

Assessment of educators' physical activity in conditions of social isolation

Iryna Kalynychenko¹, Mirosława Cieslicka², Hanna Latina¹, Mykhailo Antomonov³, Hanna Zaikina¹

¹Sumy State Pedagogical University named after A.S. Makarenko; Sumy, Ukraine

²Collegium Medicum in Bydgosz, Nicolaus Copernicus University in Torun, Poland.

³State Institution "O.M. Marzиеv Institute for Public Health of the National Academy of Medical Sciences of Ukraine"; Kyiv, Ukraine

Abstract

Purpose: To assess the educators' physical activity in the conditions of social isolation during the Covid-19 pandemic with the use of data on daily energy costs in the dynamics of 16 years.

Material & methods. To solve the problems, the data of 925 teachers of preschool and general secondary education institutions were analyzed (436 people – in 2005, 404 people – in 2018, 85 people – in 2021). Age composition of the participants of the scientific observation: I age group (I AG) up to 31 years old – 165 people (17.84 %), II age group (II AG) 31-40 years old – 271 people (29.30 %), III age group (III AG) 41-50 years old – 253 people (27.35 %), IV age group (IV AG) older than 50 years – 236 people (25.51 %). Among the teachers, 690 people (74.59 %) were residents of the regional center, 207 (22.38 %) were residents of district centers, and 28 (3.03 %) were residents of rural areas. The following methods were used during the study: questionnaire; natural experiment; statistical processing of the received data.

Results. The study revealed a tendency towards a decrease in the average values of teachers' energy expenditure of daily physical activity from 2005 (2818.78±38.32 kcal) to 2021 (2804.03±20.77 ($F_{2005-2021}=14.049$; $p=0.000$)) and a natural decrease in the average value of the indicator of energy expenditure of daily physical activity during the distance learning (2412.34±21.08 kcal) by 13.96 % compared with the similar indicator during the traditional form of learning in 2021 (2804.03±20.77 kcal), ($t_{\text{offline-online}}=34.913$; $p=0.000$).

Conclusions. In the dynamics of the studied period, there is a decrease in the average values of teachers' energy expenditure of daily physical activity from 2005 (2818.78±38.32 kcal) to 2021 (2804.03±20.77 ($F_{2005-2021}=14.049$; $p=0.000$)).

The average value of the indicator of daily energy expenditure for physical activity during the distance learning (2412.34±21.08 kcal) is 13.96 % lower, compared with the similar indicator of teachers' work using the traditional form of learning in 2021 (2804.03±20.77 kcal), ($t_{\text{offline-online}}=34,913$; $p=0,000$).

Keywords: physical activity, professional burnout, educators, COVID-19 pandemic.

Анотація

Ірина Калиниченко, Mirosława Cieslicka, Ганна Латіна, Михайло Антомонов, Ганна Заїкіна. Оцінка фізичної активності працівників галузі освіти в умовах соціальної ізоляції. Мета: оцінити фізичну активність працівників галузі освіти в умовах соціальної ізоляції під час пандемії COVID-19 із використанням даних про добові енерговитрати у динаміці 16 років. **Матеріал та методи:** для вирішення завдань було проаналізовано дані 925 вчителів закладів дошкільної та загальної середньої освіти (436 осіб – у 2005 році, 404 осіб – у 2018 році, 85 осіб – у 2021 році). Віковий склад учасників наукового спостереження: I вікова група (I ВГ) до 31 року – 165 осіб (17,84%), II вікова група (II ВГ) 31 – 40 років – 271 особа (29,30%), III вікова група (III ВГ) 41-50 років – 253 особи (27,35%), IV вікова група (IV ВГ) старше 50 років – 236 осіб (25,51%). Серед вчителів – 690 осіб (74,59%) були жителями обласного центру, 207 (22,38%) – районних центрів, 28 (3,03%) – жителі сільських поселень. Під час проведення дослідження застосовувались наступні методи: анкетування; натурний експеримент; статистична обробка отриманих даних. **Результати:** виявлено тенденцію до зниження середніх значень енерговитрат добової фізичної активності вчителів з 2005 року (2818,78±38,32 ккал) до 2021 року

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Corresponding author:

