_3$=7,6 см), and shin width, i.e., the biggest horizontal distance between the outer and inner ossicles of the shin ($s_4$=5,5 см). ($s_4$, cm) were measured by the caliper. Once the anthropometry finished, the height-and-weight index was calculated for Olena M. by the equation: $I_{BM}$=H/BM$^{-3}$ = 152,0/46,7$^{-3}$=152/3,6 = 42,2, the mean value of epiphyses width was calculated by the equation: $\delta=(s_1+s_2+s_3+s_4)/4$ = (6,2+4,7+7,6+5,5)/4 = 24/4 = 6,0; absolute bone tissue mass was calculated by the equation: $M_{BA}=\delta^2 \times H \times 1,2/1000=6^2 \times 152 \times 1,2/1000$ =6,56 and ectomorphic index by the equation: $M_{BT}=I_{BT} \times X_1 - X_2$=42,2×0,732-28,6= 31,9-28,6 = 2,29. In this way the values of $X_1$ and $X_2$ coefficients account for 0,732 and 28,6, respectively, and the reference average group values of ectomorphic index ($M_{BT}$±$SD_{BT}$=3,90±0,37) and index of absolute amount of bone tissue ($M_{BA}$±$SD_{BA}$= 6,80±0,40) for 15 year old girls group, to which Olena M. is also assigned, have been taken from the reference database [6]. Since the $M_{BT}$ index of Olena M. is out of the range of average-group values and the $M_{BA}$ index is within the range of $M_{BA}$±$SD_{BA}$, the bone component of Olena M. body mass has been estimated as ontogenetically disharmonic.

Similar to abovementioned example, using the aggregated database, the following indices have been calculated for each examined individual in the EXCEL software, on the basis of their direct anthropometry: index of absolute mass of bone tissue ($M_{BA}$) and ectomorphic index ($M_{BT}$), providing with conclusion as for ontogenetic harmony of body mass body component; relative and absolute indices of the rate of such phenomenon have been defined (Table 2).

*Table 2*

*Rate of ontogenetically disharmonic human body mass bone component in the age and gender groups*

| Stage of ontogenetic period | Age classification of the subjects | | Number of examined | Have disharmonic bone component of body mass | |
|---|---|---|---|---|---|
| | | | | individuals | P±m,% |
| VI | Late Childhood | boys 7-12 yrs. | 226 | 39 | 17,3±2,5 [a] |
| | | girls 7-11 yrs. | 174 | 14 | 8,0±2,1 |
| | | total | 400 | 53 | 13,2±1,7 |
| VII | Adolescence | boys 12-16 yrs. | 202 | 27 | 13,4±2,4 [a] |
| | | girls 11-15 yrs. | 219 | 16 | 7,3±1,8 |
| | | total | 421 | 43 | 10,2±1,5 |
| VIII | Youth | young boys 16-21 yrs. | 156 | 19 | 12,2±2,6 |
| | | young girls 15-20 yrs. | 166 | 24 | 14,5±2,7 |
| | | total | 322 | 43 | 13,4±1,9 |
| IX | Adulthood (I period) | men 21-35 р. | 114 | 12 | 10,5±2,9 |
| | | women 20-35 р. | 116 | 29 | 25,0±4,0 [b] |
| | | total | 230 | 41 | 17,8±2,5 [c] |
| Total | | male | 698 | 97 | 13,9±1,3 |
| | | female | 674 | 83 | 12,3±1,3 |
| | | total | 1372 | 182 | 12,4±0,1 |

*Note: [a] – in one ontogenetic group – reliably more frequently among male individuals; [b] – in one ontogenetic group – reliably more frequently among female individuals; [c] – reliably differs from the previous ontogenetic group.*

The data analysis has shown that gender differences were characterized by reliably (p<0,01) higher prevalence of ontogenetic disharmony of body mass component among male individuals in the VI and VII ontogenetic periods, whereas in youth period the rate of disharmonic variants among male and female individuals was reliably the same. Significantly high rate of disharmony of body mass bone component is noted among the female individuals in the first period of adulthood (25.0 ± 4.0% among females and 10.5 ± 2.9% among males, respectively; p < 0.001). Generally among 1372 individuals the rate of disharmonic body mass bone component varied from 8,0±2,1% (females in the period of late childhood) to 25,0±4,0% (adult females). The rate of disharmonic types among male individuals varied from 10,5±2,9% to 17,3±2,5%.

## Conclusions

1. On the basis of direct anthropometry the regularities of formation of human body mass bone component at the stages of postnatal ontogenesis, which become apparent by different rate of body mass disharmony due to bone component, especially in female individuals.

2. As the example showed and according to the generalized development of aggregated anthropometric data, the development of traditional methodology of anthropometry, valid advanced methodology, in particular, provides with estimation of ontogenetically disharmonic body build due to body mass bone, taking into account the ontogenetic and gender peculiarities.

3. The assessment of ontogenetic disharmony of body mass bone component is assigned to anatomy, topographic anatomy, and other clinical disciplines and can be applied to consideration of ontogenetic peculiarities of body build while assessing the body composition [5].

