THE RELATIONSHIP BETWEEN HUMAN SPIRITUALITY AND THE FUNCTIONAL STATE OF THE CARDIO-RESPIRATORY SYSTEM

ЗВ'ЯЗОК ДУХОВНОСТІ ЛЮДИНИ З ФУНКЦІОНАЛЬНИМ СТАНОМ КАРДІО-РЕСПІРАТОРНОЇ СИСТЕМИ

Savchenko V. M. [1], Kharchenko H. D. [2], Tymchyk O. V. [3]
[1, 2, 3]*Borys Grinchenko Kyiv Metropolitan University, Kyiv, Ukraine*
[1]*ORCID: 0000-0002-8483-9748*
[2]*ORCID: 0000-0002-9281-7338*
[3]*ORCID: 0000-0003-1878-7465*

DOI https://doi.org/10.32782/2522-1795.2024.18.2.10

Abstracts

Aim is to determine the level of spirituality of a person in terms of personal maturity and to investigate its connection with the functional state of the cardio-respiratory system.

Material and methods. A total of 560 research participants were examined, 301 (53.75%) of whom were men, and 259 (46.25%) of whom were women. The average age of the examined people was (M±S) 35.00±17.75 (95% confidence interval is 33.52 to 36.47 years of age). There were 337 (60.18%) of patients who were treated in the rehabilitation departments of medical institutions, and 223 (39.82%) of healthy persons (students of the Humanities University). Spirituality was assessed by determining the level of maturity of consciousness and self-awareness of the individual according to Jose Stevens (1994, 2019). The following levels of spirituality were applied in terms of personal maturity: undifferentiated, low ("infant" + "toddler"), medium-low ("child"), medium-high ("adolescent /young man"), high ("adult") and various combined levels. Anthropometric measurements included body mass and height. The function of the circulatory and respiratory organs of the research participants was assessed according to the following parameters: resting heart rate (RHR), resting respiratory rate, systolic and diastolic blood pressure (BP), forced vital capacity (FVC).

Results. The following patterns were established between a person's spirituality and the functional state of the cardio-respiratory system: research participants with the highest heart rate have the most cases of a low level of spirituality, and research participants with the lowest heart rate (at the limit of statistical significance) have the least cases of this level of spirituality; research participants with high systolic blood pressure have the most cases of undifferentiated and low levels of spirituality, and research participants with low systolic blood pressure have the most cases of medium-high level of spirituality; research participants with high diastolic blood pressure have the most cases of low level of spirituality, and research participants with low blood pressure have the most cases of medium-high level of spirituality; research participants with the lowest FVC have the most cases of a low level of spirituality; research participants with the shortest length of inspiratory breath-holding time have the most cases of undifferentiated and low levels of spirituality.

Conclusions. The functional capabilities of the cardio-respiratory system are significantly related to the level of a person's spirituality: persons with a good/normal functional state have mostly high levels of spirituality, and persons with a poor functional state have low and undifferentiated levels of spirituality; sick people, compared to healthy people, are mostly characterized by low levels of spirituality.

Key words: spirituality, personal maturity, Jose Stevens, cardio-respiratory system, relation.

Мета – визначити рівень духовності людини за особистісною зрілістю та дослідити його зв'язок з функціональним станом кардіо-респіраторної системи.

Матеріал і методи. Обстежено 560 осіб, з них: чоловіків – 301 (53,75%), жінок – 259 (46,25%) осіб. Середній вік обстежених становив (M±S) 35,00±17,75 (95% довірливий інтервал: 33,52–36,47) року. Пацієнтів, які лікувалися у відділеннях реабілітації медичних закладів, було 337 (60,18%), здорових осіб (молоді люди, які були студентами гуманітарного університету) – 223 (39,82%). Духовність оцінювали шляхом визначення рівня зрілості свідомості та самосвідомості особистості за Jose Stevens (1994, 2019). Формували такі висновки про духовність за особистісною зрілістю:

недиференційований, низький («немовля» + «малюк»), середньонизький («дитина»), середньовисокий («підліток/юнак»), високий («дорослий») та різнокомбінований рівень. Антропометричними методами вимірювали довжину і масу тіла. Оцінку функції органів кровообігу та дихання обстежених здійснювали за такими показниками, як: частота серцевих скорочень у спокої (ЧСС), частота дихальних рухів у спокої, артеріальний тиск (АТ) систолічний та діастолічний, життєва ємність легень (ЖЄЛ).

