

Influence of physical working capacity on quality of life and life satisfaction in old-age population of Ukraine

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ABSTRACT

The aim of this study was to examine relationship between indicators of physical working capacity and levels of satisfaction and quality of life in older adults. Materials and methods. This study involved 221 elderly participants including 152 women and 69 men with an average chronological age of 67.1 years. The study was conducted at the University of Third Age (Chernivtsi, Ukraine) during the years 2019-2020. Research methods: assessment of physical working capacity, Questionnaire survey with Medical Outcomes Study-Short Form (SF-36), measurement of Life Satisfaction Index (Neugarten A.O.), and statistical analysis. Results. The degree of relationship between indicators of physical performance and levels of satisfaction and quality of life was determined in older adults. It was found that physical working capacity is moderately associated with all indicators of life satisfaction; all correlation coefficients were significant at the level $\alpha = .05$. Conclusions. For this age group, among the indicators of the physical component of health, the most significant one was Physical Functioning (34.36 ± 1.8 points), and in the mental component of quality of life, the most significant was Vitality (59.34 ± 1.8 points). Among the respondents, 68.2% had low level of life satisfaction and 25.3% had average level. We found a close relationship between these parameters. Physical working capacity is closely related to the quality of life indicators such as Physical Functioning (0.664), Overall.mood.background (0.581), and Vitality (0.524).

Keywords: Old age; Physical activity; Quality of life; Life satisfaction.

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INTRODUCTION

The constant increase in the proportion of the elderly is one of the most important challenges for most countries in the world. In 2020, there are an estimated 727 million persons aged 65 years or over worldwide. This number is projected to more than double by 2050, reaching over 1.5 billion persons. The share of older persons in the global population is expected to increase from 9.3 per cent in 2020 to 16.0 per cent in 2050 (Azam Jafari, Nayyereh Aminisani, Seyed Morteza Shamshirgaran, Laven Rastgoo & Neda Gilani, 2020; Hapala, Eero, Lee, Earric & Laukkanen, Jari, 2020; WHO, https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Sep/un_pop_2020_pf_ageing_10_key_messages.pdf). In different countries this increase fluctuates from 25% to 50%. Due to the growing aging of the population, of great importance are the practical aspects of gerontology: the prevention of diseases in older adults, addressing the issues of their work and rest, and search for means of physical activity that can significantly improve the health of the elderly.

Physical working capacity is an integral expression of human capabilities. Research conducted in recent years in Ukraine and other countries have shown that there is a relationship between physical working capacity and health. Furthermore, this relationship can be traced even in school-age children (Galan, Andrieieva & Yarmak, 2019).

Physical working capacity is the ability of the body to perform muscular work of moderate intensity for a long time. This ability is an important component of physical fitness. It is closely correlated with the main indicators of physical fitness: working capacity, health condition, and physical perfection. Low working capacity is related to a decrease in reserve capacity of the body which is manifested in the conditions of intense muscular activity, limited oxygen supply, maximum myocardial oxygen consumption, and intensity of vascular responses (Pavlova Iu. Vovkanych L, & Vynogradskyi B., 2014; Rodrigo Gomes De Souza Vale, Dirceu Ribeiro Nogueira Da Gama, Flávio Boechat De Oliveira, Denize Sá De Mendonça Almeida, Juliana Brandão Pinto De Castro, Edgar Ismael Alarcon Meza, Rafael Da Silva Mattos & Rodolfo De Alkmim Moreira Nunes, 2018).

The term 'quality of life' is gaining recognition and is used in the process of forming a humanistic social policy and addressing its problems given the need for human adaptation to changing conditions (Park, S. G., 2006; Theofilou, P., 2013; Andrieieva, O. Hakman, A., Kashuba, V., Vasylenko, M., Patsaliuk, K., Koshura, A., & Istyniuk, I., 2019). Quality of life is assessed in terms of degree of satisfaction of objective needs and interests, as well as subjective satisfaction with the quality of life (Hakman Anna, Olena Andrieieva, Vitalii Kashuba, Tetiana Omelchenko, Carp Ion, Vladyslav Danylchenko, & Ksenia Levinskaia, 2019; Harahousou, Y., & Kabitsis, C., 2002; Barbosa BT, Santos RL, Chaves AB, Brindeiro-Neto W, Pereira T, Silva AI & Soares LI, 2019).