4. The findings can explain the age and gender differences as for the rate of initiation of functional disorders, prenosological, as well as nosologically defined pathological conditions as manifestations of general process of growth and development in postnatal ontogenesis.

The perspective researches encompass the study of other (fat, muscle) components of body mass at the stages of human postnatal ontogenesis, aiming at identification of general regularities that are significant for anatomical validation, development and enhancement of diagnostic techniques and prevention of human diseases.

## References


1. Бунак В.В. Антропометрия / В.В. Бунак. - М. : Наркомпрос РСФСР, 1941. - 384 с.
2. Калашникова Е.В. Ювенильный остеопороз: новый взгляд на природу заболевания и перспективы исследований / Е.В. Калашникова, А.М. Зайдман, Т.И. Арсенович // Ортопедия, травматология и протезирование. - 2000. - № 2. - С. 112.
3. Митник З.М. Можливості комп'ютерної томографії в діагностиці остеопорозу / З.М. Митник // Укр. медичний альманах. - 2001. - № 2.- С. 53-55.
4. Никитюк Б.А. Конституция человека / Б.А. Никитюк // Итоги науки и техники: Антропология. – Москва : ВИТИНИ, 1991. - Т. 4. - 152 с.
5. Нововведення №134/30/09. Методика оцінки кісткової маси у дитячому та підлітковому віці за допомогою номограм / Т.В. Фролова, О.А. Охапкіна, А.С. Шкляр // Реєстр галузевих нововведень МОЗ України. - 2009.
6. Обґрунтування та впровадження системи регіонального моніторингу здоров'я дітей, підлітків та осіб молодого віку в умовах реформування МПСД населенню України // Заключний звіт про виконання наукового проекту (прикладна НДР) МОЗ України. – Держреєстрація № 0107U001392. – Харків : ХНМУ, 2009. - 253 с.
7. Охапкіна О. В. Соматотип та тілобудова: дефінітивний аналіз у контексті онтогенетичного розвитку / О.В. Охапкіна, А.С. Шкляр // Науково-практична міжвузівська конф. «Демографія, здоров'я, медицина» (22.04.2008 р). – Харків, 2008. – С. 85-88.
8. Пат. 6249692 США, МКИ[7], A61B 5/00. Method for diagnosis and management of osteoporosis / Cowin Stephen C., The Research Foundation of City Univ. of New York. № 09/641634; Заявл. 17.08.00; Опубл. 19.06.01; НКИ 600/407).
9. Пат. 66942 U, Україна, МПІ (2011.01). – А61В5/00. Спосіб оцінки кісткової компоненти тіла з урахуванням соматотипу людини // А.О. Терещенко, А.С. Шкляр, Г.С. Барчан, С.П. Шкляр (UA). - Заявка №u201108106; Заявл. 29.06.2011; Опубл. 25.01.2012, Бюл. №2, 2012.
10. Пат. № 49707 А, UA, МПК А61N5/06, G01N33/48. Спосіб ранньої діагностики виникнення остеопорозу кісткової тканини / Заявка №2002032065; Заявл. 14.03.2002; Опубл. 16.09.2002.
11. Пат.55932 U, Україна, МПІ (2011.01). – А61В8/00. Спосіб оцінки кісткової маси за її соматометричним градієнтом / С.М. Григоров, Т.В. Фролова, Г.С. Барчан, А.С. Шкляр, С.П. Шкляр (UA). - Заявка №u201008695; Заявл. 12.07.10; Опубл. 27.12.10, Бюл. №24, 2010.
12. Пат.78523 U. Україна, МПК (2013.01) А61В 10/00. Спосіб оцінки онтогенетичної дисгармонійності кісткової компоненти тіла дітей та підлітків / Г.С. Барчан (UA), Л.І. Омельченко (UA), О.М. Хвисюк (UA), А.С. Шкляр (UA), О.А. Цодікова (UA), Л.В. Черкашина (UA), С.П. Шкляр. – ХМАПО (UA). - Заявка № u201209080; Заявл. 06.08.2012; Опубл. 25.03.2013, Бюл. №6, 2013.

