UDC 613.954+613.955
DOI: 10.56871/CmN-W.2023.72.14.006

ASSESSMENT OF THE LINEAR GROWTH OF PRESCHOOL BOYS IN ST. PETERSBURG

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For citation: Makoeva FK, Kozyreva FU, Tuaeva ISh. Assessment of the linear growth of preschool boys in St. Petersburg. Children's medicine of the North-West (St. Petersburg). 2023; 11(2):67–72. DOI: https://doi.org/10.56871/CmN-W.2023.72.14.006

Received: 06.03.2023 **Revised: 11.04.2023** **Accepted: 28.04.2023**

Abstract. The accelerated pace of the physical development of children during the period of the "half-height leap", which often coincides with the beginning of systematic schooling for boys, is accompanied by a decrease in the body's resistance to physical stress. In order to determine the features of the linear growth of boys before starting school, 1829 preschoolers were examined in the preparatory groups of educational institutions in various districts of St. Petersburg. The survey included somatometry, assessment of indicators according to the standards of the "WHO Growth Reference, 2007"; determination of the direction of growth processes according to the Verweck–Vorontsov index. Statistical analysis of the research materials was carried out by the methods of variation statistics using the STATISTICA 10.0 (StatSoft, USA) program. It was found that in 67.4% of the examined, the body length corresponds to the average values of the WHO standards. The level of physical development above the average was more common (24.3%) than the options due to low growth (8.3%). In 7.6% of preschool boys, a predominance of the intensity of "stretching" in height over an increase in height in width was noted, which makes it possible to classify them as a risk group for a decrease in endurance to physical exertion. The results of the study can be used as regional guidelines for individual dosing of physical activity in physical education classes at school and in sports sections for children.

Key words: *children; preschoolers; boys; physical development*

ОЦЕНКА ЛИНЕЙНОГО РОСТА МАЛЬЧИКОВ ДОШКОЛЬНОГО ВОЗРАСТА г. САНКТ-ПЕТЕРБУРГА

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Для цитирования: Макоева Ф.К., Козырева Ф.У., Туаева И.Ш. Оценка линейного роста мальчиков дошкольного возраста г. Санкт-Петербурга // Children's medicine of the North-West. 2023. Т. 11. № 2. С. 67–72. DOI: https://doi.org/10.56871/CmN-W.2023.72.14.006

Поступила: 06.03.2023 **Одобрена: 11.04.2023** **Принята к печати: 28.04.2023**

Резюме. Ускоренные темпы физического развития детей в период «полуростового скачка», который часто совпадает у мальчиков с началом систематического обучения в школе, сопровождается снижением резистентности организма к физическим нагрузкам. С целью определить особенности линейного роста мальчиков перед началом обучения в школе обследовано 1829 дошкольников в подготовительных группах образовательных учреждений в различных районах г. Санкт-Петербурга. Обследование включало соматометрию, оценку показателей по нормативам WHO Growth Reference 2007; определение направленности ростовых процессов по индексу Вервека–Воронцова. Статистический анализ материалов исследования проведен методами вариационной статистики с помощью программы STATISTICA 10.0 (StatSoft, USA). Выявлено, что у 67,4% обследованных длина тела соответствует средним значениям нормативов ВОЗ. Уровень физического развития выше

среднего встречался чаще (24,3%), чем варианты, обусловленные низким ростом (8,3%). У 7,6% мальчиков-дошкольников отмечено преобладание интенсивности «вытягивания» в высоту над увеличением роста в ширину, что позволяет отнести их к группе риска по снижению выносливости к физическим нагрузкам. Результаты исследования могут быть использованы в качестве региональных ориентиров при индивидуальном дозировании физических нагрузок на уроках физкультуры в школе и занятиях детей в спортивных секциях.

