

UDC 613.7-057.874:572.512

<https://doi.org/10.26641/2307-0404.2021.2.234661>

H.M. Danylenko^{1,2},
G.M. Cherniakova^{1,2},
T.V. Merkulova^{1,3},
O.H. Avdiievska^{1,2}

THE IMPACT OF SUMMER HOLIDAYS ON THE PHYSICAL DEVELOPMENT OF SCHOOL-AGE CHILDREN

SI "Institute of Children and Adolescents Health Care of the National Academy of Medical Sciences of Ukraine"¹

Yuvileiny ave., 52-a, Kharkiv, 61153, Ukraine

V.N. Karazin Kharkiv National University²

Svobody sq., 4, Kharkiv, 61022, Ukraine

Kharkiv International Medical University³

Molochna str., 38, Kharkiv, 61000, Ukraine

ДУ «Інститут охорони здоров'я дітей та підлітків НАМН України»¹

(дир. – д. мед. н., проф. Г.М. Даниленко)

пр. Ювілейний, 52-А, Харків; 61153, Україна

Харківський національний університет ім. В.Н. Каразіна²

(ректор – академік НАН України, д. соц. н., проф. В.С. Бакіров)

пл. Свободи, 4, Харків, 61022, Україна

Харківський міжнародний медичний університет³

(ректор – д. мед. н., проф. Д.М. Шиян)

вул. Молочна, 38, Харків, Україна

e-mail: chernyakova2222@gmail.com

Цитування: *Медичні перспективи.* 2021. Т. 26, № 2. С. 147-152

Cited: *Medicni perspektivi.* 2021;26(2):147-152

Key words: *school-age children, indicators of physical development, type of activities, summer time*

Ключові слова: *діти шкільного віку, показники фізичного розвитку, вид діяльності, літній відпочинок*

Ключевые слова: *дети школьного возраста, показатели физического развития, вид деятельности, летний отдых*

Abstract. *The impact of summer holidays on the physical development of school-age children. Danylenko H.M., Cherniakova G.M., Merkulova T.V., Avdiievska O.H. The aim of the work was to investigate how gender, age and type of activity in summer affects the indicators of physical development (PD) of children. 1054 students (493 boys and 561 girls) aged 7-16 years took part in the study. The PD of children was studied by assessing somatometric and physiometric indicators. To assess the impact of the type of activity, a thematic questionnaire "Summer" was used. It was found that the gender and age of children had a significant effect on PD indicators in the summer. The most intense increase in body length occurred at the age of 7-12 years, body weight - in 10-14-year-olds, and up to 16 years growth of two parameters gradually slowed down. From the age of 10, children showed a positive increase in lung capacity (LC). In 15-year-old adolescents, a decrease in both indicators (ChC and LC) was found. It was found that 62% of children carried out educational activities in the summer, 24% of those were engaged in business activities, almost 40% of students were participants in hiking trips and 23% of children attended a children's health camp. The chosen type of activity in the summer influenced the indicators of the pupils' PD as follows: educational activities were accompanied by a decrease in body length and strength of the left arm, business activity, hiking trips and staying in a health camp were accompanied by an increased weight gain and an increase in LC.*

Реферат. *Вплив літнього відпочинку на показники фізичного розвитку дітей шкільного віку. Даниленко Г.М., Чернякова Г.М., Меркулова Т.В., Авдієвська О.Г. Метою роботи було дослідити, як стать, вік та вид діяльності влітку впливають на показники фізичного розвитку дітей. Участь у дослідженні брали 1054 учні (493 хлопці та 561 дівчина) віком 7-16 років. Фізичний розвиток (ФР) дітей вивчався за оцінкою соматометричних та фізіометричних показників. Для оцінки впливу виду діяльності використовували тематичний опитувальник «Літо». Встановили, що стать та вік дітей мали достовірний вплив на показники ФР протягом літа. Найбільш інтенсивне збільшення довжини тіла відбувалося в дітей віком 7-12 років, маси тіла – у 10-14-річних, і до 16 років приріст обох параметрів поступово сповільнювався. Починаючи з 10 років у дітей відмічався позитивний приріст життєвої ємності легень (ЖЄЛ). У 15-річних підлітків було встановлено зниження показників як окружність грудної клітини (ОГК), так і ЖЄЛ. Встановили, що 62% дітей протягом літа здійснювали навчальну діяльність, 24% опитаних працювали або займалися бізнес-активністю, майже 40% учнів були учасниками туристичних походів та 23% дітей відвідали дитячий оздоровчий табір. Обраний вид діяльності влітку впливав на показники ФР учнів таким чином: навчання сприяло меншому приросту довжини тіла та сили лівої руки, бізнес-активність, туристичні походи та перебування в оздоровчому таборі супроводжувалися підвищенням набором маси тіла та зростанням показників ЖЄЛ.*

