ORIGINAL ARTICLE

CONTENTS

Motor activity regimen and daily energy expenditure of cadets and employees in practical units

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ABSTRACT

Aim: To conduct a comparative analysis of the motor activity regimen and daily energy expenditure of cadets and employees in police investigative units.

Materials and Methods: The research involved cadets of the 1st-4th training years (n = 86) and employees of police investigative units (n = 64). To establish the levels of motor activity and daily energy expenditure of cadets and employees in police investigative units, the Framingham method was used based on the registration of activities during the day.

Results: A significant difference in cadets' motor activity index and daily energy expenditure during their educational activities and police investigators during their service activities ($p < 0.001$) was found. It was found that during the day, the cadets consumed 2658.8 ± 39.6 kcal in the process of their educational activities with their motor activity index at 34.43 ± 0.32 points. The employees showed 2412.4 ± 35.1 kcal of daily energy expenditure with their motor activity index at 31.18 ± 0.29 points.

Conclusions: The results obtained are due to the specifics of the educational activities of cadets and the peculiarities of the service activities of police investigators, which are determined by an extended stay in a forced position and a low level of physical activity. The results of the conducted research should be taken into account when organizing the physical training of police investigators in the course of their service activities.

KEY WORDS: motor activity regimen, daily energy expenditure, motor activity index, cadets, employees in police investigative units, physical training

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INTRODUCTION

Human health is the highest value and asset of the state. The primary goal of state institutions and organizations, particularly educational institutions, is to form a harmoniously developed personality that will value health, promote its development in the learning environment and preserve it during professional activities [1].

In modern conditions, the problem of health is becoming especially relevant, as the full-scale war in Ukraine, pandemics of recent years, unhealthy diet, low level of physical activity, bad habits, and increased nervous and mental stress lead to its deterioration [2]. Scientific studies show that physical health is determined by 10 % by the availability and quality of medical care; 20 % by the quality of the environment; 20 % by heredity; and 50 % by conditions and lifestyle [3]. The concept of a "healthy lifestyle" covers a variety of factors related to all areas of health. One of the key factors is an optimal motor regimen, which involves a certain amount of physical activity. The proper amount of physical activity contributes to the quality functioning of the body, prevents diseases of the cardiovascular system, supporting-motor apparatus, creates the necessary conditions for the manifestation of physical abilities and promotes faster mastery of various motor actions [4]. Any physical activity involves muscle activity, which stimulates the functional activity of almost all organs and tissues and causes positive changes in the body. A prolonged decrease in motor activity leads to persistent disorders that gradually become irreversible and cause various diseases, including hypertension, atherosclerosis, coronary heart disease, leg joint diseases, posture disorders with damage to the musculoskeletal system, metabolic processes, increased adipose tissue, etc. [5-7].

The problem of adequate physical activity is particularly acute for cadets of higher educational institutions

(HEIs) of the Ministry of Internal Affairs (MIA) of Ukraine and employees of specific practical police units, including investigative units. Thus, according to research by scientists [8], cadets spend 80 % of their time sitting, and as a result, some organs and systems lose their ability to function correctly. Scientists [9] distinguish between domestic (addiction to a sedentary lifestyle, reduced motor initiative, domestic comfort, dismissive attitude to physical fitness) and educational causes of hypokinesia (irrational organization of the educational process, overload of training sessions, ignoring physical education, lack of free time). In addition, prolonged stay in shelters during the announcement of the "Air Alert" signal leads to a critical decrease in physical activity [10].

In scientific works [11-13], negative factors in investigators' service activities that adversely affect their health are identified, namely: significant neuropsychological tension (39 %); irregular working hours (35 %); increased emotional stress (35 %); sedentary work in a forced position (25 %); and permanent contact with the criminal contingent (18 %).

Thus, the need to study and analyze the levels of physical activity of cadets and employees of police investigative units to develop and implement scientifically based forms of physical activity in the educational process and the police training system that would increase their level of physical fitness and health and promote awareness of the importance of its preservation actualizes the chosen area of scientific research.