Iryna Kalynychenko

Pedagogical University named after

A.S. Makarenko; Sumy, Ukraine

orcid.org/0000-0003-1514-4210

e-mail: irinakalinichenko2017@

gmail.com

Mirosława Cieslicka

orcid.org/0000-0002-0407-2592

Hanna Latina

orcid.org/0000-0002-8483-2490

Mykhailo Antomonov

orcid.org/0000-0003-3939-6156

Hanna Zaikina

orcid.org/0000-0003-3094-4259

(2804,03±20,77 ($F_{2005-2021}=14,049$; $p=0,000$)) і закономірне зниження середнього значення показника енерговитрат добової фізичної активності під час дистанційної форми навчання (2412,34±21,08 ккал) на 13,96% порівнюючи із аналогічним показником під час традиційної форми навчання у 2021 році (2804,03±20,77 ккал), ($t_{\text{of-line-on line}}=34,913$; $p=0,000$). **Висновки:** У динаміці досліджуваного періоду спостерігається зниження середніх значень енерговитрат добової фізичної активності вчителів з 2005 року (2818,78±38,32 ккал) до 2021 року (2804,03±20,77 ($F_{2005-2021}=14,049$; $p=0,000$)). Середнє значення показника добових енерговитрат на фізичну активність під час дистанційної форми навчання (2412,34±21,08 ккал) на 13,96% є нижчим, порівняно із аналогічним показником під час роботи педагогів за традиційною формою навчання у 2021 році (2804,03±20,77 ккал), ($t_{\text{of-line-on line}}=34,913$; $p=0,000$).

Ключові слова: фізична активність, професійне вигорання, педагогічні працівники, пандемія COVID-19.

Introduction

Problem Statement and Research Relevance

Human health is considered to be the most valuable national wealth, the preservation and strengthening of which is a matter of social importance. Unfortunately, the incidence of noncommunicable diseases is increasing among the population. Almost 84 % of all deaths in Ukraine are caused by cardiovascular diseases, diabetes, cancer, chronic obstructive pulmonary disease and mental health disorders. Most noncommunicable diseases are associated with behavioral factors, one of which is insufficient physical activity (Індекс Здорова. Україна – 2019: Результати zahalnonatsionaloho doslidzhennia, 2020).

Therefore, in the system of preventive measures aimed at strengthening and preserving the population's health, physical education, maintaining an optimal movement regime in combination with a rational diet and a healthy lifestyle are significant and effective methods. Today, the low level of physical activity is associated with the use of mainly passive forms of recreation, leading a sedentary lifestyle at home and at work (WHO guidelines on physical activity and sedentary behavior. Geneva: World Health Organization, 2020).

This situation occurs in different countries. Thus, at least 40 % of Singaporeans do not meet the daily norm of physical activity (Chew et al, 2021). The effectiveness of multi-level lifestyle interventions to increase physical activity has been established. A conclusion was made regarding the need to apply elements of technology, behavioral economics, gamification, marketing, and communications. Similar results were obtained in another study (Latorre-Román et al, 2020). A decrease in the level of physical activity in the population of Spain is associated with a deterioration in the quality of life and an increase in morbidity from the cardiovascular system.

The analysis of the physical activity level in the population of rural areas of South Africa was carried out in the work of Chikafu H. et al. (2020). Weekly physical activity amounted to more than 15 hours. Gender differences were established: the activity of men was 37 % higher than that of women.

The low level of physical activity in the population of the Persian Gulf countries was stated in the work of Pearson F. et al. (2020). At the same time, there is a high prevalence of overweight, obesity and diabetes. The authors suggested to develop complex programs of improvement, in which data on the volume of motor activity, anthropometric indicators and se-

verity of risk factors for chronic diseases should be used as necessary information.

In the context of anti-epidemic measures introduced by countries during the COVID-19 pandemic, caused by the SARS-CoV-2 coronavirus, the prevention of noncommunicable diseases is under threat. Prevention of diseases, both infectious and non-infectious at the individual level, is the fifth operational function of public health, which was adopted in 2012 by the European Regional Office of the WHO as part of the public health development and the "European Action Plan for Strengthening Public Health Capacities and Services" (Slabky et al., 2017).

WHO defines the European Region as having the highest rates of noncommunicable morbidity and mortality of any region in the world. The restrictive measures introduced during the COVID-19 pandemic have complicated the process of maintaining the required level of physical activity. The level of physical activity (PA) has significantly decreased due to the cessation of the usual mode of motor activity, which leads to an increase in the risk of obesity and development of diabetes and cardiovascular diseases (Kluge et al., 2020).

Therefore, it is natural that the COVID-19 pandemic caused a new wave of actualization and popularization of PA, due to the need to recover from an infection and rehabilitate patients with post-coronavirus syndrome, focusing attention on preventing the side effects of anti-epidemic measures due to the spread of the coronavirus disease (COVID-19), in particular increasing physical activity in the conditions of a pandemic (2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region, 2021; Spruit, 2020).