The quality of life is an integral characteristic that is formed by the physical, social and psychological functioning of the individual. The WHO defines the quality of life as an individual's comparison of their position in society in the context of culture and value system with their plans, opportunities, and degree of dissatisfaction (Monteiro, António M., Silva, Pedro, Forte, Pedro, & Carvalho, Joana, 2019; WHO).

The aim of this study was to determine relationship between indicators of physical performance and levels of satisfaction and quality of life in older adults.

MATERIALS AND METHODS

Participants

This study involved 221 elderly participants including 152 women and 69 men with an average chronological age of 67.1 years.

Organization

The study was conducted at the University of Third Age (Chernivtsi, Ukraine) during the years 2019-2020.

Physical working capacity

The PWC₁₅₀ test includes assessment of individual's power output at a standard load, at which heart rate (HR) reaches 150 bpm and is the maximum for old age people. The PWC₁₅₀ test of assessing physical working capacity is based on the linear relationship between heart rate and power output. Heart rate of 150 bpm reflects the optimal mobilization of the heart's capacities in old age, as the maximum stroke volume of the heart can still be maintained upon it. Furthermore, the linear relationship between heart rate and power output is maintained up to the heart rate of 150 bpm in this age group. To assess the power output at a heart rate of 150 bpm, the subjects performed the work task 2 times for 5 minutes with different power output (on the Fitex A800 ergometer). The value of physical working capacity, at a variable age of heart rate, was calculated using the same formula as PWC₁₅₀, but taking into account the age limits of the maximum heart rate:

$$PWC_{150} = W_1 + (W_2 - W_1) (150 - HR_1) / (HR_2 - HR_1)$$

Where:

W_1 is power output at the first work task;

W_2 is the power output at the second work task;

HR_1 is the heart rate during the last minute of the first work task;

HR_2 is the heart rate during the last minute of the second work task.

Quality of life

Questionnaire survey with Medical Outcomes Study-Short Form (SF-36). SF-36 comprises 36 questions which are grouped into eight scales: physical functioning, usual role functioning, bodily pain, general health, vitality, social functioning, emotional state, and mental health. The scores for each scale are summed in such a way that the higher scores (from 0 to 100) represent better value for the given domain. Then two component scores can be derived: a mental component and a physical component of health.

Life satisfaction

The Life Satisfaction Index (Neugarten A.O.) was developed by a group of American researchers dealing with socio-psychological problems of gerontopsychology. The instrument was translated and adapted by N.V. Panina. The questionnaire consists of 20 questions, the scores of which are summed for 5 scales, which describe various aspects of the general psychological state and life satisfaction of an individual. This survey instrument is used to assess the most general psychological state of an individual which is dependent on their own characteristics and the structure of attitudes to different aspects of life. Life satisfaction index is a multifaceted indicator that evaluates the emotional component as the main component. The index of general life satisfaction is calculated using a scoring key. The maximum value of Life Satisfaction Index is 40 points. The average values of life satisfaction are 25-30 points. Scores below 25 are considered low.

Statistical analysis.

Student's *t*-test was used to assess the statistical significance. Statistical processing of the results was performed using Statistica 6.0 (StatSoft, USA) and Excel 2003 spreadsheets (Microsoft, USA).

Spearman correlation coefficient was used to assess the relationship between physical performance and life satisfaction. As a measure of the association between variables, the Pearson correlation coefficients were calculated for indicators of physical performance and quality of life of the elderly. In each case, the hypothesis $H_0: \rho = 0$ vs. $H_1: \rho \neq 0$ was tested and *p*-value was calculated. All statistical tests were done at the .05 level of significance. Data were processed using the free and open source environment RStudio.

RESULTS

When assessing the quality of life, the opinion of the respondents is of the greatest importance, which reflects and correlates all the objective and subjective factors that determine their quality of life. The subjectivity of the assessment of quality of life parameters, in particular its components characterise the emotional state of a person, personality traits, type of higher nervous activity, and social circumstances (Table 1).