Результати. Між духовністю людини та функціональним станом кардіо-респіраторної системи встановлено такі закономірності: серед осіб з найбільшою ЧСС виявлено найбільшу кількість випадків низького рівня духовності, а найменшу кількість випадків цього рівня духовності виявляють особи з найменшою ЧСС (на межі статистичної значущості); серед осіб з високим систолічним АТ реєстровано найбільшу кількість випадків недиференційованого та низького рівнів духовності, а в осіб з низьким систолічним АТ – найбільшу кількість випадків середньовисокого рівня духовності; особам з високим діастолічним АТ притаманна найбільша кількість випадків низького рівня духовності, а особам з низьким діастолічним АТ – найбільша кількість випадків середньовисокого рівня духовності; серед осіб з найменшою ЖЄЛ виявлено найбільшу кількість випадків низького рівня духовності; серед осіб з найменшою тривалістю затримки дихання після вдиху виявлено найбільшу кількість випадків недиференційованого та низького рівнів духовності.

Висновки. Функціональні можливості кардіо-респіраторної системи суттєво пов'язані з рівнем духовності людини: особам з гарним/нормальним її функціональним станом притаманні здебільшого високі рівні духовності, а особам з поганим її функціональним станом – низькі і недиференційовані рівні духовності; хворим людям, порівнюючи зі здоровими, притаманні здебільшого низькі рівні духовності.

Ключові слова: духовність, особистісна зрілість, Хосе Стівенс, кардіо-респіраторна система, зв'язок.

Introduction. Rehabilitation is a process aimed at "enabling persons with disabilities to reach and maintain their optimal physical, sensory, intellectual, psychiatric and/or social functional levels, thus providing them with the tools to change their lives towards a higher level of independence" [33, p. 8]. In order to successfully achieve this goal, the rehabilitation process should be started with an objective assessment of the patient's state of health**.** It is a well-known that human health is a multidimensional phenomenon. According to the definition of the World Health Organization (WHO), human "health is a state of complete physical, mental (spiritual) and social well-being" [11]. Currently, the patient's health is assessed by the rehabilitation team [3; 2]. Typically, such an assessment involves diagnosing the level and nature of impairments in physical health, mental health, and social well-being. Much less attention is paid to the study of mental (spiritual) health.

Currently, there is still no general consensus on the role of a person's spirituality in health care. However, the possibility of taking into account a person's spirituality during the provision of rehabilitation care is provided for in the International Classification of Functioning, Disability and Health (ICF) – domain d930 "Religion and Spirituality", Chapter 9 "Community, Social and Civic Life", component "Activities and Participation" [18, p. 176]; domain e145 "Products and Technologies for the Practice of Religious and Spirituality" Chapter 1 "Products and Technologies", component "Environmental Factors" [18, p. 185]. As can be seen from the ICF domains, spirituality and religiosity should be distinguished. Besides, such authors as Williams et al. (2015) [37], Pargament & Saunders (2007) [26] indicate it. According to Pargament & Saunders (2007) [26], spirituality refers to the thoughts, feelings, and behaviors of a person who seeks a relationship with the sacred, while religiosity refers to those thoughts, feelings, and behaviors that are specifically related to a formally organized and identified religion.

In recent decades, there has been an increase in research indicating the significant importance of spirituality and/or religiosity (hereinafter "spirituality/religiosity") in shaping human health and relationship between spirituality/ religiosity and various indicators of other components of health. Thus et al. (2018) indicate that in many medical institutions of the national health care systems of Great Britain, Australia, and the United States, the assessment of patients'

spirituality has been implemented [24]. These authors believe that cultural groups characterized by spirituality/religiosity have higher rates of immunization, better care for patients with dementia and mental illness, better adherence to treatment for many diseases, etc. Besides & Oman (2018) reviewed the evidence on the relationship between religiosity/spirituality and mortality, physical morbidity and disability. The results of various studies presented by the author indicate the potential causal influence of spirituality/religiosity on human health, which is mediated by such factors as lifestyle, social support, mental health, etc. Involvement in spirituality/religiosity has been shown to reduce cardiovascular, gastrointestinal, and respiratory mortality, and to reduce cardiovascular disease, cancer, lung disease, dementia, and disability [25]. Mukaetova-Ladinska et al. (2012) [22], Schreiber & Brockopp (2012) [29], Shattuck & Muehlenbein (2020) [30], Litalien et al. (2022) [20], etc reported on the possible connection of spirituality/religiosity with life expectancy, occurrence and development of cardiovascular, pulmonary and oncological diseases, dementia and disability.

Cardiovascular pathology is a vivid and the most common case of psychosomatic interrelationship, relationship between somatic symptom disorder and social life, spirituality and religiosity of a person. Numerous studies have shown the positive influence of spirituality, religiosity, and belief in supernatural forces on the prevention and course of cardiovascular diseases according to a number of indicators [21; 22; 30]. Somayeh et al. (2020) described a negative correlation between the severity of coronary heart disease and the level of spiritual well-being of such patients [31]. Anyfantakis et al. (2013) [8] and Brintz et al. (2017) [9] indicate the beneficial effect of spirituality/religiosity on some cardio-metabolic indicators and risk factors. Olex et al. (2013) suggest that meditation-based interventions may have beneficial effects in patients with established cardiovascular disease [23].

