



**HEALTH MOTIVATION AND ITS RELATION
TO FUNCTIONAL STATE OF THE CARDIORESPIRATORY SYSTEM,
STATISTICAL BALANCING AND MUSCLE STRENGTH
IN SICK AND HEALTHY PEOPLE**

**Savchenko Valentyn^(ACDF), Tymchyk Olesia^(BDE),
Nevedomsjka Jevgenija^(BDE), Omeri Iryna^(BDE), Buriak Olga^(BDE), Kharchenko
Halyna^(BDE), Yatsenko Svitlana^(BDE)**

Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

Author's contribution:

A – Study design; B – Data collection;
C – Statistical analysis; D – Manuscript preparation;
E – Manuscript editing; F – Final approval of manuscript

Abstract

Introduction. Motivation in modern psychology means a system of factors that determine human behavior. There are some controversial views concerning the role of motivation to live a healthy life and maintain good health. Most researchers insist on the importance of motivation in shaping human health. However, the specific data on relation of motivation to different components of human health are precious few.

The *aim of the study* was to investigate connection of motivation with the functional state of the cardio-respiratory system, statistical balancing and muscle strength.

Material and methods. 577 healthy and sick people. The participants of study were examined to determine their resting heart rate, arterial blood pressure, systolic and diastolic pressure, lung capacity, duration of breath holding after deep inhale and exhale, duration of statistical balancing and muscle strength of hands. A health motivation was researched in accordance a short survey to determine Recovery Locus of Control.

Results. Among examined people the average level of motivation prevailed – 55.11% (318/577); according to number of detected cases the high level was 38.65% (223/577) and the low one 6.24% (36/577). The high level of health motivation - 53.13% (119/224) prevailed in healthy people, and sick people most often had the average level of motivation – 62.04% (219/353). In addition, the low level of motivation was inherent to sick people compared with healthy persons.

Conclusions. People with a higher level of motivation for health have a lower level of systolic blood pressure, larger lung capacity, longer duration of statistical balancing and above-average strength of hands compared with persons having a lower level of motivation.

Key words: motivation, health, cardio-respiratory system, statistical balancing, muscle strength.



МОТИВАЦІЯ ДО ЗДОРОВ'Я ТА ЇЇ ЗВ'ЯЗОК З ФУНКЦІОНАЛЬНИМ СТАНОМ КАРДІО-РЕСПІРАТОРНОЇ СИСТЕМИ, СТАТИСТИЧНИМ БАЛАНСУВАННЯМ ТА М'ЯЗОВОЮ СИЛОЮ ХВОРИХ І ЗДОРОВИХ ЛЮДЕЙ

Савченко Валентин^(ACDF), Тимчик Олеся^(BDE),
Неведомська Євгенія^(BDE), Омері Ірина^(BDE), Буряк Ольга^(BDE),
Харченко Галина^(BDE), Яценко Світлана^(BDE)

Київський столичний університет імені Бориса Грінченка, м. Київ, Україна

Внесок автора:

A – концепція та дизайн дослідження; B – збір даних;
C – аналіз і інтерпретація даних; D – написання статті;
E – редагування статті; F – остаточне затвердження статті

Анотація

Актуальність. Мотивація у сучасній психології позначає систему чинників, що детермінують поведінку людини. Існують суперечливі думки про роль мотивації у дотримванні здорового образу життя та збереженні здоров'я. Більшість дослідників наполягають на важливому значенні мотивації у формуванні стану здоров'я людини. Однак, конкретних даних про зв'язок мотивації з різниці компонентами здоров'я людини дуже мало.

Метою роботи було дослідити зв'язок мотивації з функціональним станом кардіореспіраторної системи, статистичним балансуванням та м'язовою силою.

Матеріал і методик: 577 здорових та хворих людей. В учасників дослідження визначали частоту серцевих скорочень у стані спокою, артеріальний тиск, систолічний та діастолічний тиск, життєву ємність легень, тривалість затримки дихання після глибокого вдиху та видиху, тривалість статистичної рівноваги та м'язову силу кистей рук. Мотивацію до здоров'я досліджували за допомогою короткого опитування для визначення локусу контролю одужання.