The relevance of conducting a study of physical activity in conditions of social isolation, especially in people with a sedentary lifestyle, is confirmed by the need for the implementation of the Sustainable Development Goals, namely the achievement of the third Goal: "good health and well-being" and the implementation of the new Global Action Plan for increasing the level of physical activity for 2018-2030, which presents four strategic goals and 20 specific recommended policy measures for the implementation by member states, international partners and WHO of activities to increase physical activity worldwide (WHO guidelines on physical activity and sedentary behavior. Geneva: World Health Organization, 2020). A number of issues need to be clarified: what is the relationship between PA and professional activity, how does the amount of PA change over time with changes in the social conditions of life, what is the structure of daily PA by categories, what factors influence the educators' PA?

Today, a significant problem for most developed countries is the increase in the contribution of hypodynamism to the lifestyle of the population due to professional activity (Castillo-Retamal et al., 2011; Wang et al., 2019). According to research by Tremblay et al (2017), a sedentary lifestyle can be defined as an activity with energy expenditure ≤ 1.5 units of metabolic equivalent (MET), which corresponds to work in a sitting and lying position.

Sedentary behavior is common among the adult population in Ukraine, which takes, on average, from 218.2 minutes in rural areas to 245.5 minutes in cities every day (Doslidzhennia STEPS, 2020).

According to Prince et al (2019), working adults spend 60 % of their time per day on sedentary activities, both during professional activities and during leisure time. In addition, it has been proved that a sedentary lifestyle at work is also reflected in the choice of a form of recreation. In their free time

from work, educators choose sedentary forms of activity, in particular: watching television programs, browsing social networks (Castillo-Retamal et al., 2011). Therefore, the introduction of programs to increase physical activity must be carried out directly at the workplace, as evidenced by the research of French scientists Smith et al (2016), Genin et al. (2018).

The existence of a relationship between motor activity and cognitive abilities of elderly people was studied in the work of Krell-Roesch et al. (2021). The results of a longitudinal study confirmed that a high intensity of motor activity in old age slows down the rate of cognitive abilities deterioration. Similar conclusions were drawn in another study (Wade et al., 2020). It has been confirmed that aerobic fitness classes are positively associated with the improvement of cognitive functions in physically healthy adolescents and youth without metabolic disorders.

National strategies to contain the COVID-19 pandemic have led to restrictions on normal daily activities. Numerous scientific studies prove a decrease in the level of physical activity during the pandemic (Yang et al, 2020; Ráthonyi et al., 2021). Thus, in studies of motor activity by Taeymans et al. (2021) in the working adult population of Europe during the pandemic, a higher average duration of daily sitting (more than 8 hours during the day) was established in 36.1 % of respondents and a lower average of up to 9 units of median total MET minutes per week. In addition, scientists have proved the positive impact of dosed physical activity on mental health during the COVID-19 pandemic, in particular, at least 270 minutes of moderate-intensity exercise per week (Nie et al., 2021).

The global outbreak of the pandemic became the impetus for finding the ways to overcome critical problems in the field of education, related to the health and safety of educational process participants, economic issues and difficulties in fulfilling professional duties, technostructure and modernization of educational facilities (Li et al., 2021).

There are also research findings that demonstrate a higher risk of hospitalization during SARS-CoV-2 infection in individuals who violate WHO recommendations for physical activity (Sallis et al., 2021; Després 2021).

Analysis of teachers' professional PA indicates a predominantly sedentary lifestyle at the expense of direct professional activity (Bogaert et al., 2014; Kalynychenko, 2021). A study of teachers' PA before the COVID-19 pandemic proves its dependence on the profession. Thus, according to Pavlova's research (2012), physical education teachers had the highest level of energy expenditure, which was 22 181 MET-min/week. In contrast, basic health teachers spent only 13 565 MET-min/week, and their level of physical activity was the lowest. The level of energy expenditure among physical education teachers was high not only due to significant physical activity at the workplace (the indicator of energy expenditure at work is 10 872 MET-min/week), but also due to the fact that they spent their free time actively (running, aerobics, volleyball, swimming, etc.) and devoted more time to housework or worked longer in the yard (energy expenditure index 6 612 MET-min/week) (Pavlova, 2012). The study of pedagogical workers conducted by S.Y. Agha, S.A. Al-Dabbagh has proved the predominance of their high level of PA (56.8 %). At the same time, it was established that teachers aged 15-29 years (42.3 %) were more active compared to teachers aged 30-44 years (37%) and 45-64 years old (37.8 %). The analysis of the amount of time spent by teachers sitting proves that teachers with a low level of PA spent more than 10 hours sitting (47.2 %), up to 4.5 hours were spent by teachers with a high level of PA (49.4 %) (Agha et al, 2012).