As for the relationship between spirituality/religiosity and functioning or diseases of the respiratory organs, there are significantly fewer studies on this issue. Heidari et al. (2015) [14] reported data on the relationship between spirituality and respiratory disorders, and Helvaci et al. (2020) [15] indicated that individuals with higher levels of spirituality had lower severity of chronic obstructive pulmonary disease (COPD) symptoms and greater adherence to treatment.

The obtained results of scientific research on the relationship between spirituality/religiosity and health are not always unambiguous and clear, and are often contradictory [25; 27]. Therefore, this issue requires further study. Besides, the use of standard as well as author's questionnaires for the study of spirituality is of importance. Currently, in various national and cultural communities, spirituality is studied with the help of numerous multilingual and diversely focused questionnaires [1; 4; 5; 28].

The hypothesis of the study was the assumption that the functionality of the cardio-respiratory system of a person is related to his spirituality, which can be assessed by establishing the level of personal maturity.

The purpose of the study is to determine the level of spirituality of a person on terms of personal maturity and to investigate its connection with the functional state of the cardio-respiratory system.

Research methods. *Research participants.* The study was conducted among patients with chronic diseases and the consequences of injuries that required medical rehabilitation in a hospital, and among students of the Humanities University who, according to medical reports, were healthy people. Inclusion criteria for research study were the following: age of the examinees (17–75); patients with any chronic disease or injury with health consequences; healthy people who did not have chronic diseases or injuries with health consequences.

A total of 560 people selected and examined, 301 (53.75%) of whom were men, and 259 (46.25%) of whom were women. The average age of the examined people was (M±S) 35.00±17.75 (95% confidence interval is 33.52 to 36.47 years of age). According to age periods (WHO 2015), the research participants were divided as follows: 250 (46.3%) of them were under 26 years old,

139 (25.7%) of 26–45 years old, 122 (22.6%) of 46–65 years old, and 29 (5.4%) of 66–75 years old. There were 337 (60.18%) of patients who were treated in the rehabilitation departments of medical institutions, and 223 (39.82%) of healthy persons (students of the Humanities University).

The written informed consent from all the participants before enrolment in a study was obtained. The research protocol was reviewed and approved at a meeting of the Ethics Committee of the Faculty of Health, Physical Education and Sports at Borys Grinchenko Kyiv University. The study fully complied with the principles of the Declaration of Helsinki of the World Medical Association "Ethical Principles for Medical Research Involving Human Subjects".

Design and setting. A single-center prospective one-moment selective observational study was conducted. The research was carried out during 2018–2021. The examination of the selected persons was carried out with their consent by means of a survey. The survey was conducted once in the form of providing answers to special questionnaires in the presence of the researcher.

Spirituality was assessed by determining the level of maturity of consciousness and self-awareness of the individual according to Jose Stevens (Jose Stevens, 1994) [33]. The maturity of a person's consciousness and self-awareness (hereinafter – personal maturity) can be considered a degree of a person's internal development, one of the options for the manifestation of a person's spirituality. In our study, Jose Stevens' test involved a choice of 75 statements. The survey of the participants was conducted in Ukrainian, according to Jose Stevens' questionnaire version in English [34, p. 50–55]. The participant independently chose the language of the survey. The interviewee chose the statement ("yes") if it was corresponded to his ideas. The analysis of the answers involved the grouping of statements on five scales (15 statements in one scale), each of which corresponded to one of the levels (degrees) of a person's personal maturity: "infant", "toddler", "child", "adolescent/ young man" (later, this level of maturity was denoted by one word "young man") and "adult" [34, p. 50–55]. The level of personal maturity was considered to be the one for which the highest number of points was scored ("yes" – 1 point). The level was considered formed when 10 or more points were scored on its scale. If none of the levels scored this amount, then personal maturity was considered undifferentiated. In cases of simultaneous formation of several levels of personal maturity (the same sum of points on several scales), a conclusion was made about their combination.

Since there are currently quite a lot of methods and approaches to the study of spirituality, in the future, in order to emphasize the method by which the level of spirituality was determined, we introduced the term "spirituality in terms of personal maturity".

Anthropometric measurements included body mass and height. The function of the circulatory and respiratory system of the research participants was assessed according to the following indicators: resting heart rate (RHR), respiratory rate at rest (RR), systolic and diastolic blood pressure (SBP & DBP), forced vital capacity (FVC), which was measured with a portable dry spirometer, maximal voluntary inspiratory breath-holding time (MVIBHT), maximal voluntary expiratory breath-holding time (MVEBHT). Given conclusion about the level of spirituality in terms of personal maturity was a nominal qualitative indicator, for further statistical analysis, interval scales were used for quantitative indicators of the function of the circulatory and respiratory system (Table 1).