AIM

The aim is to conduct a comparative analysis of the motor activity regimen and daily energy expenditure of cadets and employees in police investigative units.

MATERIALS AND METHODS

The research involved cadets of the National Academy of Internal Affairs (NAIA) of the 1st-4th training years who entered the Academy in 2021-2024 and specialize in Law (n = 86) being trained as specialists for pre-trial investigation bodies (future police investigators) and employees of police investigative units (n = 64) who took advanced training courses at the NAIA.

To achieve the research aim, a set of modern general scientific methods was used, namely theoretical, empirical, and mathematical statistics methods. Theoretical methods were used to systematize and summarize information on the research topic and compare existing theoretical approaches and strategies for determining physical activity and energy expenditure levels. 21 sources from MedLine, Scopus, Web of Science, and Index Copernicus were analyzed.

To establish the index of motor activity and daily energy expenditure of cadets and employees in police investigative units, the Framingham method was used based on the registration of activities during the day [14]. This method determined the duration of a specific type of activity and rest, the combination of physical activity of different intensity, the total duration of various types of activity, and the amount of energy expenditure. The numerical value is in the motor activity index (MAI) and daily energy expenditure (DEE) volume. According to this method, a person's motor activity is divided into five levels: basic; sedentary; small; average; high. Certain types of physical activity determine each level and, accordingly, have an energy value depending on the kcal expended, which makes it possible to calculate the daily energy expenditure of each person. To determine the amount of time spent on each type of motor activity, the daily timekeeping of activities lasting more than 5 minutes was performed. Various kinds of physical activity were recorded in a special form.

Methods of mathematical statistics were used to process the data correctly. The compliance of the sample data distribution with the Gauss' law was assessed using the Shapiro-Wilk W test. The reliability of the difference between the indicators was determined using the Student's t-test. The reliability of the difference was set at $p<0.05$. All statistical analyses were performed using SPSS software, version 10.0, adapted for medical and biological research.

The procedure for organizing the study and the topic of the article were previously agreed with the Committee on compliance with Academic Integrity and Ethics of the NAIA. Also this study followed the regulations of the World Medical Association Declaration of Helsinki. Informed consent was received from all participants who took part in this study.

RESULTS

The analysis of the obtained results gave grounds to state a significant difference ($p < 0.001$) in the MAI and daily energy expenditure of cadets and employees in police investigative units. In particular, cadets spent an average of 2658.8 ± 39.6 kcal per day during their educational activities. At the same time, the MAI was 34.43 ± 0.32 points. In the conditions of service activities, the daily energy expenditure of police investigators was recorded in the range of 2412.4 ± 35.1 kcal, and the MAI was 31.18 ± 0.29 points.

A thorough analysis of the levels of motor activity showed that in the process of the cadets' educational activities during the day, the basic level (sleep,

Table 1. Indicators of motor activity regimen and daily energy expenditure of cadets (n=86) and employees in police investigative units (n=64)

Motor activity levels	Amount of time spent on motor activity, min	MAI, points	DEE, kcal
Indicators of daily motor activity of cadets (n=86)			
Basic	613.1±9.7	10.22±0.16	766.4±12.1
Sedentary	238.1±3.3	4.37±0.06	333.4±4.6
Small	405.3±5.9	10.13±0.15	830.8±12.1
Average	128.7±7.0	5.15±0.28	386.0±21.1
High	54.8±4.5	4.56±0.38	342.2±28.4
Amount	1440	34.43±0.32	2658.8±39.6
Indicators of daily motor activity of employees in police investigative units (n=64)			
Basic	508.6±6.5	8.48±0.11	635.7±8.1
Sedentary	486.9±9.1	8.93±0.17	681.6±12.7
Small	351.1±8.1	8.78±0.20	719.7±16.5
Average	64.2±2.8	2.57±0.11	192.7±8.5
High	29.2±4.1	2.43±0.34	182.6±25.6
Amount	1440	31.18±0.29	2412.4±35.1
t/p $MAI_{cadets\text{-}employees}$		t=7.52 / p<0.001	
t/p $DEE_{cadets\text{-}employees}$		t=4.66 / p<0.001	