***Ключевые слова**: дети; дошкольники; мальчики; физическое развитие*

INTRODUCTION

Age-related dynamics of body length — linear growth — is one of the objective criteria of health and implementation of the genetic program of the development of a child. A growth of children in length is influenced by numerous endogenous and exogenous factors [1–5]. The complex of endogenous factors affecting development of child is individual, but the specificity of the impact of environmental factors is generalized and largely available for correction [6–10]. Minimizing the adverse effects of global external factors, such as the environmental situation, social and economic status, and others, requires a solution at the state level, but nutritional rationalization, correction of macro- and micronutrient imbalances, and optimization of physical activity are quite realizable at the individual level [11, 12]. Most children at the age of 6–7 years have an acceleration of growth processes, which requires from the child's organism a significant strain and reduces endurance to additional loads, for example, the beginning of systematic schooling is really important [13–15]. Monitoring of regional features of linear growth of preschoolers allows us to develop recommendations on the dosage of physical loads in physical education classes at school and sports sections for first-graders [16–18].

AIM

To identify the features of linear growth of boys in St. Petersburg during the preschool period.

MATERIALS AND METHODS OF THE STUDY

A total of 1829 boys attending preschool groups of children's educational institutions in St. Petersburg participated in the study by random sampling. Preschoolers were divided into groups: 1st (n=99) — boys at the age of 6 years; 2nd (n=490) — at the age of 6.5 years; 3rd (n=1149) — at the age of 7 years and 4th group (n=91) — at the age of 7.5 years. To examine the boys, in accordance with the ethical principles laid down in the Declaration of Helsinki, voluntary informed consent was signed by legal representatives of each child. When creating the electronic database, the initial data were depersonalized.

Physical development (PD) of preschoolers was assessed by means of comparative analysis of children's body length (BL) with WHO norms — WHO Growth Reference, 2007 [19]. Depending on the number of standard deviations (SD) that distinguish the child's BL value from the median (Me) of the age-sex scale, the following variants of PD were identified: "average" (AFD; ±1SD); "above average" (AAFD; from +1.1SD to +2SD); "high" (HFD; more than +2.1SD); "below average" (BAFD; from –1.1SD to –2SD); and "low" (LFD; less than –2.1SD). Within each age group, arithmetic mean (M), standard error of the mean (m), 95% confidence interval (95% CI), and median (Me) values were calculated for BL. The prevalence of the directionality of growth processes was determined using the "stenia" index created by Verveck and Vorontsov (SI). SI was calculated by dividing body length (cm) by the sum of chest circumference (cm) and doubled body weight (kg) [20]. Depending on the value of SI, we distinguished predominance of height growth (dolichomorphia and moderate dolichomorphia), harmonious FD (mesomorphia), and predominance of volumetric growth (brachymorphia and pronounced brachymorphia).

Statistical analysis of the data was performed by methods of variation statistics using STATISTICA 10.0 program (StatSoft, USA). Data samples were tested for normality of distribution using the Kolmogorov-Smirnov criterion. The results of the study are presented as P [95% CI] %, where P is the percentage, CI is the 95% confidence interval for the percentage. The statistical significance of differences between the indicators was analyzed using Pearson's χ^2 criterion (with Yates' correction). Differences in the results were considered statistically significant at $p < 0.05$.

RESULTS AND DISCUSSION

Characteristics of the level of physical development of preschoolers is presented in Table 1. The majority of boys in all age groups have average physical development (57.1–68.6%). In group 4, the number of children with AFD is less than in other groups, and the difference of indicators with group 3 is statistically significant (p=0.025). In all groups, above-average BL was more often recorded than low BL. Above average FD was almost equally recorded in all age groups (18.0–20.9%);

and higher boys were identified in Group 1 than in other groups. The difference in rates with Group 4 was statistically significant (p=0.042). More preschoolers with below average FD were in group 4 than in groups 3 (p<0.001), 2 (p=0.001) and 1. Stunting was detected in 26 children (1.5%), the prevalence rate was statistically significant only in Group 3 among all variants of FD.