In recent years, there has been a trend towards deterioration in children's health. This is partly due to negative socio-economic, environmental and psycho-emotional factors. The influence of constant stress and overload at school disrupts the mechanism of self-regulation of physiological functions and leads to the development of chronic diseases in children [2, 3].

Appropriate use of free time in the summer can have a positive effect on children and help them cope with stress after the school year. Wellness and recreation during summer help to improve and strengthen the physical and psychological health of children and restore their vitality. In addition, the organized recreation of schoolchildren during the holidays creates conditions for development of their creative abilities and prevents child's neglect. Uncontrolled time is often associated with an increased frequency of manifestations of risky behavior (smoking, alcoholism, drug addiction), an increase in body weight, a decrease in physical activity and sleep disturbance [12].

Formation of healthy lifestyle skills among young people should be the primary task. Such active forms of summer recreation and health improvement as school and suburban camps, summer language camps, hiking trips need to be developed. It is worth paying more attention to the forms and methods of organizing summer vacations for school-age children, to update their content, to improve the technologies of medical and psychological-pedagogical support.

The aim of this work was to investigate how gender, age and type of summer activity (education, business activity, hiking and recreation in suburban camps) affect the indicators of physical development of school-age children.

MATERIALS AND METHODS OF RESEARCH

The data used in the study were collected from March to September 2019. The study involved 1054 students (493 boys and 561 girls) aged from 7 to 16 years old, studying in secondary schools in Kharkov. Physical development (PD) of children was studied by assessing somatometric (height, body weight, chest circumference) and physiometric (lung capacity, muscle strength of the hands) indicators using standard instruments [4, 5]. We used the questionnaire «Summer» to assess the impact of the type of activity.

Statistical processing was carried out using IBM's SPSS 17.0 (license N d47646601451106a68cb) software for Windows7 and MS Office 2010 (MXMM-7JXX8-4XHCV-P6HVY-C38T2). We used

Student's t-test and Mann-Whitney test. The critical level of significance of statistical hypotheses is $p < 0.05$ [1].

The study was conducted with the written consent of the parents. It adhered to the principles of the Helsinki Declaration of Human Rights and approved by the Bioethics and Deontology Committee of the SI "ICAHN NAMSU".

RESULTS AND DISCUSSION

The study found that body length of boys increased by 2.4% and of girls – by 1.9% ($p < 0.05$) for the summer period. The increase in body weight was greater in girls (7.1%) than in boys (6.8%) ($p < 0.05$). The chest circumference index (ChC) increased by 3.3% in boys and by 4.0% in girls ($p < 0.05$), while the lung capacity index (LC) increased by 1.85% in boys and decreased by 1.2% in girls. The indices of the right hand strength (SRH) increased by 37.9% in boys and by 38.2% in girls ($p < 0.001$) and left hand strength (SLH) increased by 31.8% and 38.5% respectively ($p < 0.001$).

The influence of the age on the parameters of the PD was investigated. Groups that differed in increase in body length were identified using the Duncan test. Children 7-12 years old had the largest increase in height (from 2.8% to 3.8%), 13-14-year-old pupils had an average increase in height (1.8%-2.2%) and 15-16-year-old adolescents had the lowest rates of increase in height (0.5%-1.3%) ($p < 0.05$).