Physical activity parameters indicate that the respondents' subjective assessment of the volume of physical activity, which is not limited by the health state, was 34.36 ± 1.8 points out of 100 possible during the experiment. As for the parameter of bodily pain, it reaches the value 32.9 ± 1.4 . In our opinion, this is primarily due to the fact that the elderly are quite sensitive and it is very important for them to feel safe for their own health.

Table 1. Quality of life of the study participants (n = 221)

Quality of life components (SF-36)	Scale	X	m
Physical component of health	Physical Functioning	34.36	1.8
	Role-Physical Functioning	25.67	2.8
	Bodily pain	31.44	2.5
	General Health	32.9	1.4
	Vitality	59.34	1.8
Mental component of health	Social Functioning	21.41	0.4
	Role-Emotional	19.50	1.8
	Mental Health	35.17	1.2

The feeling of satisfaction with life in old age appears as an important indicator of an individual's physical health, which is manifested in their interest in life and the content of later life. General assessment of the quality and content of life in old age is reflected in the emotional feeling of satisfaction with life. Factors influencing life satisfaction and success of adaptation in old age include: health, financial position, marital status, optimal functioning, relationships with the outside world, and even the ability to drive a car.

With an inner perception of their age, a meaningful and productive life, an interest in their own health and communication, appropriate physical and work activities, the lives of the elderly will be full, and they will feel happy and satisfied.

We conducted an assessment of the life satisfaction index (LSI) among 221 people aged 60-75 years. According to the LSI assessment, most respondents (68.2%) have a low level of life satisfaction, which indicates that they lack enthusiasm for everyday life, passively accept own failures, and see bad luck as a

given. Furthermore, they are insecure and have low self-esteem, and thus can not enjoy life. They are dissatisfied with their health and various activities. An average level of life satisfaction was found in 25.3% of respondents. This group of subjects realistically assess their own internal and external factors, health state, and have adequate self-esteem. They treat everyday life well, but do not feel completely satisfied with life. They adequately evaluate their physical capabilities, but do not take the initiative to change something and to improve their physical condition, and do not try to make their leisure time more diverse through physical activity. Only 6.5% of respondents have a high level of LSI.

Without information about the physical working capacity of the subjects, it is not possible to judge the state of health, social hygienic and social economic living conditions of older adults. An assessment of physical working capacity of study participants showed that 3.3% of them had a high level and 6.6% had a higher than average level of working capacity (Figure 1).

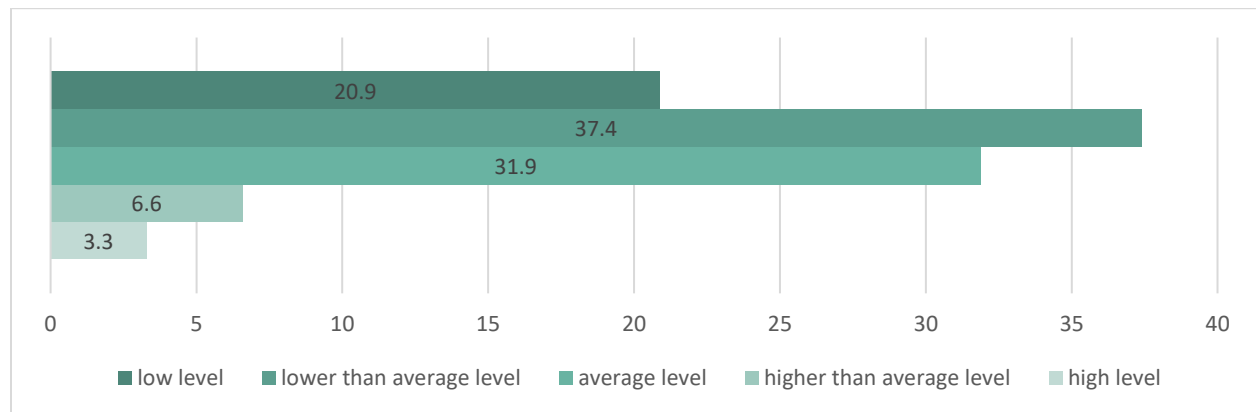


Figure 1. Distribution of study participants by level of physical working capacity, % (n=221)

During the study, we found a correlation between physical working capacity and quality of life in older adults (Figure 2).