Statistical analysis. The sample size was not previously calculated. The statistical characteristic of the sample is provided by finding the arithmetic mean (M) and its standard deviation (S). A 95% confidence interval (95% CI) was used to estimate the dispersion of values around the central point. Qualitative binary indicators of the samples were compared by testing the null hypothesis of equality of proportions expressed as percent, ordinal values – by calculating Pearson's Chi-square test ($\chi 2$) with Yates correction. The connection between the investigated indicators was established by creating contingency tables (crosstabulation) based on the analysis of which

Table 1

Interval scales of Indicators of circulatory and respiratory system

Indicators of circulatory and respiratory system	Indicator values according to level of measurement				
	1	**2**	**3**	**4**	**5**
RHR, bpm	≤ 59	60–69	70–79	≥ 80	—
SBP, mmHg	≤ 109	110–119	120–129	130–139	≥ 140
DBP, mmHg	≤ 69	70–79	80–89	≥ 90	—
FVC, ml	≤ 2999	3000–3900	4000–4900	5000–5900	≥ 5901
MVIBHT, sec	≤ 29	30–44	45–59	60–89	≥ 90
MVEBHT, sec	≤ 19	20–29	30–39	40–49	≥ 50

a conclusion was made about the association of the investigated features. The criterion for the reliability of statistical estimates was the level of significance with the indication of the probability of falsely rejecting the null hypothesis *(p)*, the threshold level was 0.05. Data processing of the study was carried out using the software product SPSS Statistics Base (IBM, USA).

Research results. It was found in previous research that the majority of the examined participants 25.7% (144/560) show the level of personal maturity "adult", and the smallest number of the examined participants 3.2% (18/560) show the level of maturity "infant". Almost a fifth of the examined participants 20.3% (113/560) had various combinations of levels of personal maturity. A combination of low levels of personal maturity ("infant", "toddler", "child") was found in 141 participants, high levels ("young man", "adult") – in 35 participants, and multidirectional levels – in 64 out of 560 examined participants [6].

In order to use for further analysis, the combined conclusions about personal maturity not on an aggregate basis, but in essence of their reflection of the subject of research, as well as taking into account a small number of some conclusions about personal maturity ("infant", "toddler"), related and close essentially equal levels, and new conclusions were drawn about spirituality by personal maturity [6]:

– undifferentiated level – 13.2%;

– low level ("infant" + "toddler") – 10.0%;

– medium-low level ("child" + combination of "child" and "adolescent/young man") – 12.3%;

– medium-high level ("adolescent/ young man" + a combination of "adolescent/ young man" and "adult") – 27.7%;

– high level ("adult") – 25.7%;

– multi-combined level (simultaneous combination of low and high levels of maturity) – 11.1%.

In general, it can be noted that the formed high levels of personal maturity ("young man" + "adult" + a combination of "young man" and "adult") accounted for half of the examined – 53.39% (299/560), and low levels ("infant" + "toddler" + "child" + the combination of "child" and "young man"), including undifferentiated, one third of the examined: 35.54% (199/560).

First, an analysis of the conjugation of the distribution of levels of spirituality by personal maturity with the distributions of indicators of the function of the circulatory and respiratory organs over the entire sample of research participants was carried out.

Table 2 shows the results of the analysis of the relationship between the levels of spirituality of the research participants and the distribution of heart rate. According to the table, the relationship between these indicators is not established. Here it is possible to emphasize only the tendency on the border of statistical significance towards the predominance of the number of cases of a low level of spirituality in persons with a heart rate of 80 and more in 1 minute (12.68%; 9/71), compared to persons in whom the heart rate was 59 and less in 1 minute and in which this level of maturity was not registered at all (0/28) ($t=1.9762$, $p>0.05$).

Table 3 shows that the undifferentiated level of spirituality is statistically significantly more often registered among persons with a systolic blood pressure of 140 mmHg and more – 19.05% (12/63), than among people with blood pressure of 109 mmHg and less – 4.65% (2/43) ($p<0.05$). Also, people with the highest systolic blood pressure were most often found to have

a low level of personal maturity – 22.22% (14/63), which was statistically significantly more compared to people who had a blood pressure of 109 mmHg and less – 6.98% (3/43) ($p<0.05$), 110– 119 mmHg – 3.61% (3/83) ($p<0.001$) and 120–129 mmHg – 9.69% (19/196) ($p<0.01$). In the research participants with the lowest systolic blood pressure, an average high level of personal maturity was most often recorded – 34.88% (15/43), which was more on the border of statistical significance, as compared with persons with the highest systolic blood pressure – 19.05% (12/63) ($t=1.8367$, $p>0.05$).

In turn, the low level of personal maturity of the research participants was mostly manifested under conditions of the highest level of diastolic blood pressure – 22.95% (14/61), and least often – under conditions of the lowest level of diastolic blood pressure – 4.67% (5/107) ($p<0.001$). The largest number of cases of medium-high level of spirituality was registered among persons with a diastolic blood pressure of 69 mmHg and less – 30.84% (14/107), and the lowest – among people with a diastolic blood pressure of 90 mmHg and more: 16.39 % (10/61) ($p<0.05$) (Table 4).