In the conditions of COVID-19 pandemic, a transformation of the teachers' lifestyle took place (Latina 2020; Parra et al., 2021), in particular, the duration of work at the computer increased (Fleming, 2020), and the share of a sedentary lifestyle increased (McClintok, 2021). The need to work online for up to 4 hours a day has led to undue stressors and increased demands on physical health (Trinidad, 2021). One of the most serious consequences of long-term professional stress is the syndrome of "professional burnout" (PB).

Based on the analysis of approaches to the study of the "professional burnout" syndrome, this syndrome was defined as a stress reaction that occurs as a result of the long-term professional stresses of medium intensity (Latina, 2020; Kalynychenko et al., 2021).

Based on the results of the assessment of teachers' physical activity during the COVID-19 pandemic, it was established that 38.34 hours per week were spent on professional duties, 80 % of teachers exercised at home for 4.12 hours per week, 57.39 % of teachers walked for 1.69 hours (Aperribai et al., 2021).

Thus, at the stage of modern social transformations caused by the COVID-19 pandemic, a sedentary lifestyle is a threat to the development of passivity, increasing the risk of developing non-infectious diseases and can be one of the manageable factors to overcome the dangers of future pandemics (Ramirez Varela et al., 2021).

Purpose: to assess the educators' physical activity in the conditions of social isolation during the Covid-19 pandemic with the use of data on daily energy costs in the dynamics of 16 years.

Material and Methods of the research

Participants. The research summarizes the results of scientific observation of 925 teachers of preschool and general secondary education institutions (436 people – in 2005, 404 people – in 2018, 85 people – in 2021), thus using the hypothesis about the significant influence of professional activity and social factors, related to the conditions of the distance learning on the teachers' physical activity. The contingent of respondents was made up of women, who form the vast majority of the teaching staff at the education institutions.

Age composition of the participants of the scientific observation: I age group (I AG) up to 31 years old – 165 people (17.84 %), II age group (II AG) 31-40 years old – 271 people (29.30 %), III age group (III AG) 41-50 years old – 253 people (27.35 %), IV age group (IV AG) older than 50 years – 236 people (25.51 %).

Among the teachers – 690 people (74.59 %) were residents of the regional center, 207 (22.38 %) – district centers, 28 (3.03 %) – residents of rural areas.

The study was conducted in compliance with the principles of voluntariness, with a guarantee of human rights and freedoms protection, inviolability of physical and mental integrity, observance of the principles of justice and equality, with preliminary detailed information of the volunteers about the essence of the study in accordance with the "World Medical Association Declaration of Helsinki" (2008).

The study is a fragment of the research work of the Department of Public Health and Medical-Biological Foundations of Physical Culture of the Educational-Scientific Institute of Physical Culture of the Sumy State Pedagogical University named after A.S. Makarenko "Comprehensive study of the functional state, adaptive capabilities of the body and the risk of develop-

ing diseases in various population groups”, state registration number 0120U100799 (01.2020 – 12.2025).

Procedure

The study lasted from 2005 to 2021, with three periods being distinguished (as of 2005, 2018 (before the start of quarantine measures) and 2021 – the period of remote work due to the coronavirus pandemic and introduced quarantine measures).

For the physiological and hygienic characteristics of the teachers' physical activity, we used: 1) analysis of the materials of the teachers' questionnaire survey according to the specially developed “Chart of formalized self-report on physical activity”; 2) determination of teachers' energy consumption by tabular-timing method.

The formalized report made it possible, with the help of self-assessment of the time spent during the day on different (by intensity) categories of PA, to determine the average daily energy expenditure and, according to the obtained data, to assess the level of PA, both for a specific person and for groups as a whole (Cale et al, 2006; Polka et al. et al., 2011).

The chart of the formalized timing self-report consisted of two blocks: the characteristics of the weekday and the description of the day off. Data from the timing self-report of each respondent were entered into a summary table by PA categories: background (basic), very low, low, medium, high, very high.

Energy consumption during performance of a certain type of activity was calculated by multiplying the energy “cost” of the type of work by its duration during the day. The amount of energy “cost” of each type of activity was used from previous scientific studies in the form of the MET indicator (metabolic equivalent of physical activity, as the amount of energy expenditure at rest, which approaches the amount of maximum oxygen consumption, which is 3.5 ml/kg/min (1.2 kcal/kg)). In the corresponding energy expenditure calculations, MET is a coefficient (Metabolic equivalent). Therefore, the use of MET allows to correctly compare energy costs between people with different body weights and to act as coefficients, which can be conditionally accepted as kcal/min.