Результати. Серед обстежених переважав середній рівень мотивації – 55,11% (318/577); за кількістю виявлених випадків високий рівень становив 38,65% (223/577), а низький – 6,24% (36/577). У здорових людей переважав високий рівень мотивації до здоров'я - 53,13% (119/224), а хворі найчастіше мали середній рівень мотивації - 62,04% (219/353). Крім того, низький рівень мотивації був притаманний хворим людям порівняно зі здоровими.

Висновки. Особи з вищим рівнем мотивації до здоров'я мають найнижчий рівень систолічного артеріального тиску, більшу життєву ємність легень, більшу тривалість статистичної рівноваги та вищу за середню силу кистей порівняно з особами з нижчим рівнем мотивації.

Ключові слова: мотивація, здоров'я, кардіореспіраторна система, статистичне балансування, м'язова сила.



Introduction

Health has been the highest value of man at all times. Health is a resource of full human life. But not everyone saves this resource, worries about it. There are various health preserving actions associated with the health maintenance, the implementation of which requires appropriate efforts related to motivation.

Motivation (from the Latin 'movere') is a multifaceted phenomenon that describes the factors that determine the purposeful activity / activity of a person. Motivation involves certain human efforts and actions aimed at satisfying one's needs, achieving goals and objectives [1, 2, 3].

Abraham Maslow defined motivation as a function of satisfying the needs in hierarchical order, namely physiological, safety, belongingness, esteem and self-actualization needs [4].

In recent years, increasing importance has been given to the study of motivation for activities aimed at preserving health [5].

If we set ourselves a goal to preserve and recover our own health, then motivation is, first of all, an individual / personal phenomenon.

In domestic and foreign scientific and popular literature, health motivation is presented as motivation of people of different ages to live a healthy lifestyle. It can be considered that the motivation to live a healthy lifestyle is a set of external and internal incentives that contribute a person's desire to perform activities aimed at preserving health.

In Ukraine a significant number of scientific articles are devoted to motivation of young people to maintain a healthy lifestyle. Most of these publications point to a low valeological

literacy of young people, insufficient information available to them and poor awareness of the role of proper nutrition, daily routine, physical culture in the human health improvement, adverse effects of bad habits on body, as well as youth unwillingness to self-healing and poor motivation for better health [6, 7].

To the full extent the above also applies to the motivation for physical activity, which can be defined as a special state of the individual, aimed at achieving the optimal level of physical fitness and working capacity.

In Ukraine, scientific studies have been conducted that confirm the significant role of internal motivation in the implementation of constant motor activity as the main component of a healthy lifestyle of young people [8, 9, 10].

In the world, attention is also paid to the motivation of young people to perform sufficient motor activity. Trigueros et al. [11] provided data on the essential role of the emotional component of motivation of adolescents aged 14 to 19 years for regular physical activity and the formation of healthy habits, and Nascimento Júnior et al. [12] pointed to a predominant role of the internal component of motivation over the external component for the development of a healthy lifestyle.

Not only in young people, but also in elderly people, motivation affects their physical activity. Thus, in people aged 60-75, internal motivation for health was included in a mathematical model that described the main factors determining physical activity at this age [13].

Health motivation in sick people is less studied. In the part of the scientific literature it is stated that the patients have the low motivation to treat and fight a disease, to assume a personal responsibility for their own health, which



significantly affects the results of treatment [14].

Carter et al. express the opinion that motivation is not a significant factor that determines behavior in the field of health care [15].

Williams & Rhodes [16] state that people are more likely to do what they are motivated to do. Regarding health, it looks like this: until there is no serious illness, a person usually does not take care of his health [16].

However, there are the data about the relationship between motivation and the current state of human health. Some researchers point to the important role of motivation in the formation of human health, even more important than some risk factors for the development of diseases [17].