Note: MAI – motor activity index, DEE – daily energy expenditure, t – value of Student's t-test; p – level of statistical significance of differences
Source: compiled by the authors of this study

lying down) accounted for 613.1 ± 9.7 minutes, the MAI at this level was 10.22 ± 0.16 points, the DEE – 766.4 ± 12.1 kcal. Based on the processing of physical activity forms, it was found that future law enforcement officers spent an average of 472 minutes sleeping, and the rest of the time resting lying down (using gadgets, watching videos, TV programs, etc.). The volume of the basic level of motor activity was recorded in the investigative police units by 104.5 minutes less than in the cadets – 508.6 ± 6.5 minutes, the MAI reached 8.48 ± 0.11 points, the DEE amounted to 635.7 ± 8.1 kcal (Table 1). The results obtained are explained by the specifics of the service activities of the employees of the practical unit and the determined daily routine of cadets, according to which at least 8 hours should be allocated for sleep.

In case of future investigators, their sedentary level of motor activity, which involves traveling in transport, reading, working at the computer, and eating, is 238.1 ± 3.3 minutes. The MAI at this level is 4.37 ± 0.06 points, the DEE – 333.4 ± 4.6 kcal. Among the types of sedentary motor activity, the most significant proportion was reading and preparation for training sessions – 105 minutes; traveling in transport – 54 minutes; eating – 46 minutes; working at the computer – 33 minutes. Police employees of the investigative units spent much more time on this level of motor activity – 486.9 ± 9.1 minutes. At the same time, the MAI was 8.93 ± 0.17 points, the DEE – 681.6 ± 12.7 kcal per day. The distribution of time by types of motor activity in conditions of service activities differs. In particular, longer work at the computer was noted (on average 306 min); the time of movement in transport was 140 min; other (sitting/standing, etc.) – within 40 min.

On average 405.3 ± 5.9 minutes were spent on physical activity of low level in cadets during a day. Accordingly, the MAI was 10.13 ± 0.15 points, the DEE – 830.8 ± 12.1 kcal. Such results are conditioned by the specifics of educational activities, as this level includes educational training sessions (except for physical training), walking (to educational training sessions, public transport stop, etc.), and personal hygiene. Among the main types of motor activity at this level, the most significant percentage is accounted for by educational training sessions – 336 minutes; walking – 25 minutes; hygiene procedures – 24 minutes; 20 minutes – other types of physical activity that are low in energy expenditure (moving around the dormitory, lining up, some types of household work, etc.). The amount of motor activity that belongs to the low level was 351.1 ± 8.1 min in the employees of police investigative units. The MAI and the DEE, respectively, were 8.78 ± 0.20 points and 719.7 ± 16.5 kcal. Among other things, the most extended period is spent at the workplace and performing service tasks that require more energy than at a sedentary level – 197 minutes; walking (delivery of official documents to various institutions and organizations, etc.) – 86 minutes, driving – 35 minutes; hygiene procedures – 33 minutes.

During the cadets' educational activities, much less time was recorded for average-level motor activity (morning gymnastics, housework, walking, low- and medium-intensity mass sport participation events, etc.) – 128.7 ± 7.03 minutes. Among the list of activities that belong to this level, the most significant proportion is household chores, household work (38 min); low- and medium-intensity mass sport participation events (30 min), morning physical exercises (28 min), walks (22 min), other (11 min). The MAI was 5.15 ± 0.28 points, respectively, and the DEE was 386.0 ± 21.1 kcal. The average level of motor activity of police employees in investigative units was much less time – 64.2 ± 2.8 min. The MAI and the DEE amounted to 2.57 ± 0.11 points and 192.7 ± 8.5 kcal, respectively. Among the activities, homework took the most time.