In accordance with the energy “cost” of individual types of PA, a classification of PA categories by energy expenditure (Metabolic equivalent) was developed (Table 1).

The level of teachers' professional burnout was assessed according to V.V. Boiko's method “Diagnostics of the level of emotional burnout” (Raihorodskyi, 1998). PB was determined based on twelve symptoms. According to the sum of the points

of each symptom, the high, average and low levels of PB were determined (110 points and less – low (1), 111-180 points – average (2), 183 points and more – high level (3)).

Statistical analysis

Descriptive statistics were used to determine the arithmetic mean (M), standard deviation (S), error of the mean (m) and estimate the probability of differences using a Student's t -test. Differences and associations were considered probable at a significance level of $p < 0.05$. The obtained values of the Student's t -test were evaluated by comparison with the critical values (Antomonov, 2017). Quantitative values of the indicators were assessed for compliance with the normal distribution according to the Kolmogorov-Smirnov test. Distribution in samples of quantitative values of energy expenditure of physical activity (EE PA) in the period before the introduction of quarantine measures in 2005 ($K-S d = 0.062$; $p < 0.15$), in 2018 ($K-S d = 0.045$; $p > 0.20$), after the introduction of quarantine measures ($K-S d = 0.067$; $p > 0.20$), point assessments of professional burnout symptoms before the introduction of quarantine measures in 2005 ($K-S d = 0.060$; $p < 0.10$), in 2018 – ($K-S d = 0.056$; $p > 0.20$), after the introduction of quarantine measures ($K-S d = 0.062$; $p > 0.20$) testified to the compliance of the samples with the law of normal distribution. Nominal and ratio variables were described as percentages. For nominal variables (nomenclature scales), the relationship was calculated according to conjugation tables using the Pearson's χ^2 test.

The significance of the difference between the mean values of dependent quantitative variables by groups of factors was determined using one-way (ANOVA) analysis of variance. Significance testing in analysis of variance was based on a comparison of variance due to between-group variance (MS_{efect}) and variance due to within-group variance (called mean squared error or MS_{error}). The obtained within-group variances can be compared using the F -test, which tests whether the variance ratio is indeed significantly greater than 1.

Dependent values were energy expenditure and duration of different categories of physical activity and assessment of professional burnout. Independent values were four age groups, work experience (group 1 – less than 10 years, group 2 – 11-20 years, group 3 – 21-30 years, group 4 – more than 30 years), levels of professional burnout.

Accumulation and systematization of the received data was carried out in Microsoft Office Excel spreadsheets. Statistical analysis was performed using the STATISTICA 10.0 pro-

Table 1. Classification of physical activity categories according to energy expenditure

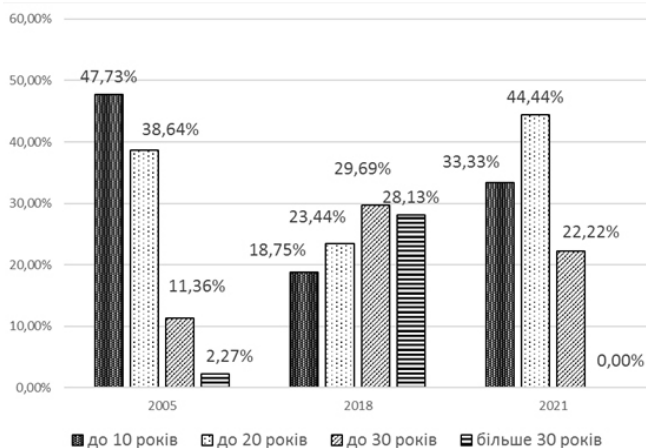
The intensity of physical activity (category PA)	Energy “cost” (MET)	Types of activity
Background (basic) (B)	0.9	Sleep
Very low (VL)	1.3	Checking notebooks, working with documents, preparation for lessons (sitting), communication with parents, transportation, eating, reading, watching TV, working with computer (including searching for Internet resources, moderating parent/student chats), advanced training courses, surfing social networks
Low (L)	2.6	Conducting lessons, preparation of visual aids, educational work with children, personal hygiene
Medium (M)	4.0	Walking at a fast pace, walking in the open air, household work
High (H)	6.0	Sports classes with intense physical activity

gram (developer – StatSoft.Inc).