The body weight gain of schoolchildren was the highest in seven-year-old children and 10-14 years old children (8.0%-12.0%), the increase was average in the group of 8-9-year-old students (6.5%-7.4%) and the lowest increase was observed in 15-16-year-olds (3.9%-4.4%) ($F = 9.4$ $p < 0.001$). (Fig. 1).

Studying the ChC indicators we found that the greatest increase was observed in children of 11-12 years (5.5% and 6.6%, respectively) ($p < 0.05$) and it was only 1.4% in 15-years old adolescents ($p < 0.05$). LC indicators were negative in children of 7-9 years and 15-years-old adolescents. A gradual increase in LC indicators occurred from the age of 10 and the maximum was observed in 14-years-old children (4.5%) (Fig. 2).

The next stage was to determine the influence of the type of summer activity on the PD indicators of schoolchildren. It was found that 62% of children carried out educational activities during the summer, 24% of respondents worked or were engaged in business activities, almost 40% of pupils were participants in hiking trips and 23% of children attended children's health camp (Fig. 3).

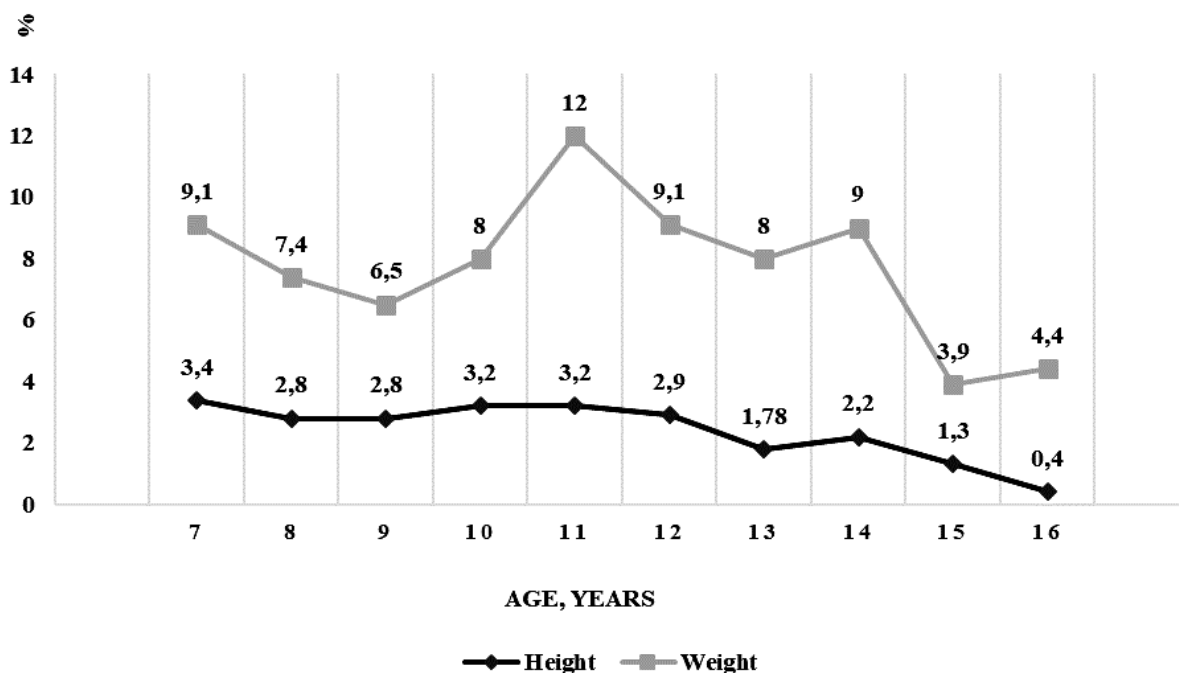


Fig. 1. Height and weight gains in school-age children, %

Investigating the influence of educational activity, significant differences were found in the indicators of height and SLH. Children who did not study during the summer grew by (3.9 ± 0.1) cm, and their SLH indicator increased by (6.0 ± 0.2) kg/s,

while those who studied grew by (3.5 ± 0.1) cm ($F=10.0$ $p=0.002$) and the DLR indicator increased by (5.1 ± 0.2) kg/s ($F=7.05$ $p=0.008$). The influence of educational activity on other PD indicators of children was not significant.