According to the biological pattern, BL increased with age; the calculated group BL values are shown in Table 2. The BL gains were 3.4 cm from 6 to 6.5 years, 2.9 cm from 6.5 to 7 years and 2.1 cm from 7 to 7.5 years. The difference between groups was statistically significant (from p <0.01 to p <0.001). In all groups, the median values of WHO norms (Child Growth Standards, 2006) are higher than in the preschoolers examined by us.

The distribution of preschoolers according to the "stenia" index is shown in Table 3. According to I.M. Vorontsov, the coincidence of the beginning of systematic education and the phase of intensive linear growth may cause a decrease in physical and mental endurance in children. The majority of preschoolers had harmonious FD (mesomorphia); there were fewer such boys at the age of 6 years than in other groups, and in comparison with Group 3, the difference was statistically significant (p=0.022). In all groups there were more children with predominance of the processes of "stretching" in height over the increase in girth and latitudinal dimensions. Among six-year-old boys there were more children with moderate dolichomorphia than in groups 2 (p <0.001), 3 (p=0.005) and 4, which may indicate the start of their "half-height" growth spurt. Dolichomorphia, indicating a pronounced "stretching", was determined in 13 preschoolers (0.8%); the prevalence of dolichomorphia depending on age was not statistically significant. There were 22 boys with predominance of volumetric growth, 17 of them were in Group 3; age-dependent prevalence rates were also not statistically significant.

Table1. Characteristics of physical development of preschoolers (% [95% CI])

Таблица 1. Характеристика уровня физического развития дошкольников (%[95% ДИ])

Physical development / Физическое развитие	Age / Возраст					Note / Примечание
	6 years n=99 / 6 лет n=99	6,5 years n=490 6,5 лет n=490	7 years n=1149 / 7 лет n=1149	7,5 years n=91 / 7,5 лет n=91	Total / n=1829	
Low / Низкое	2,0 [0,6–3,4]	0,8 [0–1,6]	1,6 [1,2–2,0]	2,2 [0,8–3,6]	1,5 [1,2–1,8]	–
Below average / Ниже среднего	5,0 [2,8–7,2]	6,9 [5,8–8,08]	6,2 [5,5–6,9]	17,6 [13,7–21,5]	6,7 [6,1–7,3]	P_{2-4} <0,001 P_{3-4}<0,001
Average / Среднее	65,8 [61,1–70,5]	67,0 [64,9–69,1]	68,6 [66,5–70,7]	57,1 [52,0–62,2]	67,5 [66,4–68,6]	P_{3-4}=0,025
Above average / Выше среднего	18,2 [14,3–22,1]	19,6 [17,8–21,4]	18,0 [16,9–19,1]	20,9 [16,7–25,1]	18,6 [17,7–19,5]	–
High / Высокое	9,0 [6,1–11,9]	5,7 [6,7–6,7]	5,6 [4,9–6,3]	2,2 [0,8–3,6]	5,7 [5,2–6,2]	P_{1-4}=0,042

Table 2. Dynamics of body length in preschoolers

Таблица 2. Динамика длины тела у дошкольников

Indicator / Показатели	Age / Возраст			
	6 years n=99 / 6 лет n=99	6,5 years n=490 6,5 лет n=490	7 years n=1149 / 7 лет n=1149	7,5 years n=91 / 7,5 лет n=91
M (см)	117,5	120,9	123,8	125,9
m	0,52	0,24	0,16	0,67
95% ДИ / 95% CI	116,4–118,5	120,5–121,4	123,6–124,2	124,5–127,2
Me (см)	117,0	121,0	124,0	126,0
MeWHO (см)	116,0	118,4	121,7	124,5

Note: The difference in mean body length (M) was statistically significant between groups 1 and 2 (p <0.001); 2 and 3 (p <0.001); 3 and 4 (p <0.001).

Примечание: разница средних показателей длины тела (M) статистически значима между 1-й и 2-й (p<0,001); 2-й и 3-й (p <0,001); 3-й и 4-й (p <0,001) группами.