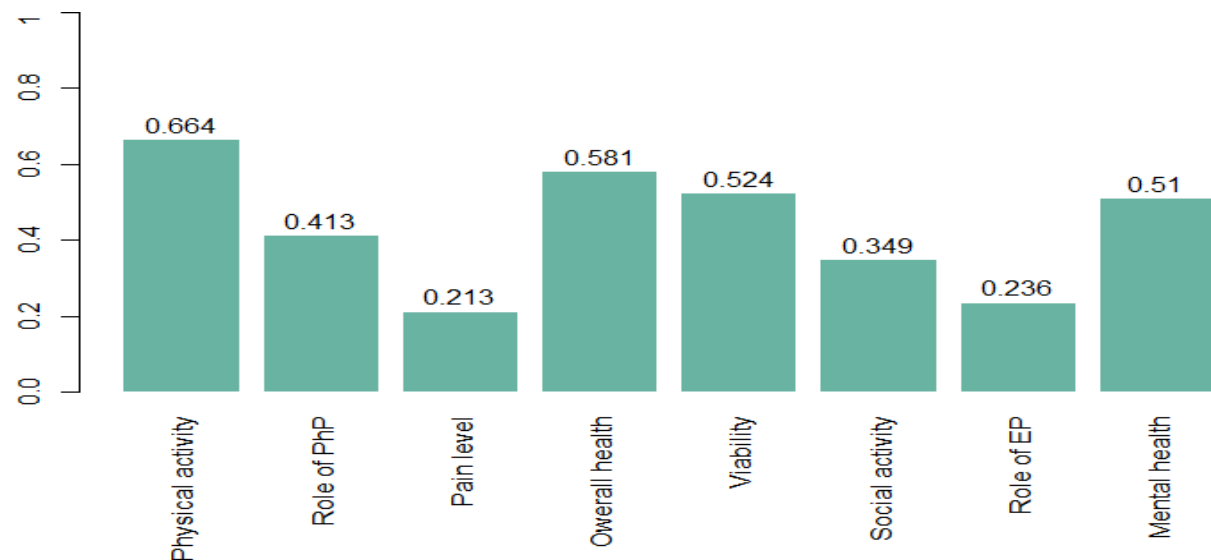


Figure 2. Correlation between physical working capacity and indicators of quality of life in older adults (n=221)

Physical performance is moderately correlated with all variables in the Life satisfaction domain (Table 2).

Table 2. Correlation between physical working capacity and life satisfaction in older adults (n = 221).

Parameter 1	Parameter 2	Spearman correlation coefficient	p-value
PhisDis.num	Interest in life	.319	.002088 ***
PhisDis.num	Consistency in achieving goals	.320	.001983 ***
PhisDis.num	Consistency between goals and objectives	.357	.0005158 ***
PhisDis.num	Overall mood background	.358	.0004974 ***
PhisDis.num	Life Satisfaction Index Num	.370	.0003058 ***

All correlation coefficients were significant at the level $\alpha = .05$.

DISCUSSION

In recent years, a number of studies have reported the positive effects of physical activity on slowing the aging process. Moderate physical activity improves the functions of the cardiorespiratory system affected by disease and increases their reserves (Bianco, et al, 2019). Physical exercise can have a positive effect on metabolism (Drozdovska, et al, 2020). Regular exercise increases the body's tolerance to adverse environmental factors and improves resistance to disease. According to studies conducted in countries with a high level of involvement of the population in physical activity, from 50% to 70% of the population over 65 years of age assess their health as good or satisfactory. However, it is important to take into account that the aging of Ukrainian population under unfavorable social economic and environmental conditions is accompanied by a decrease in physical activity, a sharp deterioration in health, and a catastrophic increase in the number of chronically ill people.