Furthermore, it was found out that the majority of cases of low level of spirituality were inherent in the research participants with forced vital capacity (FVC) – 26.67% (8/30), which was significantly more when compared with research participants with FVC of 3000–3900 ml – 9.93% (14/ 141) ($p<0.05$), 4000–4900 ml – 11.33% (17/150) ($p<0.05$) and 5000–5900 ml – 8.45% (6/71) ($p<0.05$). A medium-low level of spirituality was most rarely observed in persons with a FVC of less than 3000 ml, 6.67% (2/30), which was on the border of statistical significance compared to persons who had a FVC of 5000–5900 ml – 22.54% (16/71) ($t=1.9042$, $p>0.05$) and more than 5900 ml – 26.09% (6/23) ($t=1.9571$, $p>0.05$) (Table 5).

Table 2

Distribution of levels of spirituality in terms to personal maturity among the research participants by RHR ($\chi^2 = 15.58$, $p=0.4100$)

Levels of spirituality	Resting heart rate (RHR) bpm							
	≤ 59 (n=28)		60–69 (n=181)		70–79 (n=185)		≥ 80 (n=71)	
	n	%	n	%	n	%	n	%
Undifferentiated	4	14.29	22	12.15	27	14.59	9	12.68
Low	0	0	22	12.15	22	11.89	9	12.68
Medium-low	3	10.71	28	15.47	15	8.11	8	11.27
Medium-high	6	21.43	45	24.86	52	28.11	19	26.76
High	9	32.14	46	25.41	48	25.95	13	18.31
Variously combined	6	21.43	18	9.94	21	11.35	13	18.31

Table 3

Distribution of levels of spirituality in terms of personal maturity among the research participants by systolic blood pressure (SBP) ($\chi^2 = 32.13$, $p=0.0418$)

Levels of spirituality	Systolic blood pressure, mmHg									
	≤ 109 (n=43)		110–119 (n=83)		120–129 (n=196)		130–139 (n=81)		≥ 140 (n=63)	
	n	%	n	%	n	%	n	%	n	%
Undifferentiated	2	4.65	14	16.87	22	11.22	13	16.05	12	19.05
Low	3	6.98	3	3.61	19	9.69	14	17.28	14	22.22
Medium-low	4	9.30	12	14.46	26	13.27	8	9.88	4	6.35
Medium-high	15	34.88	26	31.33	51	26.02	18	22.22	12	19.05
High	14	32.56	22	26.51	51	26.02	16	19.75	13	20.63
Variously combined	5	11.63	6	7.23	27	13.78	12	14.81	8	12.70

Spirituality in terms of personal maturity depended on the length of inspiratory breath-holding time of the research participants (Table 6). It was found out the most undifferentiated level among research participants who held their breath after inhalation for less than 29 seconds and less – 18.92% (7/37), which significantly outweighed the cases of this level, compared with research participants who held their breath after inhalation for 90 and more than 2.22% (1/45) ($p<0.01$). Besides, a low level of personal spirituality was most often registered among research participants who held their breath after inhalation for less than 30 seconds – 24.32% (9/37), which was significantly different from persons who held their breath after inhalation for 90 seconds or more, – 4.44% (2/ 45) ($p<0.01$). Those research participants, who could hold their breath after inhaling for 90 or more seconds, had the most cases with an average low level of maturity – 24.44% (11/45). It was much more cases of this level of spirituality in persons who could hold their breath after inhaling for less than 30 seconds – 2.70% (1/37) ($p<0.01$) (Table 6).

As for the relationship of spirituality in terms of the personal maturity of the research participants with the length of expiratory breath-holding time, the largest number of its various combined levels was registered among participants who could hold their breath after exhalation for 20–29 seconds, 17.68% (29/164), which was significantly more, compared with persons who could hold their breath after exhalation for 40–49 seconds, – 1.79 % (1/56) ($p<0.01$) (Table 7).

It is known that the values of indicators of the functioning of circulatory and respiratory system mostly depend on the sex and age of a person. This is evidenced by the results of our research testify to the fact that is shown in Table 8. Only distributions of gradations of resting heart rate and heart rate after expiratory breath-holding time did not have a statistically significant correlation with gender, in all other cases such a relationship was found.