The motivation is believed to form a person's ability to adapt to the adversities of chronic diseases [18]. Ciarrochi et al. reported the dependence of well-being with the level of intrinsic motivation in cancer patients [19].

Davidson et al. indicated that motivation can influence the behavior of cancer patients in choosing additional treatment methods [20].

Rapolienė et al. found a relationship in stroke survivors between intrinsic motivation at the beginning of rehabilitation and increased self-efficacy after rehabilitation, indicating an understanding of one's recovery behavior [21].

Stenlund et al. conducted a long-term study and found that the availability of motivation to change health behaviors led to greater subjective well-being 10 years later compared to those who were not motivated to maintain health [22].

Therefore, there is currently a conflicting understanding of the

importance of motivation to keep a healthy lifestyle and to maintain health.

The hypothesis of the study was that a person's functional abilities are significantly related to the level of motivation for better health.

Connection with scientific plans, programs, and themes. The research was conducted in accordance with individual plans for scientific research of the academic staff of the Department of Physical Therapy and Occupational Therapy of the Faculty of Health, Physical Education, and Sport at Borys Grinchenko Kyiv Metropolitan University.

Aim of the study

The purpose of the study was to determine the level of motivation for better health in sick and healthy people and to establish its relation to the functional state of the cardio-respiratory system, statistical balancing and muscle strength.

Material and methods

Participants of study. The study was conducted among patients having chronic diseases and consequences of injuries that required medical rehabilitation in a hospital, and among students of the Humanities University, who according to medical conclusions were healthy people.

Criteria for inclusion in the study were: age of human subjects from 17 to 79 years inclusive; patients with any chronic illness or trauma with health consequences; young people, students of the Humanities University, without chronic diseases or injuries with health consequences.

577 persons were selected and examined. There were 317 men (54.94%) and 260 women (45.06%). The average age of human subjects was (M ± S) 34.95 ±



17.71 (95% confidence interval: 33.50-36.40) years. There were 353 patients (61.18%), 224 students (38.82%).

All participants of the study gave their informed consent for participation in the study.

The study was in full compliance with the principles of Declaration of Helsinki adopted by the World Medical Association "Ethical Principles for Medical Research involving Human Subjects".

Organization (design) and methods of research. The study was carried out in 2019-2020. The examination of selected persons was carried out with their consent through survey and measurement of anthropometric and functional parameters. The survey was conducted in the form of answers to special questionnaires, once, in the presence of a researcher.

Height and body weight were measured by anthropometric methods. Assessment of circulatory and respiratory function of human subjects was performed by the following parameters: resting heart rate, blood pressure – systolic and diastolic, lung capacity that was measured by a portable dry spirometer, duration of breath holding after deep exhale.

The muscular strength of the hands was also measured with a wrist dynamometer, as well as duration of static balancing. Quantitative values of these indicators were divided into intervals.

A health motivation was researched in accordance a short survey to determine Recovery Locus of Control, which is based on opinion of respondent about his own role in recovery [23, pp. 98-99].

The preamble to the questionnaire points to the need to choose appropriate answer to each question that would correspond to the point of view on one's

own health. There were 9 such questions. The answers were evaluated in points by a special method. Then a sum of points was defined. The sum of points could range from 0 to 36.

High points are indicative of a high level of motivation to improve one's health and vice versa.

We conducted a scaling of numerical values of the test result in 4 gradations with conclusions concerning the level of motivation: 0-9 points – very low level of motivation, 10-18 points – low level of motivation, 19-27 points – average level of motivation, 28 points and more – higher level of motivation.

Statistical analysis. A sample statistical characteristic was determined by finding the arithmetic mean (M) and its standard deviation (S). Absolute and relative frequencies of the investigated indicators were also calculated in the samples.

Binary quality indicators of samples were compared by testing the null hypothesis about the equality of particles, expressed as a percentage, ordinal values - by calculating the criterion of conformity of Pearson's chi-square (χ^2) with Yates correction.

The connection between the studied indicators was established by constructing conjugation tables (cross tabulation). The criterion for the reliability of statistical estimates was the level of significance with indication of the probability of incorrect rejection of the null hypothesis (p), the value 0.05 was accepted as a threshold level.