Results of the research

One of the consequences of a teacher's intense work is professional burnout, which negatively affects the psychosomatic health of specialists. In general, among the respondents, 13.70±1.13 % of people have a high level of PB, 37.90±1.59 % have an average level, and 48.41±1.64 % have a low level. A high level of PB has the highest specific weight in the groups of teachers aged 30 to 40 and 40 to 50 years old (32.76±1.54 % and 26.72±1.45 %, respectively), compared to the groups of the youngest colleagues of the I AG (17.24±1.24 %) and senior colleagues of the IV AG (12.27±1.08 %).

Educators with a high level of PB are most often found in groups of people with experience up to 10 and up to 20 years (30.77±1.52 % in each group). The analysis of the distribution of PB among teachers in the temporal aspect was performed. In particular, in 2005, a high level of PB was found mainly among teachers of the II AG (47.73 %). In 13 years, the symptoms of the high-level PB prevailed among teachers of the IV AG (39.68 %), and during the period of online education, the burden of high-level PB was again registered among the teachers of the II AG (55.56 %). At the same time, the minimum specific weight of high-level PB was determined among teachers of the I AG and IV AG (11.11 % in each group).



less than 10 years, more than 30 years

Fig. 1. Distribution of teachers with a high level of professional burnout by work experience by specialty (%)

Confirmation of such a tendency can be found by analyzing the distribution of teachers with a high level of PB by work experience (Fig. 1). In 2005, a high level of PB was most often found among teachers with less than 10 and up to 20 years of

work experience, and it is these groups that include individuals of the I AG and the II AG. The period of education modernization, widespread introduction of information technologies in the period until 2018 was accompanied by an increase in the number of respondents in groups of teachers with experience of up to 30 years and more than 30 years.

The results of variance analysis for the average values of the energy expenditure of daily physical activity (EE DPA) and the indicator of professional burnout of teachers as a whole allowed to establish a statistically significant effect of the age of teachers only on the indicator of EE DPA in the period before the introduction of quarantine measures ($F=3.47$; $p=0.016$).

Taking into account the different social conditions for professional activity in connection with the introduction of distance education, the age characteristics of the investigated indicators were analyzed separately in different years.

In 2005, a probable dependence on age was established only for the indicator of the general PB syndrome ($F=5.65$; $p=0.0008$). According to the variance analysis of the 2018 indicators, a probable influence of the age factor on the average values of the energy expenditure of the daily PA was recorded ($F=3.25$; $p=0.022$).

However, in 2021, under the condition of blended learning using *online* mode, no age-specific characteristics of the average values of the studied indicators were found ($p=0.358 - 0.676$).

In the range of sixteen years of observation, a probable connection with the place of residence existed only in 2005 according to the average value of the indicator of the general PB syndrome with a predominance among teachers of the regional center (113.95±50.01 c.u.) compared to teachers of rural areas (76.53±45.70 c.u.; $F=9.668$; $p < 0.001$).

A tendency towards a decrease in the average values of energy expenditure of teachers' daily physical activity from 2005 (2818.78±38.32 kcal) to 2021 (2804.03±20.77 ($F_{2005-2021}=14.049$; $p < 0.001$)) and a natural decrease of the indicator of EE DPA during the distance learning (2412.34±21.08 kcal) by 13.96 % compared with the similar indicator during the traditional form of learning in 2021 (2804.03±20.77 kcal), ($t_{\text{offline-online}}=34.913$; $p < 0.001$) were revealed.

All components of teachers' daily physical activity (except for a low level) depended on the time of observation, which is confirmed by the statistical characteristics of variance analysis (Table 2).

The dependence of DPA on the level of teachers' PB was revealed, namely: in all years of observation, a low average indicator of energy expenditure of DPA was recorded in persons with a high level of professional burnout (Table 3).

Probable differences were established for the indicators of EE DPA in 2021, when the educational process was car-

Table 2. Indicator of the duration of the components of teachers' daily physical activity in the dynamics of the observation period (min), (M±m)

Components of daily physical activity	Years				F (for off-line)	p (for on-line)
	2005 n=436	2018 n=404	offline n=85	online n=85		
Back-ground level	436,17±3,37	421,25±3,11	402,07±5,38	402,07±5,38	12,317	p<0,001
Very low level	419,48±9,03	463,62±5,62	521,35±7,89	774,41±8,76	22,319	p<0,001
Low level	349,09±7,74	351,88±5,12	319,26±8,15	42,08±1,49	2,636	0,072
Medium level	225,39±7,77	189,98±3,95	197,14±6,47	197,14±6,47	9,902	p<0,001
High level	11,95±1,32	13,69±1,21	24,29±2,23	24,29±2,23	8,929	p<0,001