Table 3. Value of "stenia" index of preschoolers (% [95% CI])
Таблица 3. Показатели индекса «стении» у дошкольников (%[95% ДИ])

Physical development / Физическое развитие	Age / Возраст					Note / Примечание
	6 years n=99 / 6 лет n=99	6,5 years n=490 6,5 лет n=490	7 years n=1149 / 7 лет n=1149	7,5 years n=91 / 7,5 лет n=91	Total / n=1829	
Pronounced brahimorfia / Выраженная брахиморфия	–	–	0,1 [0–0,2]	–	0,1 [0–0,2]	–
Brahimorfia / Брахиморфия	–	1,1 [0,6–1,6]	1,5 [1,1–1,9]	–	1,2 [0,9–1,5]	–
Mesomorphia / Мезоморфия	83,3 [79,5–87,1]	90,2 [88,9–91,5]	90,8 [89,9–91,7]	92,1 [89,2–95,0]	90,3 [88,1–92,5]	P_{1-3}=0,023
Moderate dolihomorfia / Умеренная долихоморфия	15,5 [11,7–19,3]	7,0 [5,8–8,2]	7,3 [6,5–8,1]	6,6 [3,8–9,4]	7,6 [7,0–8,2]	P_{1-2} <0,001 P_{1-3}=0,005
Dolihomorfia / Долихоморфия	1,2 [0,1–2,3]	1,7 [1,1–2,3]	0,3 [0,1–0,5]	1,3 [0,1–2,5]	0,8 [0,6–1,0]	P_{2-3}=0,022

CONCLUSION

The results of our study show the peculiarities of linear growth of metropolitan boys during the period of children's preparation for systematic schooling. We made the following conclusions based on the obtained data.

1. In 67.4% of the examined preschoolers the body length corresponds to the average values of WHO Growth Reference 2007.
2. The level of physical development above average was more frequent in children (24.3%) than variants caused by low growth (8.3%).
3. Median body length values in all age groups exceeded the WHO standards (WHO Growth Reference 2007). Standards developed by WHO (WHO Growth Reference 2007), which should be taken into account in the individual characterization of physical development of preschoolers living in St. Petersburg.
4. In 7.6% of preschool boys there was a predominance of linear growth intensity over growth in width, which allows us to assign them to the risk group of a possible decrease in the level of endurance to both physical and mental load. This circumstance should be taken into account when determining the physical education group for physical education classes at school and the intensity of training in sports sections.

ADDITIONAL INFORMATION

Author contribution. Thereby, all authors made a substantial contribution to the conception of the study, acquisition, analysis, interpretation of data for the work, drafting and revising the article, final approval of the version to be published and agree to be accountable for all aspects of the study.

Competing interests. The authors declare that they have no competing interests.

Funding source. This study was not supported by any external sources of funding.

Consent for publication. Written consent was obtained from the patient for publication of relevant medical information within the manuscript.

ДОПОЛНИТЕЛЬНАЯ ИНФОРМАЦИЯ

Вклад авторов. Все авторы внесли существенный вклад в разработку концепции, проведение исследования и подготовку статьи, прочли и одобрили финальную версию перед публикацией.

Конфликт интересов. Авторы декларируют отсутствие явных и потенциальных конфликтов интересов, связанных с публикацией настоящей статьи.

Источник финансирования. Авторы заявляют об отсутствии внешнего финансирования при проведении исследования.

Информированное согласие на публикацию. Авторы получили письменное согласие пациентов на публикацию медицинских данных.