The data of the study were processed using the software product SPSS Statistics Base (Firm IBM, USA).

Results

Distribution of levels of motivation for better health among the examined participants of study is shown in figure 1. It was established that the majority of human subjects, which is 55.11% (318/577), had the average level of

motivation.

The high level of motivation was 38.65% (223/577) in accordance with the number of detected cases. Very low level of motivation was not registered among human subjects, and only 6.24% (36/577) had low level of motivation.

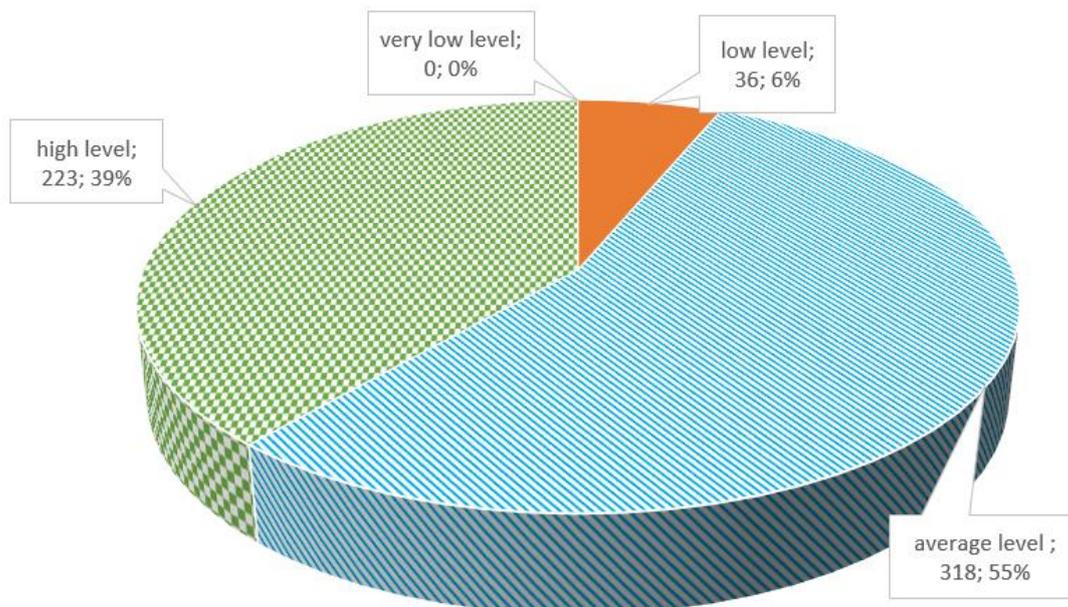


Figure 1 – Distribution of levels of motivation for better health among human subjects (number, %)

The analysis of connection of health motivation with heart rate in human subjects is shown in table 1. Concerning

the distribution of values, the connection between these indicators was not established.

Table 1

Distribution of levels of motivation for better health depending on the level of resting heart rate in human subjects ($\chi^2 = 5.91, p=0.4331$)

Level of motivation	Resting heart rate for 1 minute							
	< 60 (n=31)		60-69 (n=184)		70-79 (n=189)		> 79 (n=72)	
	n	%	n	%	n	%	n	%
Low	1	3.23	15	8.15	13	6.88	3	4.17
Average	21	67.74	96	52.17	115	60.85	40	55.56
High	9	29.03	73	39.67	61	32.28	29	40.28

The study of relationship between the health motivation of human subjects and the level of their systolic blood pressure showed that a low level of motivation was least common in

individuals with the lowest level of systolic blood pressure – 2.27% (1/44), and most often – with the highest level of systolic blood pressure – 15.38 % (10/165) ($p < 0.05$).

The lowest number of average levels of motivation was also found in persons with the lowest level of systolic blood pressure – 36.36% (16/44), the highest number – in persons with the highest level of systolic blood pressure – 70.77% (46/65) ($p < 0.01$).