A high level of motor activity includes specially organized physical exercises and active recreation (intensive games, running, cycling, etc.). During educational activities, the cadets i. e. future investigators had only 54.8 ± 4.5 minutes of high level of motor activity. The MAI at this level was 4.56 ± 0.38 points, the DEE – 342.2 ± 28.4 kcal. Mainly, a high level of motor activity is represented by training sessions on special physical training, independent physical exercises (attending sports sections and the gym), participation in mass sport and recreational activities. Police employees of the investigative units had a high level of motor activity on average of 29.2 ± 4.1 minutes. The MAI – 2.43 ± 0.34 points, the DEE – 182.6 ± 25.6 kcal. These results are due to a lack of time and desire to exercise. The survey shows that only 18 % of employees allocate time for their independent physical training and try to take care of their health.

DISCUSSION

Scientists [15] argue that the human body's motor activity needs are always individual, depend on several physiological, socioeconomic, and cultural factors, and are primarily determined by hereditary and genetic characteristics. Scientists have proven that prolonged sitting at a desk causes a wide range of bodily complications, from minor adaptation and physiological to pathological, and rational systematic physical activity positively impacts health [16].

According to scientists [17], the specifics of police investigators' service activities lead to several somatic disorders, including: fatigue (50 %); low back pain (15 %); headache (15 %); weakness (15 %); decreased attention (15 %); irritability (15 %). As a result, such activities lead to diseases of the cardiovascular system (5 %), respiratory system (15 %), gastrointestinal tract (30 %), vegetative-vascular dystonia (5 %), diabetes mellitus (5 %), sciatica (10 %), nervous system diseases (15 %), diseases of the ear, throat, nose (5 %), and other diseases (5 %).

Rational systematic physical activity experienced by higher education students during educational and independent physical training sessions positively impacts their health [18]. According to scientists, motor activity is a physiological human need, and the optimal amount of motor activity for young people should be 12-14 hours a week, with sufficient physiological load. Given these postulates, experts around the world [19] are concerned about the discrepancy between the actual amount of motor activity and the biological norms necessary for the full development of a person, especially during the period of incomplete sexual development. Rationally organized motor activity is the key to preventing diseases and gaining strong immunity. At the same time, its insufficiency disrupts the normal functioning of body systems, reduces resistance, worsens adaptation to physical loads, overweight, increases blood cholesterol levels, etc. [20]. The analysis of recent studies shows that increased motor activity is an effective means of not only growing working capacity, but also improving the quality of life, preventing neuropsychiatric conditions, and strengthening physical and mental health. However, a sedentary lifestyle carries at least twice the risk of serious illness and premature death [4, 6, 10].

The obtained results confirm the findings of many scientists [6, 9, 15, 18, 21] and extend them, in particular in the direction of a rational combination of mental and physical labor during the educational activities of cadets and the service activities of employees who are sedentary for an extended period and have low energy expenditure; the need to increase the level of motivation for physical exercise and a conscious attitude to maintaining their physical health at the proper level.

CONCLUSIONS

A comparative analysis of the motor regimen, the MAI and the daily energy expenditure of cadets of higher educational institutions of the Ministry of Internal Affairs of Ukraine and employees of police investigative units was carried out. A significant difference in cadets' MAI and daily energy expenditure during their educational activities and police investigators during their service activities ($p < 0.001$) was found. It was found that during the day, the cadets consumed 2658.8 ± 39.6 kcal in the process of their educational activities with their MAI at 34.43 ± 0.32 points. The employees in police investigative units showed 2412.4 ± 35.1 kcal of daily energy expenditure with their motor activity index at 31.18 ± 0.29 points. The results obtained are due to the specifics of the educational activities

of cadets and the peculiarities of the service activities of police investigators, which are determined by an extended stay in a forced position and a low level of physical activity. The results of the conducted research should be taken into account when organizing the physical training of police investigators in the course of their service activities.

PROSPECTS FOR FURTHER RESEARCH

Prospects for further research include developing and introducing scientifically based forms of physical activity into the police service training system, which would increase their physical fitness and health and promote awareness of the importance of its preservation.

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CONFLICT OF INTEREST
The Authors declare no conflict of interest

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