REFERENCES

1. Gritsinskaya V.L., Galaktionova M. Yu. Individual'no-tipologicheskiye zakonomernosti rosta i razvitiya detey [Individual-typological patterns of growth and development of children]. Krasnoyarsk; 2005. (in Russian).
2. Grebneva N.N., Sazanova T.V. Issledovaniye protsessov rosta i razvitiya detskogo organizma na kriticheskikh etapakh ontogeneza [Study of the processes of

growth and development of the child's organism at critical stages of ontogenesis]. Problemy sovremennogo pedagogicheskogo obrazovaniya. 2018; 59(3): 234–8. (in Russian).
3. Gritsinskaya V.L., Novikova V.P., Khavkin A.I. Variativnost' dinamiki somatometricheskikh pokazateley u shkol'nikov s razlichnym nutritivnym statusom (longitudinal'noye issledovaniye) [Variability of the dynamics of somatometric parameters in schoolchildren with different nutritional status (longitudinal study)]. Voprosy prakticheskoy pediatrii. 2020; 15(5): 68–72. DOI: 10.20953/1817-7646-2020-5-68-72. (in Russian).
4. Gritsinskaya V.L., Novikova V.P. Fizicheskoye razvitiye detey Sankt-Peterburga: k diskussii o metodakh otsenki [Physical development of children in St. Petersburg: to the discussion about assessment methods]. Pediatr. Sankt-Peterburg. 2019; 10(2): 33–6. DOI: 10.17816/PED10233-36. (in Russian).
5. Makoyeva F.K. Gigiyenicheskaya otsenka kompleksnogo vliyaniya ekologicheskikh faktorov na sostoyaniye zdorov'ya naseleniya [Hygienic assessment of the complex influence of environmental factors on the state of public health]. Profilakticheskaya i klinicheskaya meditsina. 2022; 1(82): 5–10. DOI: 10.47843/2074-9120_2022_1_5. (in Russian).
6. Gritsinskaya V.L., Beketova Ye.V., Korniyenko T.V. Sravnitel'naya kharakteristika fizicheskogo razvitiya gorodskikh i sel'skikh shkol'nikov Krasnoyarskogo kraya [Comparative characteristics of the physical development of urban and rural schoolchildren of the Krasnoyarsk Territory]. Gigiyena i sanitariya. 2012; 91(4): 58–60. (in Russian).
7. Gritsinskaya V.L., Nikitina I.L. Somatometricheskiye pokazateli fizicheskogo razvitiya shkol'nikov g. Sankt-Peterburga [Somatometric indicators of the physical development of schoolchildren in St. Petersburg]. Rossiyskiy vestnik perinatologii i pediatrii. 2018; 63(1): 66–70. DOI: 10.21508/1027-4065-2018-63-1-66-70. (in Russian).
8. Son'kin V.D., Vasil'yeva R.M., Orlova N.I., Pronina T.S. Rezul'taty populyatsionnogo monitoringa fizicheskogo sostoyaniya detey 6–7 let v regionakh Rossiyskoy Federatsii [Results of population monitoring of the physical condition of children aged 6–7 years in the regions of the Russian Federation]. Soobshcheniye 2. Motornoye razvitiye. Novyye issledovaniya. 2020; 1(61): 46–56. (in Russian).
9. Gritsinskaya V.L. Otsenka fizicheskogo razvitiya mal'chikov shkol'nogo vozrasta Sankt-Peterburga s ispol'zovaniyem antropometricheskogo kal'kulyatora VOZ. ZNISO. 2018; 2(299): 16–9. (in Russian).