The highest level of motivation was least registered at the highest level of systolic blood pressure – 13.85% (9/65), and most often – at the lowest level of systolic blood pressure – 61.36% (27/44) ($p < 0.001$) (table 2).

Table 2

Distribution of levels of motivation for better health depending on the level of systolic blood pressure in human subjects ($\chi^2 = 39.92$, $p = 0.00001$)

Level of motivation	Systolic blood pressure, mm Hg									
	< 110 (n=44)		110-119 (n=85)		120-129 (n=200)		130-139 (n=83)		>139 (n=65)	
	n	%	n	%	n	%	n	%	n	%
Low	1	2.27	1	1.18	11	5.50	9	10.84	10	15.38
Average	16	36.36	46	54.12	121	60.50	44	53.01	46	70.77
High	27	61.36	38	44.71	68	34.00	30	36.14	9	13.85

It was further found that human subjects with a pulmonary capacity less than 3000 ml have the largest number of low levels of motivation – 16.13% (5/31), which was significantly higher compared to persons whose pulmonary capacity made up 4000-4900 ml – 3.9% (6/154) ($p < 0.01$).

It is indicative that the largest number of high levels of motivation was found in those persons who have large pulmonary capacity – 45.83% (33/72), and the lowest – in those with the lowest pulmonary capacity – 22.58% (7/31) ($p < 0.05$) (table 3).

Table 3

Distribution of levels of motivation for health depending on the pulmonary capacity in human subjects ($\chi^2 = 12.02$, $p = 0.1499$)

Level of motivation	Indicator of pulmonary capacity									
	< 3000 ml (n=31)		3000-3900 ml (n=144)		4000-4900 ml (n=154)		5000-5900 ml (n=72)		> 5900 ml (n=24)	
	n	%	n	%	n	%	n	%	n	%
Low	5	16.13	13	9.03	6	3.90	4	5.56	2	8.33
Average	19	61.29	80	55.56	92	59.74	35	48.61	15	62.50
High	7	22.58	51	35.42	56	36.36	33	45.83	7	29.17

No data on relation of the state of motivation for health of human subjects to the duration of breath holding after both inhale and exhale (tables 4, 5) have been obtained.

Here we can emphasize only the tendency to a high level of motivation in

persons with the longest duration of breath holding on the inhale (more than 90 seconds) – 46.67% (21/45) compared with the persons having the shortest duration of breath holding on the inhale (less than 30 seconds) – 28.95% (11/38) ($t = 1.6525$, $p > 0.10$).

Table 4

Distribution of levels of motivation for better health depending on the breath holding after inhale in human subjects ($\chi^2 = 5.68$, $p=0.6823$)

Level of motivation	Duration of breath holding after inhale									
	< 30 seconds (n=38)		30-44 seconds (n=112)		45-59 seconds (n=151)		60-89 seconds (n=108)		> 90 seconds (n=45)	
	n	%	n	%	n	%	n	%	n	%
Low	3	7.89	7	6.25	8	5.30	10	9.26	1	2.22
Average	24	63.16	64	57.14	89	58.94	61	56.48	23	51.11
High	11	28.95	41	36.61	54	35.76	37	34.26	21	46.67

Table 5

Distribution of levels of motivation for better health depending on the breath holding after exhale in human subjects ($\chi^2 = 9.52$, $p=0.2996$)

Level of motivation	Duration of breath holding after exhale									
	< 20 seconds (n=89)		20-29 seconds (n=166)		30-39 seconds (n=103)		40-49 seconds (n=57)		> 49 (n=39)	
	n	%	n	%	n	%	n	%	n	%
Low	11	12.36	7	4.22	6	5.83	3	5.26	2	5.13
Average	47	52.81	102	61.45	58	56.31	29	50.88	25	64.10
High	31	34.83	57	34.34	39	37.86	25	43.86	12	30.77

The relation of the motivation for better health of human subjects to their statistical balancing has been established. Thus, the largest number of high levels of motivation has been registered in persons with a duration of statistical balancing 45-59 sec – 51.85% (14/27) and with a duration of statistical balancing more than

89 sec – 46.51% (20/43), which was statistically significantly different from the persons having the duration of statistical balancing less than 15 seconds, in whom this level of motivation was 29.66% (35/118) ($p < 0.05$ for both cases of comparison) (table 6).