Table 4

Distribution of levels of spirituality in terms of personal maturity among the research participants by diastolic blood pressure (DBP) ($\chi^2 = 19.83$, $p=0.1784$)

Levels of spirituality	Diastolic blood pressure, mmHg							
	≤ 69 (n=107)		70-79 (n=116)		80-89 (n=182)		≥ 90 (n=61)	
	n	%	n	%	n	%	n	%
Undifferentiated	13	12.15	16	13.79	24	13.19	10	16.39
Low	5	4.67	9	7.76	25	13.74	14	22.95
Medium-low	14	13.08	12	10.34	23	12.64	5	8.20
Medium-high	33	30.84	32	27.59	47	25.82	10	16.39
High	27	25.23	33	28.45	41	22.53	15	24.59
Variously combined	15	14.02	14	12.07	22	12.09	7	11.48

Table 5

Distribution of levels of spirituality in terms of personal maturity among the research participants by forced vital capacity (FVC) ($\chi^2 = 36.25$, $p=0.0143$)

Levels of spirituality	Forced vital capacity (FVC), ml									
	≤ 2999 (n=30)		3000–3900 (n=141)		4000–4900 (n=150)		5000–5900 (n=71)		≥ 5901 (n=23)	
	n	%	n	%	n	%	n	%	n	%
Undifferentiated	3	10.00	15	10.64	21	14.00	12	16.90	4	17.39
Low	8	26.67	14	9.93	17	11.33	6	8.45	3	13.04
Medium-low	2	6.67	11	7.80	18	12.00	16	22.54	6	26.09
Medium-high	4	13.33	45	31.91	41	27.33	15	21.13	2	8.70
High	5	16.67	35	24.82	39	26.00	14	19.72	5	21.74
Variously combined	8	26.67	21	14.89	14	9.33	8	11.27	3	13.04

In turn, the level of spirituality in terms of personal maturity throughout the sample is significantly related to the gender of the research participant (χ^2=37.5; p=0.0000) and their age (χ^2=54.4; p=0.0000). This led to a further analysis of the relationship between indicators of the function of the circulatory and respiratory system and the level of spirituality in terms of personal maturity separately in men, women and in each age group.

Table 9 shows that a statistically significant relationship was found only for the distributions of gradations of physical education and the level of personal maturity in women (χ^2=35.46; p=0.0118). To some extent, this was due to the fact that the various combined level of personal maturity of women was in 22 cases out of 25 (88.0%) associated with the values of forced vital capacity (FVC) from 3000 to 4900 ml.

Table 6

Distribution of levels of spirituality in terms to personal maturity among the research participants by length of inspiratory breath-holding time (LIBHT) (χ^2 = 36.81, p=0.0123)

Levels of spirituality	Length of inspiratory breath-holding time									
	≤ 29 sec (n=37)		30–44 sec (n=110)		45–59 sec (n=149)		60–89 sec (n=103)		≥ 90 sec (n=45)	
	n	%	n	%	n	%	n	%	n	%
Undifferentiated	7	18.92	13	11.82	23	15.44	16	15.53	1	2.22
Low	9	24.32	17	15.45	12	8.05	10	9.71	2	4.44
Medium-low	1	2.70	10	9.09	17	11.41	14	13.59	11	24.44
Medium-high	7	18.92	20	18.18	44	29.53	30	29.13	12	26.67
High	8	21.62	34	30.91	34	22.82	26	25.24	11	24.44
Variously combined	5	13.51	16	14.55	19	12.75	7	6.80	8	17.78

Table 7

Distribution of levels of spirituality in terms of personal maturity among the research participants by length of expiratory breath-holding time (LIBHT) (χ^2 = 24.37, p=0.2265)

Levels of spirituality	Length of expiratory breath-holding time									
	≤ 19 sec (n=88)		20–29 sec (n=164)		30–39 sec (n=101)		40–49 sec (n=56)		≥ 50 (n=35)	
	n	%	n	%	n	%	n	%	n	%
Undifferentiated	14	15.91	23	14.02	14	13.86	7	12.50	2	5.71
Low	14	15.91	17	10.37	11	10.89	5	8.93	3	8.57
Medium-low	11	12.50	13	7.93	12	11.88	11	19.64	6	17.14
Medium-high	18	20.45	37	22.56	31	30.69	16	28.57	11	31.43
High	19	21.59	45	27.44	24	23.76	16	28.57	9	25.71
Variously combined	12	13.64	29	17.68	9	8.91	1	1.79	4	11.43

Table 8

Statistical characteristics of the correlation of indicators of circulatory and respiratory system by gender and age categories

Indicators of circulatory and respiratory system	Demographic indicators	
	Gender	Age
RHR, bpm	χ^2=2.93; p=0.3998	χ^2=22.7; p=0.0060
SBP, mmHg	χ^2=45.98; p=0.0000	χ^2=150.0; p=0.0000
DBP, mmHg	χ^2=20.11; p=0.0000	χ^2=124.2; p=0.0000
FVC, ml	χ^2=96.00; p=0.0000	χ^2=30.6; p=0.0020
MVIBHT, sec	χ^2=11.86; p=0.0118	χ^2=84.1; p=0.0000
MVEBHT, sec	χ^2=5.55; p=0.2351	χ^2=48.5; p=0.0000

As to men, both a high level in 30/42 (71.4%) cases and a mixed level of personal maturity in 18/22 (81.8%) cases had a value of forced vital capacity (FVC) of 5000 ml or more.