10. Gritsinskaya V.L., Novikova V.P. Tendentsii regional'nykh pokazateley fizicheskogo razvitiya shkol'nikov Sankt-Peterburga [Trends in regional indicators of the physical development of schoolchildren in St. Petersburg]. Profilakticheskaya i klinicheskaya meditsina. 2019; 1 (70): 17–21. (in Russian).
11. Simakhodskiy A.S., Leonova I.A, Pen'kov D.G., Zorina S.A. i dr. Pitaniye zdorovogo i bol'nogo rebenka. Chast' I. Sankt-Peterburg; 2020. (in Russian).
12. Gritsinskaya V.L., Nikitina I.L. Sovremennyye aspekty otsenki urovnya fizicheskogo razvitiya shkol'nikov megapolisa. Meditsinskiy sovet. 2017; (19): 40–3. DOI: 10.21518/2079-701X-2017-19-40-43. (in Russian).
13. Shibkov A.A., Yefimova N.V. Uroven' adaptatsionnogo potentsiala i morfofunktsional'nogo sostoyaniya detey 7–8 let, prozhivayushchikh v ekologicheski neblagopriyatnykh usloviyakh krupnogo megapolisa [The level of adaptive potential and morphofunctional state of children 7–8 years old living in ecologically unfavorable conditions of a large metropolis]. Vestnik Rossiyskogo universiteta druzhby narodov. Seriya: Ekologiya i bezopasnost' zhiznedeyatel'nosti. 2016; 1: 122–32. (in Russian).
14. Gritsinskaya V.L., Tsallagova R.B., Makoyeva F.K. Dinamika fizicheskogo razvitiya shkol'nikov Sankt-Peterburga: longitudinal'noye issledovaniye [Dynamics of the physical development of schoolchildren in St. Petersburg: a longitudinal study]. Uchenyye zapiski universiteta im. P.F. Lesgafta. 2020; 8 (186): 93–6. DOI: 10.34835/issn.2308-1961.2020.8.p92-96. (in Russian).
15. Gladkaya V.S., Gritsinskaya V.L., Galaktionova M.Yu., Kilina O. Yu. Metody i metodika otsenki rosta i razvitiya detey [Methods and methodology for assessing the growth and development of children]. Uchebnoye posobiye. Abakan; 2017. (in Russian).
16. Suvorova A.V., Chernyakina T.S., Yakubova I. Sh. Pokazateli funktsional'nogo sostoyaniya serdechno-sosudistoy sistemy shkol'nikov kak kriteriy adaptatsionnykh protsessov k intensivnoy uchebnoy deyatel'nosti [Indicators of the functional state of the cardiovascular system of schoolchildren as a criterion for adaptive processes to intensive learning activities]. Profilakticheskaya i klinicheskaya meditsina. 2012; 4: 51–5. (in Russian).
17. Gritsinskaya V.L., Galaktionova M. Yu. Kliniko-psikhologicheskiye aspekty adaptatsii pervoklassnikov [Clinical and psychological aspects of adaptation of first-graders]. Byulleten' Sibirskogo otdeleniya Rossiyskoy akademii meditsinskikh nauk. 2003; 23 (3): 51–3. (in Russian).
18. Kozlovskiy A.A., Kravchenko A.D., Vlasyuk A.O. Fizicheskoye razvitiye detey-pervoklassnikov [Physical development of first-graders]. Rossiyskiy pediatricheskiy zhurnal.. 2022; 3(1): 155. (in Russian).
19. De Onis M., Onyango A.W., Borghi E. et al. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World Health Organization. 2007; 85: 660–7.