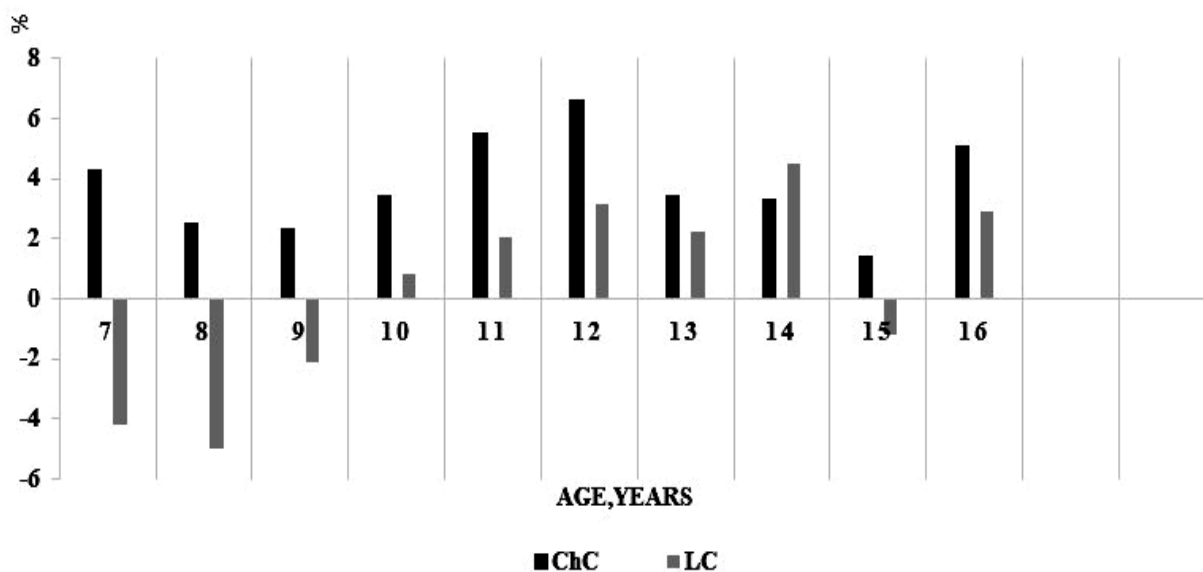


Fig. 2. Increase in ChC and LC indicators stratified by age, %

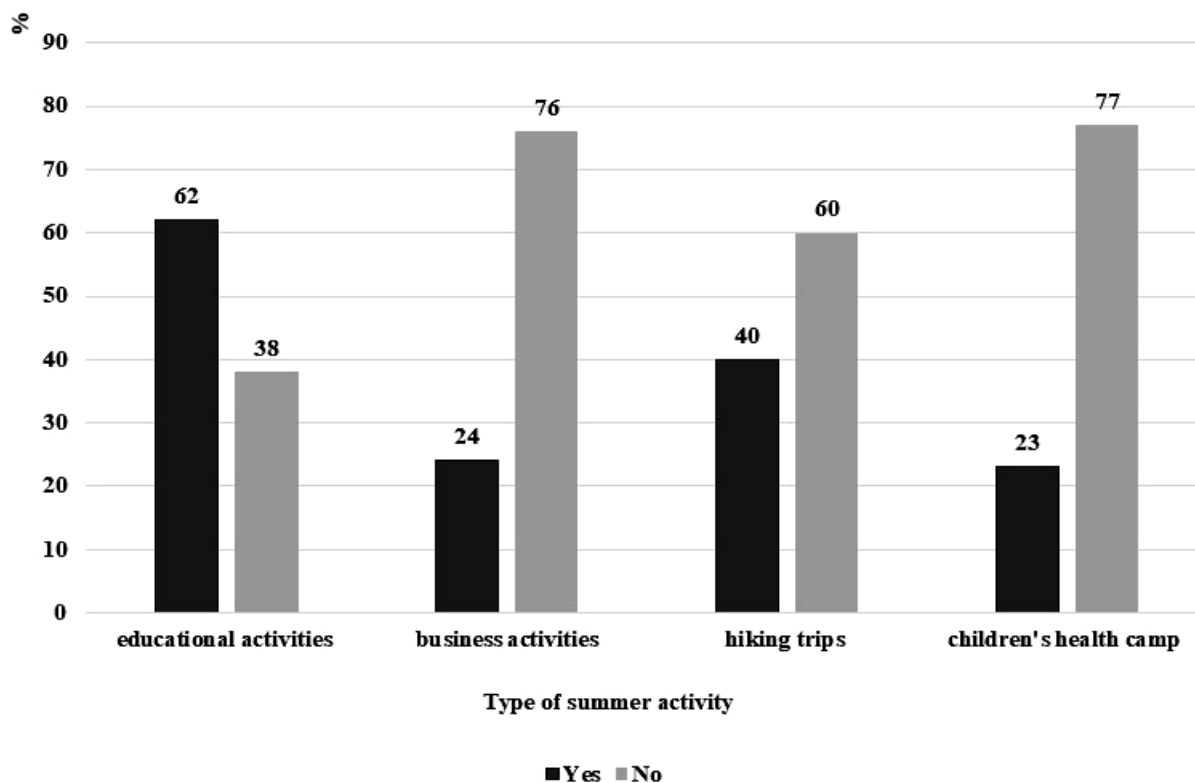


Fig. 3. Proportion of school-age children with different types of activities during summer, %

Summer business-activity significantly influenced body weight and LC indicators. In particular, those who were engaged in business gained weight (3.6 ± 0.2 kg ($F=7.9$ $p=0.005$) and increased LC by (124.6 ± 23.1) ml ($F=16.4$ $p<0.001$) and in those who were not engaged in business, the weight gain was (3.1 ± 0.1) kg, and the LC increased by (21.4 ± 12.4) ml.

The next activity investigated was hiking. According to the survey, this type of activity has a significant impact on ChC and body weight. ChC measurements showed that in schoolchildren who did not participate in the hikes, the indicator increased by (2.5 ± 0.1) cm and in those who visited hikes increased by (3.1 ± 0.2) cm ($F=7,4$ $p=0.007$). The body weight of children who did not go on hikes increased by (3.0 ± 0.1) kg, and in those who went on hikes increased by (3.6 ± 0.2) kg ($F=9.7$ $p=0.002$).

We have analyzed the works of foreign authors on this topic. Hippel P.T. et al found that BMI grows and changes faster during the summer than during the school year [8]. In national representative survey of Australian children Olds T. et al. found that holidays were characterized by longer sleep duration and much more time spent watching TV, playing videogames, lower vigorous activity and lower total daily energy expenditure [11]. Watson et al. suggests that the summer holiday period is characterized by

increased fatness and decreased fitness. It is possible that these patterns may be due to changes in diet and/or time use (e.g. children may be less active, eat more and have more screen time during the school holidays, compared with the in-school period) [9].

Various assumptions have been made to explain the increase in body weight gain in children and adolescents during the summer. These include decreased physical activity, increased sedentary time, deterioration in nutrition and lack of school lessons [13]. According to Avery A. et al. [6] during the school year, children and adolescents have a more structured, consistent and controlled day than during vacations. In the summer, they have more options as for diet, physical activity or inactivity, more time to use gadgets, children suffer from sleep disturbances. Mahoney J.L. shows that adolescents who regularly took part in organized activities were at lower risk of obesity than those who did not [10]. Zinkel S. R. et al. studied 162 teenagers to assess the potential impact of the season on overall energy expenditure. No difference was found in energy consumption during summer and during the school year. The authors suggested that the main factor of weight gain in the summer is the increased consumption of calories from food and beverages [7].

CONCLUSIONS

1. Gender and age aspects have a significant effect on the parameters of the PD of school-age children during the summer.