According to our study, life satisfaction in the elderly is depend on the relationships within the family and the presence of friends and a socially important group. In particular, Pavlova Iu. Vovkanych L, & Vynogradskyi B. (2014) report that life satisfaction is influenced by social economic factors (income and well-being), marital status, physical activity, and health.

It has been found that there are gender differences in the feeling of satisfaction with life in older adults (Theofilou, P., 2013; Hapala, Eero, Lee, Earric & Laukkanen, Jari., 2020). For example, women are more likely to report psycho-emotional manifestations and dissatisfaction with their own health. In particular, the attitude to own helplessness and morbidity in old age is dependent on gender. Women focus more on their own health, visit doctors often, and complain about their illnesses.

Sirgy, M. J., Michalos, A. C., Ferriss, A. L., Easterlin, R. A., Patrick, D., & Pavot, W. (2006) identified a number of relationships, many of which are prognostic. Life satisfaction is affected by health: healthier people are happier than people who have health problems. Life satisfaction was found to be associated with marital status: married people are significantly more satisfied with life than single people. Association of life satisfaction with income level was also identified (Yelizarova, O, Stankevych, T, Parats, A, Antomonov, M, Polka, N, & Hozak, S., 2020).

Life satisfaction is a complex integrated concept that accumulates many factors and aspects. Hakman A. (2019) believes that the factors influencing life satisfaction include the following: personal and family safety; material well-being; family well-being; setting creative goals; creative self-realization; fruitful leisure; good

social climate; decent social status; effective informal social contacts; social stability, confidence in the future; comfortable living environment; and good health.

We confirmed the data on the deterioration of some indicators of quality of life with age that were reported by Yelizarova et al. (2020). Such changes reflect the deterioration of physical and mental health that occurs with age and the global trend towards an increase in the number of people with chronic diseases. Similar data on the relationship between health and physical working capacity, physical activity, and morphofunctional indicators in middle-aged men and women were reported by Haapala et al. (2020) and Monteiro et al. (2020).

Researchers emphasize the close association between quality of life and level of physical working capacity of older persons. For example, Yu. Pavlova et al. (2014) found that participation in health-enhancing and recreation activities can improve (up to 1.6 times) the quality of life of older and oldest-old persons, in particular, by increasing the level of physical working capacity. Improvements in quality of life were observed on the scales that measure the amount of daily physical activity, mood, and social activity. Our research confirmed these results.

The findings of our study of the relationship between physical working capacity and quality of life of older people makes contributions to, clarifies and extends the theoretical and methodological knowledge on the formation, support, and improvement of quality of life in this age group. Increasing the level of physical activity of older persons through active leisure provides an opportunity to adapt to changes in the environment, promotes social integration, and improve quality of life and life satisfaction (Shim, Yu-Jin, Choi, Ho-Suk, Shin, Won-Seob, 2019).

The current findings are important for designing special health-enhancing and recreational programs aimed at improving the quality of life. Physical activities should be organized based on the recommendations of Ahn, Yong-Duk & Shin, Jeong-Hun on differences in levels of physical loads for the older and oldest-old persons and of Şahin, Gülşah & Coşkun, Ali & Apaydin, Serap. (2018) on the impact of physical activity on the indicators of functional condition and physical fitness of older-age women.

CONCLUSIONS

This study has determined physical working capacity of older adults. Lower than average (37.4%) and average (31.0%) levels of physical working capacity prevailed among the respondents. The quality of life has been also determined in older persons. For this age group, among the indicators of the physical component of health, the most significant one was Physical Functioning (34.36 ± 1.8 points), and among the mental component of quality of life, the most significant was Vitality (59.34 ± 1.8 points). Among the respondents, 68.2% had low level of life satisfaction and 25.3% had average level. We found a close relationship between these parameters. Physical working capacity is closely related to the indicators of quality of life such as Physical Functioning (0.664), Overall.mood.background (0.581), and Vitality (0.524). However, physical working capacity was found to be associated with all indicators of life satisfaction. All correlation coefficients were significant at the level $\alpha = .05$.

DISCLOSURE STATEMENT

There were no conflicts of interest.

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