Table 3. Indicators of daily energy expenditure of teachers with different levels of professional burnout syndrome according to the tabular-timing method (kcal/min), (M±σ)

Levels of general symptom of professional burnout	Years			
	2005	2018	2021	
			offline	online
Low (1) n=410	2804,75±667,86	2730,467±262,58	2868,134±190,31 $t_{1-2}=2,605; p=0,011$	2483,505±175,75 $t_{1-2}=2,766; p=0,007$
Average (2) n=321	2872,231±821,31	2773,754±225,06 $t_{2-3}=2,006; p=0,046$	2759,645±172,17	2367,011±1,18
High (3) n=116	2754,320±638,76	2705,481±224,80	2720,722±209,68 $t_{1-3}=2,051; p=0,046$	2303,278±195,12 $t_{1-3}=2,535; p=0,014$

ried out in a blended form and the duration of very low physical activity in the online mode (774.41±8.76 min) exceeded by 32.68 % the duration of the similar component in the offline mode (521.35±7.89; $t=24.48; p<0.001$).

Discussion

Increasing physical activity is an effective tool for population health management. However, there are certain problems of motor activity regulation. Siedler et al (2021) analyzed 95 guidelines published since 2000 that included recommendations for physical activity to improve general health and prevent cardiometabolic diseases. It was concluded that most of the recommendations on physical activity were not specific enough for practical implementation. The overall quality of the manuals improved over time, but the lack of specificity of the recommendations remained.

It is well known that physical activity is an integral part of a person's lifestyle and reflects a socially motivated attitude of a person to an active lifestyle. In everyday life, the usual PA often does not meet the biological needs of the body in movement, which contribute to health strengthening and preservation.

The tasks of the work included the use of the method of timing self-report on daily physical activity with subsequent calculation of energy expenditure.

These methods are widely used in population health monitoring. Thus, in the work of Chen et al (2021) physical activity was measured in metabolic equivalents using the International Physical Activity Questionnaire (IPAQ). It was concluded that meeting moderate and vigorous physical activity recommendations in adults was associated with a reduced likelihood of liver dysfunction in both urban and rural Chinese populations.

Special questionnaires for analyzing the level of motor activity were used in works (Rai et al, 2020; Jacob et al, 2020; Chen et al, 2021). The use of such assessment tools makes it possible to differentiate the levels of motor activity of the respondents, to establish the dependence with health and lifestyle features, to identify the factors with the greatest impact on health.

Distance education has fundamentally changed the teacher's work: the requirements for mastering a computer and software components have increased, the stressful nature of work has increased, and the peculiarities of communication with students and parents have arisen. Adaptive reactions of the body to online learning emerged in the form of PB in a group of

young teachers with less than 10 years of experience and up to 20 years of experience. In the group of teachers with more than 30 years of experience, there were no individuals with a high level of PB. Probably, it is caused by the peculiarities of personnel provision of the educational process with a decrease in the number of teachers with considerable work experience.

In the study, it was established that energy expenditure of DPA is in a fairly wide range: from 2412.34±21.08 kcal to 2818.78±18.32 kcal and depends on many factors related to the life activities of the respondents. Nowadays, there are no common recommendations on PA regulation of the adult population. The obtained data coincide with the data of previous scientific studies by Agha et al (2012), Pavlova (2012), Parra et al (2021).

Several main areas of PA research can be identified: 1) study of functional changes in the body under the influence of PA; 2) determination of PA norms for different age and gender groups; 3) studying the energy characteristics of PA. Today, the direction of development of the methods of quantitative and qualitative assessment of PA remains relevant. The most widespread are: the method of pedometry, registration of energy expenditure, determination of the time spent during the day, week, month, year on all forms of physical activity, the ratio of dynamic and static components of muscle activity during the day, timing, pulsometry, the method of determining the sum of movements in linear indicators of locomotion, self-control (Polka et al, 2011; Kalynychnenko et al, 2021).

In the European region, the term "health-enhancing physical activity" is widely used. As noted by experts of the Institute for Health Promotion Research, this definition emphasizes the connection of physical activity with health and means "any form of physical activity that promotes health and increases functional capabilities, but such that does not cause harm and not associated with undue risk" (Cavill et al, 2006).