20. Novikova V.P., Gritsinskaya V.L., Gurova M.M., Boytsova Ye.V. i dr. Praktikum po otsenke fizicheskogo razvitiya detey [Workshop on the assessment of the physical development of children]. Uchebno-metodicheskoye posobiye. Ser. Biblioteka pediatricheskogo universiteta. Sankt-Peterburg; 2021. (in Russian).

ЛИТЕРАТУРА

1. Грицинская В.Л., Галактионова М.Ю. Индивидуально-типологические закономерности роста и развития детей. Красноярск; 2005.
2. Гребнева Н.Н., Сазанова Т.В. Исследование процессов роста и развития детского организма на критических этапах онтогенеза. Проблемы современного педагогического образования. 2018; 59(3): 234–8.
3. Грицинская В.Л., Новикова В.П., Хавкин А.И. Вариативность динамики соматометрических показателей у школьников с различным нутритивным статусом (лонгитудинальное исследование). Вопросы практической педиатрии. 2020; 15(5): 68–72. DOI: 10.20953/1817-7646-2020-5-68-72.
4. Грицинская В.Л., Новикова В.П. Физическое развитие детей Санкт-Петербурга: к дискуссии о методах оценки. Педиатр. Санкт-Петербург. 2019; 10(2): 33–6. DOI: 10.17816/PED10233-36.
5. Макоева Ф.К. Гигиеническая оценка комплексного влияния экологических факторов на состояние здоровья населения. Профилактическая и клиническая медицина. 2022; 1(82): 5–10. DOI: 10.47843/2074-9120_2022_1_5
6. Грицинская В.Л., Бекетова Е.В., Корниенко Т.В. Сравнительная характеристика физического развития городских и сельских школьников Красноярского края. Гигиена и санитария. 2012; 91(4): 58–60.
7. Грицинская В.Л., Никитина И.Л. Соматометрические показатели физического развития школьников г. Санкт-Петербурга. Российский вестник перинатологии и педиатрии. 2018; 63(1): 66–70. DOI: 10.21508/1027-4065-2018-63-1-66-70.
8. Сонькин В.Д., Васильева Р.М., Орлова Н.И., Пронина Т.С. Результаты популяционного мониторинга физического состояния детей 6–7 лет в регионах Российской Федерации. Сообщение 2. Моторное развитие. Новые исследования. 2020; 1(61): 46–56.
9. Грицинская В.Л. Оценка физического развития мальчиков школьного возраста Санкт-Петербурга с использованием антропометрического калькулятора ВОЗ. ЗНИСО. 2018; 2(299): 16–9.
10. Грицинская В.Л., Новикова В.П. Тенденции региональных показателей физического развития школьников Санкт-Петербурга. Профилактическая и клиническая медицина. 2019; 1 (70): 17–21.
11. Симаходский А.С., Леонова И.А, Пеньков Д.Г., Зорина С.А. и др. Питание здорового и больного ребенка. Часть I. Санкт-Петербург; 2020.
12. Грицинская В.Л., Никитина И.Л. Современные аспекты оценки уровня физического развития школьников мегаполиса. Медицинский совет. 2017; (19): 40–3. DOI: 10.21518/2079-701X-2017-19-40-43.
13. Шибков А.А., Ефимова Н.В. Уровень адаптационного потенциала и морфофункционального состояния детей 7–8 лет, проживающих в экологически неблагоприятных условиях крупного мегаполиса. Вестник Российского университета дружбы народов. Серия: Экология и безопасность жизнедеятельности. 2016; 1: 122–32.
14. Грицинская В.Л., Цаллагова Р.Б., Макоева Ф.К. Динамика физического развития школьников Санкт-Петербурга: лонгитудинальное исследование. Ученые записки университета им. П.Ф. Лесгафта. 2020; 8 (186): 93–6. DOI: 10.34835/issn.2308-1961.2020.8.p92-96.
15. Гладкая В.С., Грицинская В.Л., Галактионова М.Ю., Килина О.Ю. Методы и методика оценки роста и развития детей. Учебное пособие. Абакан; 2017.
16. Суворова А.В., Чернякина Т.С., Якубова И.Ш. Показатели функционального состояния сердечно-сосудистой системы школьников как критерий адаптационных процессов к интенсивной учебной деятельности. Профилактическая и клиническая медицина, 2012; 4: 51–5.
17. Грицинская В.Л., Галактионова М.Ю. Клинико-психологические аспекты адаптации первоклассников. Бюллетень Сибирского отделения Российской академии медицинских наук. 2003; 23 (3): 51–3.
18. Козловский А.А., Кравченко А.Д., Власюк А.О. Физическое развитие детей-первоклассников. Российский педиатрический журнал. 2022; 3(1): 155.
19. De Onis M., Onyango A.W., Borghi E. et al. Development of a WHO growth reference for school-aged children and adolescents. Bulletin of the World Health Organization. 2007; 85: 660–7.
20. Новикова В.П., Грицинская В.Л., Гурова М.М., Бойцова Е.В. и др. Практикум по оценке физического развития детей. Учебно-методическое пособие. Сер. Библиотека педиатрического университета. СПб.; 2021.