2. The chosen type of activity influenced the PD indicators as follows: educational activity was accompanied by a decrease in body length and strength of the left arm, business activity, hiking and staying in children`s health camp was accompanied by an increase in weight gain and lung capacity.

3. It can be suggested that the main factor of weight gain in summer is an increase in calorie intake from food and beverages, while an increase in physical activity helps the development of the respiratory system of school-age children.

Conflict of interests. The authors declare no conflict of interest.

REFERENCES

1. Antomonov MYu. [Mathematical processing and analysis of biomedical data]. Kyiv: Medinform; 2018. p. 579. Russian. Available from: <https://www.olx.ua/.../antomonov-m-yu-monografya>
2. Varnavskih EA. [Evaluation of the influence of summer holiday on the physical health of children aged 8-11 years]. *Fundamentalnyie issledovaniya*. 2014;4:58-62. Russian. Available from: <http://www.fundamental-research.ru/ru/article/view?id=33666>
3. Varnavskih EA, Lyapin VA, Kozyreva FU. [Forms of summer recreation and health improvement of children and adolescents]. *Omskiy nauchnyi vestnik*. 2015;1(138):41-46. Russian. Available from: <https://cyberleninka.ru/article/n/formy-letnego-otdyha-i-ozdorovleniya-detey-i-podrostkov-obzor-literatury/viewer>
4. Osadchuk NI, Serheta IV. [Physical development of children and adolescents and modern approaches to the evaluation of degree of harmony]. *Monohrafiia: Vinnytsia*; 2014. p. 188. Ukrainian.
5. [About the statement of Criteria of an assessment of physical development of children of school age: the order N 802 from 13.09.2013]. Kyiv: MOZ Ukrainy. 2013. p. 48. Ukrainian. Available from: <https://zakon.rada.gov.ua/laws/show/z1694-13>
6. Avery A, Anderson C, McCullough F. Associations between children's diet quality and watching television during meal or snack consumption: A systematic review. *Maternal Child Nutrition*. 2017;13(e12428):1-20. doi: <https://doi.org/10.1111/mcn.12428>
7. Zinkel SR, Moe M, Stern EA, Hubbard VS, Yanovski SZ, Yanovski JA, Schoeler DA. Comparison of total energy expenditure between school and summer months. *Pediatric Obesity*. 2013;8:404-10. doi: <https://doi.org/10.1111/j.2047-6310.2012.00120.x>
8. von Hippel PT, Workman J. From kindergarten through second grade, U.S. children's obesity prevalence grows only during summer vacations. *Obesity*. 2016;24(11):2296-300. doi: <https://doi.org/10.1002/oby.21613>
9. Watson A, Maher C, Tomkinson GR, Golley R, Frayssé F, Dumuid D, Lewthwaite H, Olds T. Life on holidays: study protocol for a 3-year longitudinal study tracking changes in children's fitness and fatness during the in school versus summer holiday period. *BMC Public Health*. 2019;19:1353. doi: <https://doi.org/10.1186/s12889-019-7671-7>
10. Mahoney JL. Adolescent summer care arrangements and risk for obesity the following school year. *Journal of Adolescence*. 2011;34(4):737-49. doi: <https://doi.org/10.1111/j.2047-6310.2012.00120.x>
11. Olds T, Maher C, Dumuid D. Life on holidays: differences in activity composition between school and holiday periods in Australian children. *BMC Public Health*. 2019;19(Suppl 2):450. doi: <https://doi.org/10.1186/s12889-019-6765-6>
12. Morgan K, Melendez-Torres GJ, Bond A, Hawkins J, Hewitt G, Murphy S, Moore G. Socio-economic inequalities in adolescent summer holiday experiences, and mental wellbeing on return to school: Analysis of the School Health Research Network/Health Behaviour in School-Aged Children Survey in Wales. *Int. J. Environ. Res. Public Health*. 2019;16:1107. doi: <https://doi.org/10.3390/ijerph16071107>
13. Brazendale K, Beets M, Weaver RG, Pate RR, Turner-McGrievy GM, Kaczynski AT, Chandler JL, Bohnert A, von Hippel PT. Understanding differences between summer vs. school obesogenic behaviors of children: the structured days hypothesis. *International Journal of Behavioral Nutrition and Physical Activity*. 2017;14(100). doi: <https://doi.org/10.1186/s12966-017-0555-2>