According to the definition of WHO, physical activity is any movement of the body, which is carried out by skeletal muscles and is accompanied by energy expenditure. The term "physical activity" refers to any type of movement, in particular during rest, travel, and work. Improving health is facilitated by both moderate and intense physical activity (Hlobalni rekomendatsii shchodo fizychnoi aktivnosti dlia zdorovia, 2010).

We believe that analysis of the PA category should be conducted according to the concept of R. V. Sylla, the essence of which is that the regulation of the optimal amount of PA, which is a stimulus for the development of the body and strengthening of health, should be based on the duration of "useful" PA with an

increase in metabolism substances in 5-10 times, compared to the state of rest (with a pulse rate of 130-160 beats per minute) (Sylla et al, 1980).

The results of self-reporting on daily energy expenditure by teachers made it possible to determine that, on average, the specific weight of the time spent on physical exercises and independent sports activities in free time was 5.85 % (24.29±2.23 min per day) of the total daily time budget during quarantine measures in 2021. In previous years, the high level of DPA was lower: 11.95±1.32 min – in 2005 and 13.69±1.21 min – in 2018.

Widely known are WHO recommendation for adults to adhere to 150 minutes of moderate physical activity or 75 minutes of vigorous physical activity per week, or to combine moderate and vigorous physical activity. Therefore, it can be assumed that teachers in today's conditions are responsible for their health and increase the share of high-level PA in their daily time budget.

An interesting fact is the constancy of the indicators of the average intensity of DPA among teachers. We believe that the average intensity of motor activity consists of such types of motor activity as: household work, childcare, walking and walks in the fresh air. Their time share in the teachers' daily schedule has not changed because the conditions for performing these types of motor activity have not changed. The research was carried out during the third wave of quarantine measures and the teachers performed the types of activities inherent in the average level of intensity of motor activity, at their usual time, after returning from the education institution.

In 2005, among teachers with experience of 31 years and more, a probable predominance of a low level of PB ($p < 0.05$) over the indicators of other groups of teachers by work experience was observed, which can be explained by the formed adaptation to the professional stressors of the working conditions of teachers with extensive experience in pedagogical work. In the following years, in our opinion, in connection with the intensification of the educational process and informatization, teachers with considerable work experience and older age groups performed professional duties with a significant strain of adaptation processes. However, the mechanisms of adaptation to new working conditions in the online mode allowed teachers of older age groups with considerable work experience to successfully provide the educational process without pronounced PB syndrome.

Analysis of the obtained data testifies to the formation of a high level of PB among younger teachers with the leading importance of the manifestation of the symptom complex of resistance in the teachers of the regional center, which is determined by a rapid emotional reaction, emotional and moral disorientation, expansion of the sphere of saving emotions, reduction of professional duties, which cannot not be marked on the level of pedagogical activity effectiveness.

Studies confirm the hypothesis of a connection between

PB and DPA level. In particular, it was established that a decrease in the energy expenditure of DPA naturally accompanies the educational process in the online mode (especially in persons with a high level of PB) due to an increase in the time of a very low level of physical activity (774.41±8.76 min), a decrease in the dynamic component of the daily budget time due to low DPA level from 319.26±8.15 min to 42.08 ±1.19 min ($t=33.47$; $p < 0.001$).

Conclusions

1. In the dynamics of the studied period, there is a decrease in the average values of energy expenditure of teachers' daily physical activity from 2005 (2818.78±38.32 kcal) to 2021 (2804.03±20.77) ($F_{2005-2021} = 14,049$; $p < 0,001$).

2. The average value of the indicator of daily energy expenditure for physical activity during the distance learning (2412.34±21.08 kcal) is lower by 13.96 %, compared to the similar indicator during the work of teachers in the traditional form in 2021 (2804.03±20.77 kcal), ($t_{\text{offline-online}} = 34,913$; $p < 0,001$).

3. The body's adaptive reactions to online learning emerged in the form of PB in a group of young teachers with less than 10 years of experience and up to 20 years of experience. In the group of teachers with more than 30 years of experience, there were no individuals with a high level of PB.

4. In the conditions of the distance form of the educational process, a dangerous complex of the risk of psychosomatic diseases is formed, which consists of the formed syndrome of emotional professional burnout and low daily physical activity.

Author Contributions

Iryna Kalynychenko: – research design, data collection, statistical analysis, manuscript preparation.

Mirosława Cieslicka: data collection, statistical analysis, manuscript preparation.

Hanna Latina: data collection, statistical analysis, manuscript preparation.

Mykhailo Antomonov: - research design, data collection, statistical analysis, manuscript preparation

Hanna Zaikina: statistical analysis, manuscript preparation

Conflicts of Interest

The authors declare no conflict of interest.

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