13. Поворознюк В.В. Особенности фактического питания у детей и подростков: результаты украинско-беларусского исследования / В.В. Поворознюк, Э.В. Руденко, Н.В. Григорьева [и др.] // Проблеми остеології. - 2006. - Т. 9. - С. 98-99.
14. Поворознюк В.В. Структурно–функциональное состояние костной ткани у детей и подростков: результаты украинско-беларусского исследования / В.В. Поворознюк, Э.В. Руденко, Е.В. Бутылина [и др.] // Проблеми остеології. - 2006. - Т. 9. - С. 99-100.
15. Рассохин Б.М. Остеопенический синдром у детей и подростков, больных сколиозом / Б.М. Рассохин, Г.А. Зубовский, И.Е. Сергеев // Укр. мед. альманах. – 2000. – № 4. – С. 71-75.
16. Рубин М.П. Остеопороз: диагностика, современные подходы к лечению, профилактике / М.П. Рубин, Р.Е. Чечурин, О.М. Зубова // Тер. архив. - 2002. - № 1. - С. 32-37.
17. Сегеда С. Антропологічний склад українського народу: етногенетичний аспект / С. Сегеда. – Київ : Вид-во ім. О.Теліги, 2001. - 255 с.
18. Сегеда С. Антропологія / С. Сегеда. – Київ : Либідь, 2001. – 335 с.
19. Сегеда С. Людність і розселення. Антропологічний склад. Українці. Історико-етнографічна монографія: У 2 кн. / С. Сегеда / За наук. ред. А.Пономарьова. – Опішне : "Українське народознавство", 1999. – Т. 1. – С. 115-122.
20. Сегеда С. Основи антропології / С. Сегеда. - К. : Либідь, 1995. – 208 с.
21. Сегеда С.П. Антропологічний склад українського народу (спроба комплексного аналізу) / С.П. Сегеда // Народознавчі зошити. Двомісячник. – 1998. – З. 2 (20). – С. 113-128.
22. Семенова Л.К. Исследования по возрастной морфологии за последние пять лет и перспективы их развития / Л.К. Семенова // Архив анатомии, гистологии и эмбриологии. - 1986. – Т. XCI, Вып. 11. – С. 80-85.
23. Соціальна медицина та організація охорони здоров'я. Підручник / Заг. ред. Москаленко В.М., Вороненко Ю.В. - Тернопіль, 2002. – С. 50-75.
24. Фролова Т.В. Вивчення структурно-функціонального стану кісткової тканини з урахуванням екологічних та демографічних особливостей: поширення остеопенії / Т.В. Фролова, В.А. Ольховський, С.П. Шкляр // Патологія. - 2006. – Т. 3, № 1. - С. 39-43.
25. Фролова Т.В. Остеопенія та системна дисплазія сполучної тканини: регіональний денситометричний реєстр / Т.В. Фролова, А.С. Шкляр, О.В. Охапкіна, Л.В. Черкашина // Актуальні питання внутрішньої медицини: міжфахова інтеграція. Програма І Львівської медичної науково-практичної конференції. - Львів, 2008. – С. 11.
26. Фролова Т.В. Регіональний моніторинг здоров'я дітей та підлітків: порушення кісткоутворення та накопичення кісткової маси Міждисциплінарний підхід / Т.В. Фролова, О.В. Охапкіна, А.С. Шкляр [та ін.] // Вісник проблем біології і медицини. - 2007. - № 4. - С. 162-167.
27. Carter J. Somatotyping – development and applications / J. Carter, B. Heath. - Cambridge University Press, 1990. - 504 p.
28. Carter J. The Heath-Carter comatotype method / J. Carter. - San-Diego state univ., 1980. - 368 p.
29. Matiegka J. The testing of physical effeciecy / J. Matiegka // Amer. J. Phys. Antropol. - 1921. - Vol. 2, № 3. - P. 25-38.

## Реферат

МЕТОДИ ОЦІНКИ І ЧАСТОТА ОНТОГЕНЕТИЧНО ДИСГАРМОНІЙНОЇ КІСТКОВОЇ КОМПОНЕНТИ МАСИ ТІЛА ЛЮДИНИ В РІЗНИХ ВІКОВО-СТАТЕВИХ ГРУПАХ

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Ключові слова: анатомія, антропометрія, онтогенез, кісткова компонента маси тіла.

На основі прямої антропометрії виявлені закономірності формування кісткової компоненти маси тіла людини на етапах постнатального онтогенезу, які проявляються різною частотою дисгармонічності маси тіла за рахунок кісткової компоненти. Розвиток класичної методології антропометрії, зокрема обґрунтованої інноваційної методики, дозволяє забезпечити визначення онтогенетично дисгармонійної тілобудови за рахунок кісткової компоненти маси тіла, враховуючи онтогенетичні і статеві відмінності. Отриманими результатами можна пояснити статевовікові особливості в частоті формування функціональних розладів, донозологічних і нозологічно окреслених станів, як проявів загального процесу зростання і розвитку в постнатальному онтогенезі.

## Реферат

МЕТОДЫ ОЦЕНКИ И ЧАСТОТА ОНТОГЕНЕТИЧНО ДИСГАРМОНИЧНОЙ КОСТНОЙ КОМПОНЕНТЫ МАССЫ ТЕЛА ЧЕЛОВЕКА В РАЗНЫХ ВОЗРАСТНО-ПОЛОВЫХ ГРУППАХ

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Ключевые слова: анатомия, антропометрия, онтогенез, костная компонента массы тела.

На основе прямой антропометрии выявлены закономерности формирования костной компоненты массы тела человека на этапах постнатального онтогенеза, которые проявляются разной частотой дисгармоничности массы тела за счёт костной компоненты. Развитие классической методологии антропометрии, в частности обоснованной инновационной методики, позволяет обеспечить определение онтогентически дисгармоничного телосложения за счёт костной компоненты массы тела, учитывая онтогенетические и половые различия. Полученными результатами можно объяснить половозрастные особенности в частоте формирования функциональных расстройств, донозологических и нозологически очерченных состояний, как проявлений общего процесса роста и развития в постнатальном онтогенезе.