Table 6

Distribution of levels of motivation for better health depending on the statistical balancing in human subjects ($\chi^2 = 18.53$, $p=0.0465$)

Level of motivation	Duration of statistical balancing											
	< 15 seconds (n=118)		15-29 seconds (n=121)		30-44 seconds (n=56)		45-59 seconds (n=27)		60-89 seconds (n=31)		> 89 seconds (n=43)	
	n	%	n	%	n	%	n	%	n	%	n	%
Low	12	10.17	2	1.65	2	3.57	1	3.70	4	12.90	3	6.98
Average	71	60.17	75	61.98	30	53.57	12	44.44	14	45.16	20	46.51
High	35	29.66	44	36.36	24	42.86	14	51.85	13	41.94	20	46.51

Finally, it was found that the motivation of human subjects for better

health is related to their muscular strength in the hands (table 7).



This was confirmed by the fact that the average level of motivation was more common in people with low strength in the hands – 77.78% (35/45), which was significantly higher than the below average strength – 53.27% (57/107) ($p < 0.01$), average strength – 50.43% (58/115) ($p < 0.01$) and above average strength of the hand – 52.08% (50/96) ($p < 0.01$).

The lowest number of high level of motivation was intrinsic to persons with small muscle strength in the hands – 22.22% (10/45), and large number of this level of motivation was typical for persons with average strength – 39.13% (45/115) ($p < 0.05$) and above average strength in the hands – 42.71% (41/96) ($p < 0.05$).

Table 7

Distribution of levels of motivation for better health depending on a muscle strength in the hands in human subjects ($\chi^2 = 16.89$, $p = 0.0311$)

Level of motivation	Low strength (n=45)		Below average strength (n=107)		Average strength (n=115)		Above average strength (n=96)		Great strength (n=42)	
	n	%	n	%	n	%	n	%	n	%
Low	0	0	10	9.35	12	10.43	5	5.21	1	2.38
Average	35	77.78	57	53.27	58	50.43	50	52.08	27	64.29
High	10	22.22	40	37.38	45	39.13	41	42.71	14	33.33

Discussion

Summarizing the obtained results and using only statistically significant data, it can be stated that the average level of motivation for better health has prevailed among the examined patients and healthy people – 55.11% (318/577), and by number of detected cases the high level of motivation was 38.65% (223/577).

There was no relation of level of motivation for better health to heart rate, duration of breath holding in human subjects after both inhale and exhale.

During researching the relation of motivation for better health in human subjects to functional indicators of cardio-respiratory system, the following regularities have been established:

- ✚ a large number of high level of motivation was found at the lowest level of a systolic blood pressure, and average and low levels of motivation – at the highest level of a systolic blood pressure;
- ✚ high level of motivation was

registered more often in people with the large pulmonary capacity, and low level of motivation – more often in people with the lowest pulmonary capacity.

It was also found that the largest number of high level of motivation is inherent to persons having the longest duration of statistical balancing, average strength and above average strength in the hands. Average level of motivation for better health is predominantly inherent to persons having weak strength in the hands.

Thus, it can be affirmed that people with high level of motivation have lower level of systolic blood pressure, larger lung capacity, longer duration of statistical balancing and above average strength in the hands compared to people with low level of motivation.

Further research of distributions of levels of motivation for better health in sick and healthy people has shown a predominance of high level of motivation in healthy people – 53.13% (119/224) and

average level of motivation in sick people – 62.04% (219/353).

Besides that sick people had large

number of low level of motivation – 9.06% (32/353) compared with healthy people – 1.79% (4/224) (table 8).