СПИСОК ЛІТЕРАТУРИ

1. Антомонов М. Ю. Математическая обработка и анализ медико-биологических данных. 2-е изд. Київ: МІЦ «Медінформ», 2018. 579 с. URL: <https://www.olx.ua/.../antomonov-m-yu-monografya>
2. Варнавских Е. А. Оценка влияния формы летнего отдыха на физическое здоровье детей 8-11 лет. *Фундаментальные исследования*. 2014. № 4. С. 58-62. URL: <http://www.fundamental-research.ru/ru/article/view?id=33666>
3. Варнавских Е. А., Ляпин В. А., Козырева Ф. У. Формы летнего отдыха и оздоровления детей и подростков. *Омский научный вестник*. 2015. Т. 138,

№ 1. С. 41-46. URL: <https://cyberleninka.ru/article/n/formy-letnego-otdyha-i-ozdorovleniya-detey-i-podrostkov-obzor-literatury/viewer>

4. Осадчук Н. І., Сергета І. В. Фізичний розвиток дітей і підлітків та сучасні підходи до оцінки ступеня його гармонійності: монографія. Вінниця, 2014. 188 с.

5. Про затвердження Критеріїв оцінки фізичного розвитку дітей шкільного віку: наказ від 13.09.2013 № 802 / МОЗ України. Київ, 2013. 48 с. URL: <https://zakon.rada.gov.ua/laws/show/z1694-13>

6. Avery A., Anderson C., McCullough F. Associations between children's diet quality and watching television during meal or snack consumption: A systematic review. *Maternal Child Nutrition*. 2017. Vol. 13(e12428). P. 1-20. DOI: <https://doi.org/10.1111/mcn.12428>

7. Comparison of total energy expenditure between school and summer months / S. R. Zinkel et al. *Pediatric Obesity*. 2013. Vol. 8. P. 404-410. DOI: <https://doi.org/10.1111/j.2047-6310.2012.00120.x>

8. von Hippel P. T., Workman J. From kindergarten through second grade, U.S. children's obesity prevalence grows only during summer vacations. *Obesity*. 2016. Vol. 24, No. 11. P. 2296-2300. DOI: <https://doi.org/10.1002/oby.21613>

9. Life on holidays: study protocol for a 3-year longitudinal study tracking changes in children's fitness

and fatness during the in school versus summer holiday period / A. Watson et al. *BMC Public Health*. 2019. Vol. 19. P. 1353

DOI: <https://doi.org/10.1186/s12889-019-7671-7>

10. Mahoney J. L. Adolescent summer care arrangements and risk for obesity the following school year. *Journal of Adolescence*. 2011. Vol. 34, No. 4. P. 737-749. DOI: <https://doi.org/10.1111/j.2047-6310.2012.00120.x>

11. Olds T., Maher C., Dumuid D. Life on holidays: differences in activity composition between school and holiday periods in Australian children. *BMC Public Health*. 2019. Vol. 19, Suppl 2. P. 450. DOI: <https://doi.org/10.1186/s12889-019-6765-6>

12. Socio-Economic Inequalities in Adolescent Summer Holiday Experiences, and Mental Wellbeing on Return to School: Analysis of the School Health Research Network/Health Behaviour in School-Aged Children Survey in Wales / K. Morgan et al. *Int. J. Environ. Res. Public Health*. 2019. Vol. 16. P. 1107. DOI: <https://doi.org/10.3390/ijerph16071107>

13. Understanding differences between summer vs. school obesogenic behaviors of children: the structured days hypothesis / K. Brazendale et al. *International Journal of Behavioral Nutrition and Physical Activity*. 2017. Vol. 14, No. 100.

DOI: <https://doi.org/10.1186/s12966-017-0555-2>

The article was received
2021.01.28