Table 9

Statistical characteristics of the correlation of indicators of circulatory and respiratory system with the level of spirituality in terms of personal maturity by research participants gender

Indicators of circulatory and respiratory system	Gender	
	Men (n=301)	Women (n=259)
RHR, bpm	χ^2=9.75; p=0.8352	χ^2=18.04; p=0.2604
SBP, mmHg	χ^2=19.86; p=0.4657	χ^2=25.75; p=0.1741
DBP, mmHg	χ^2=14.87; p=0.4609	χ^2=15.56; p=0.4121
FVC, ml	χ^2=19.75; p=0.5052	χ^2=35.46; **p=0.0118**
MVIBHT, sec	χ^2=24.34; p=0.2275	χ^2=21.75; p=0.3543
MVEBHT, sec	χ^2=19.35; p=0.4990	χ^2=28.48; p=0.0997

Table 10 shows correlations of indicators of the function of the circulatory and respiratory system with the level of spirituality in terms of personal maturity in each age period of the research participants. A statistically significant relationship between diastolic blood pressure and the level of personal maturity is specific only for research participants aged ≤ 25 years (χ^2=26.63; p=0.0319). For young people with both high and medium-low levels of personal maturity, diastolic blood pressure up to 79 mmHg is common – 39/50 (78.0%) cases and 20/27 (74.1%) cases, respectively.

The presented results indicate that the regularities of the correlation of spirituality with the personal maturity of the research participants and the functional state of their cardio-respiratory system revealed in general throughout the sample are not manifested in separate groups of examinees, formed by gender and age. This allows us to assume that, in general, spirituality in terms of personal maturity is not a constant process, but is formed and changes throughout a person's life (in our case, from 17 to 75 years old) in different ways for men and women [28] and associated with changes in the function of the cardio-respiratory system.

Discussion. Summarizing the obtained results of the study of the relationship between spirituality in terms of the personal maturity of the research participants and the functional state of the cardio-respiratory system, the following patterns were established:

– research participants with the highest heart rate have the most cases of a low level of spirituality, and research participants with the lowest heart rate (at the limit of statistical significance) have the least cases of this level of spirituality;

– research participants with high systolic blood pressure have the most cases of undifferentiated and low levels of spirituality, and research participants with low systolic blood pressure have the most cases of medium-high level of spirituality;

– research participants with high diastolic blood pressure have the most cases of low level of spirituality, and research participants with low

Table 10

Statistical characteristics of the correlation of indicators of circulatory and respiratory system with the level of spirituality in terms of personal maturity by research participants age categories

Indicators of circulatory and respiratory system	Age		
	≤ 25 years old (n=250)	26–45 years old (n=139)	46–65 years old (n=122)
RHR, bpm	χ^2=10.97; p=0.7544	χ^2=13.60; p=0.5558	χ^2=8.43; p=0.9052
SBP, mmHg	χ^2=17.78; p=0.6017	χ^2=22.43; p=0.3174	χ^2=13.62; p=0.84.94
DBP, mmHg	χ^2=26.63; **p=0.0.0319**	χ^2=11.41; p=0.7234	χ^2=6.45; p=0.9711
FVC, ml	χ^2=30.81; p=0.0577	χ^2=26.15; p=0.1609	χ^2=24.75; p=0.2111
MVIBHT, sec	χ^2=24.25; p=0.2316	χ^2=18.71; p=0.5409	χ^2=15.86; p=0.7253
MVEBHT, sec	χ^2=20.79; p=0.4095	χ^2=18.08; p=0.5820	χ^2=17.32; p=0.6323

blood pressure have the most cases of medium-high level of spirituality;

– research participants with the lowest FVC have the most cases of a low level of spirituality;

– research participants with the shortest length of inspiratory breath-holding time have the most cases of undifferentiated and low levels of spirituality.

The specified patterns are found within the entire sample and are not manifested in separate groups of research participants formed by gender and age.

Further study of the distribution of levels of spirituality in terms of personal spirituality separately in healthy people and people with health problems showed a predominance of undifferentiated and low levels in people with health problems, and medium-low and medium-high levels in healthy people (Table 11). These data allow us to state that people with health problems are characterized by the greater cases of low levels of spirituality.

Thus, the results of our research confirmed that high levels of spirituality in terms of personal maturity are common mainly for individuals with the lowest heart rate, low (normal) levels of systolic and diastolic blood pressure. A low level of spirituality in terms of personal maturity is mostly found in research participants who have the highest heart rate, the highest levels of systolic and diastolic blood pressure, a small value of FVC, and the shortest length of inspiratory breath-holding time. The undifferentiated level of spirituality in terms of personal maturity is mostly found among research participants with high systolic blood pressure and the shortest length of expiratory breath-holding time.

In general, it can be stated that the functional capabilities of the cardio-respiratory system are significantly related to the level of spirituality of a person in terms of personal maturity, and people with health problems mostly have low levels of spirituality.