Table 8

Distribution of levels of motivation for better health in sick and healthy people

Levels of motivation	Sick people (n=353)		Healthy people (n=224)		Level of statistical significance
	n	%	n	%	
Low	32	9.06	4	1.79	p < 0.001
Average	219	62.04	101	45.09	p < 0.001
High	102	28.90	119	53.13	p < 0.001

When discussing the obtained results about the specific connection of motivation to health with functional capabilities or the state of physical health of a person, there are very few such data for comparison in the scientific literature found.

In our previous work, the relationship between health motivation and the functional state of the cardio-respiratory system was established, which was manifested in the predominance of a high level of motivation under the condition of satisfactory adaptation potential of the cardiovascular system and full compliance of the respiratory function with respect to body weight [24].

It is also possible to cite a work that indicates the relationship between the glycosylated hemoglobin index and the patient's knowledge of diabetes: the higher the level of knowledge, the better the carbohydrate metabolism compensation index [14].

The inverse relationship of more positive views of non-anticipated vulnerability and challenges/ motivation/ hope with blood pressure in diabetic persons was reported by Lynch et al. [25].

Thus, the results of our study suggest that there is a substantial connection

between health motivation and functional state of cardio-respiratory system, state of vestibular apparatus in terms of the duration of statistical balancing and strength of bone muscles.

We join the community of scientists who consider motivation to be an important psychological and social factor that directly affects human health [5,17,18]. It is also worth noting the need to form a positive motivation and strong-willed regulation to maintain our own health.

Conclusions

1. The average level of motivation for better health prevails among examined sick and healthy people – 55.11% (318/577), by number of detected cases the high level is 38.65% (223/577) and the low one – 6.24% (36/577), a very low level of motivation has not been registered.

2. A high level of health motivation prevailed in healthy young people – 53.13% (119/224), and the average level of motivation is most often registered in sick people – 62.04% (219/353). In addition, sick people have larger number of low level of motivation – 9.06% (32/353) compared with healthy persons – 1.79% (4/224).



3. The connection of level of motivation for better health with level of systolic blood pressure, pulmonary capacity, duration of statistical balancing and muscle strength of hands has been established. It has been shown that people with a high level of motivation have a lower level of systolic blood pressure, larger lung capacity, longer duration of statistical balancing and above average

strength of hands compared with persons having a lower level of motivation.

Prospects for further research

In the future, it is promising to explore the connection between health motivation and indicators characterizing the physical, mental, and social well-being of an individual.

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**Author's information:****Savchenko Valentyn,***Doctor of Medicine, Professor*

Head of the Department of Physical Therapy and Occupational Therapy, Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

ORCID: 0000-0002-8483-9748

E-mail: v.savchenko@kubg.edu.ua

Omeri Iryna,*Doctor of Philosophy, Associate Professor*

Associate Professor of the Department of Physical Therapy and Occupational Therapy,

Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

ORCID: 0000-0001-6773-4146

E-mail: i.omeri@kubg.edu.ua

Tymchyk Olesia,*Doctor of Philosophy, Associate Professor*

Associate Professor of the Department of Physical Therapy and Occupational Therapy,

Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

ORCID: 0000-0003-1878-7465

E-mail: o.tymchyk@kubg.edu.ua

Buriak Olga,

Senior Lecturer of the Department of Physical Therapy and Occupational Therapy,

Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

ORCID: 0000-0001-7074-5743

E-mail: o.buriak@kubg.edu.ua

Nevedomsjka Jevgenija,*Doctor of Philosophy, Associate Professor*

Associate Professor of the Department of Physical Therapy and Occupational Therapy,

Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

ORCID: 0000-0002-7450-3562

E-mail: y.nevedomska@kubg.edu.ua

Kharchenko Halyna,*Doctor of Philosophy*

Associate Professor of the Department of Physical Therapy and Occupational Therapy,

Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

ORCID: 0000-0002-9281-7338

E-mail: h.kharchenko@kubg.edu.ua

Yatsenko Svitlana,

Senior Lecturer of the Department of Physical Therapy and Occupational Therapy,

Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine

ORCID: 0000-0001-8609-0120

E-mail: s.yatsenko@kubg.edu.ua

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