The results of our study contribute to the conclusions of the other researches which indicate the existence of a relationship between spirituality/religiosity and the course and consequences of cardiovascular diseases. Thus, our conclusion about the most medium-high level of spirituality in terms of personal maturity in individuals who had the lowest level of systolic blood pressure corresponds to the conclusions of several studies: a higher level of spiritual well-being is significantly associated with lower systolic and diastolic ambulatory blood pressure [17]; spiritual well-being and frequency of non-organizational religious activity are weakly but significantly associated with lower diastolic BP [9]; women who attend religious services are less likely to develop hypertension [32]; the Buddhist older people who regularly attended a temple every Buddhist Holy day (which occurs once a week) were found to have systolic and diastolic blood pressure readings lower than people who did not attend as regularly [35]; secular practice of meditation is associated with lower blood pressure [10]; there were significant reductions in systolic and diastolic BP in African Americans who regularly attended church and participated in a 12-week cardiovascular disease training based

Table 11

Distribution of levels of spirituality in terms of personal maturity among healthy people and people with health problems

Levels of spirituality	People with health problems (n=337)		Healthy people (n=223)		Level of statistical significance
	n	%	n	%	
Undifferentiated	55	16.32	19	8.52	$p<0.01$
Low	46	13.65	10	4.48	$p<0.001$
Medium-low	32	9.50	37	16.59	$p<0.05$
Medium-high	76	22.55	79	35.43	$p<0.001$
High	88	26.11	56	25.11	$p>0.05$
Variously combined	40	11.87	22	9.87	$p>0.05$

on existing health guidelines and scriptures [36]; the Religious Well-being subscale was associated with reduced systolic blood pressure reactivity in response to the structured interview [12].

In our previous study, we also studied the relationship between spirituality, which was assessed by analyzing human character traits and the level of blood pressure [5]. In this study, people with increase in systolic blood pressure (more than 140 mmHg) had more initial (low) level of spirituality than people with low systolic blood pressure. However, the relationship between the levels of spirituality by character traits and diastolic blood pressure was not found.

The feedback we established between the level of spirituality and heart rate does not correspond to the results of research on this topic. Thus, Krause et al. (2016) [19] found that under conditions of stress associated with intense spiritual work, the sympathetic tone of the nervous system prevails at rest, which leads to an acceleration of heart rate, and Edmondson et al. (2005) [12] believe that a person's religiosity is not related to heart rate at all. In our study, which examined the state of spirituality by character traits, there was also no relationship between levels of spirituality and heart rate [5].

Summarizing and explaining the published results on the relationship of spirituality/ religiosity with cardiovascular diseases, Lucchese & Koenig (2013) emphasize that there is no "direct" effect on the functioning of the cardiovascular system or on the occurrence and development of cardiovascular diseases [21]. Most likely, spirituality/religiosity affects the cardiovascular system through psychological, social and behavioral factors. Also, these authors emphasize that the relationship between R/S and cardiovascular health and disease is extremely complex, involving decision-making that is under the individual's control as well as genetic and environmental factors over which the individual has no control [21].

Our finding of a direct relationship between respiratory function indicators and the level of spirituality is a confirmation of the established relationship between the level of spirituality and breathing disorders in patients with COPD and lung cancer, which was reported by Heidari et al. (2015) [14] and Hasegawa et al. (2017) [13]. This is also consistent with the data reported by Helvaci et al. (2020) [15]: individuals with higher levels of spirituality have lower severity of COPD symptoms. Summarizing the effects of the spiritual practices of qigong, tai chi, and yoga, Heredia-Rizo et al. (2023) in a systematic literature review showed that these spiritual practices can be effective for improvement of symptoms associated with COPD and bronchial asthma. The authors recommend using qigong, tai chi and yoga in the rehabilitation process of such patients [16]. The results of our previous research also showed direct relationship between spirituality and the state of the respiratory system. Thus, under the condition of a larger value of FVC (5900 ml and more), mostly only a good (high) level of spirituality was revealed [5].

Conclusions

1. According to the studied indicators, there is mostly a direct relationship between a person's spirituality and the functional state of the cardio-respiratory system, which is indicated by the lowest heart rate, low (normal) levels of systolic and diastolic blood pressure in people with high levels of spirituality. In turn, undifferentiated and low levels of spirituality are most often found in individuals who have the highest heart rate, the highest levels of systolic and diastolic blood pressure, a small value of FVC and the shortest length of inspiratory breath-holding time. In general, individuals with a good/ normal functional state of the cardio-respiratory system have mostly high levels of spirituality, while individuals with a poor functional state of the cardio-respiratory system have low and undifferentiated levels of spirituality. People with health problems, compared to healthy people, mostly show low levels of spirituality.

2. The established features of spirituality can be taken into account when drawing up individual rehabilitation programs for patients to assess the level of spirituality in terms of personal maturity.

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Прийнято: 12.04.2024
Опубліковано: 10.06.2024

Accepted on: 12.04.2024
Published on: 10.06.2024