

Effect of recreational activities in urban parks on the overall condition of sedentary older adults

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Abstract.

The objective of the study was to examine the effect of an outdoor program including health-enhancing and recreational physical activities in urban parks on physical and emotional status of the elderly. The following methods were used in the study: physical activity was assessed with Framingham Physical Activity Index, quality of life was studied with Medical Outcomes Study Questionnaire Short Form (SF-36), life satisfaction was evaluated with Life Satisfaction Index, cognitive functions were assessed with MMSE test, emotional status was assessed with Well-being-Activity-Mood (WAM) technique, test PWC150 was used to assess physical working capacity, and psychosocial adjustment was evaluated using the modified Rogers and Dymond's questionnaire. The data were analyzed using statistics. The study involved 51 women and 50 men aged 60-65 years. The outdoor program was developed for old-age people and lasted 6 months. The program included three periods: preparatory (lasted one month), main (lasted four months) and maintaining (lasted one month). It includes the following physical activities: Nordic walking, breathing exercises and stretching, exercises at various park locations using stairs, benches, Swedish wall, horizontal bar, and parallel bars. The effectiveness of the outdoor program of health-enhancing and recreational physical activity in urban parks was evidenced by the positive changes in the emotional state (5.5-6.2 points), in the indicators of quality of life (physical activity was 81.3±0.6 points in men and 85.8±0.6 points in women, general health was 76.4±0.3 points in men and 75.4±0.3 points in women, social activity was 72.3±0.7 points in men and 78.5±0.9 points in women, viability was 72.6±1.1 points in men and 83.4±1.3 points in women, and mental health was 72.6±1.1 points in men and 76.4±0.7 points in women), in the life satisfaction index (25% of men and 27.4% of women had a high level of LSI), in physical fitness (42.0% of men and 25.5% of women had a higher than average level of physical working capacity), and in mental working capacity (13.7% of women and 18.0% of men had a very high level of concentration). Participation in the developed outdoor program contributed to increasing the levels of physical activity and mental and physical working capacity, improving quality of life and life satisfaction, psychosocial adjustment, cognitive functions, and emotional status (WAM) of the elderly. The results of the study were used to develop and substantiate the social project 'Active parks are healthy locations in Ukraine'.

Key words: old age, physical activity, general health condition, quality of life, satisfaction, outdoor program.

Introduction.

The issue of increasing the level of physical activity during leisure time in old age has an important place in scientific research in physical culture and sports, geriatrics, and medicine (Andrieieva O., et al. 2019; Barbosa, B.T. et al., 2019; Blanka Dwojaczny et al., 2021; Federici A., Palanca R. 2019; Samuel Honório et al., 2021). Often, a tendency to a reduction in physical activity level is observed in elderly (Ebubekir Aksay, 2021). Hypokinesia ranks fourth among the factors that cause premature mortality worldwide. In Ukraine, a significant percentage of the population is not involved in health-enhancing and recreational physical activity. This, combined with ignoring other components of a healthy lifestyle, results in the average life expectancy of citizens that is ranked among the worst in Europe (Dutchak M.V., 2015). Only 3% of older adults in Ukraine have an adequate amount of physical activity (Hakman A. et al., 2019). Low level of physical activity leads to the development of diseases of the cardiovascular, nervous, and endocrine systems as well as of the musculoskeletal system, causes general deterioration of health, and accelerates age-related involutional changes in the body (Samuel Honório, 2021).

Providing a safe, barrier-free, and healthy-built environment for activities is critical to encouraging seniors' physical activity (Zhai et al., 2020). Therefore, it is extremely necessary to implement various programs

aimed at overcoming the above mentioned social challenge. A significant reserve in this regard is seen in physical recreation – one of the areas of implementation of health-enhancing and recreational physical activity. Recreational and health-enhancing activities are of a pronounced recreational nature in old age, the main purpose of these is to improve the physical and emotional condition of a person and to develop motivation for regular exercise. Exercise classes for the elderly have a focus on health promotion and disease prevention (Ebubekir Aksay, 2021). Theoretical and technological aspects of the introduction of physical recreation in the leisure of the elderly have been reported in the studies (Balatska L et al. 2020; Eliane Aparecida Franco et al., 2021; Levy-Storms Lene, 2017; Meungguk Park et al., 2020; Minyong Lee et al., 2021).

More and more elderly people are staying indoors for a long time that leads to the increase in the incidence of specific diseases and conditions associated with the disturbance of the natural balance between energy expenditure and energy intake. As a result, the people is increasingly using relatively long stays in natural environments (parks, mountains, forests, aquatic environment, etc.) to recover, to improve health condition, and to increase working capacity. However, their leisure activities in these places may be very close to a resting state by the energy expenditures.

The connection between physical activity and the nature of the environment is obvious (Kahlmeier, 2011). In the scientific publications, special attention is paid to the possibility of organizing health-enhancing outdoor activities, in particular in urban parks (Li D Deal et al., 2018; Javad Sarvestan et al., 2020). Analysis of scientific literature and best practices of recreational activities in urban parks shows that in many countries the park environment is an important center for active leisure of various segments of the population. In this context, urban parks, as the entities of the leisure industry, are the most accessible for daily leisure activities of all groups of the population. Recreational activity in urban parks involves conducting entertainment events, which are characterized by emotional switching and festivity as well as are different from the daily lives of the visitors. These events include the unusualness and variety of activities, the ability of organizers to stimulate the interest of visitors and to encourage them to participate in recreational programs despite the embarrassment and inertia.

The influence of physical exercises in parks on the physical and emotional status and the level of physical activity of the elderly was addressed in the study (Levy-Storms Lene et al., 2017; Barbosa B.T. et al., 2019). The relationship was found between the amount of physical activity and the size of the park and the available locations for physical activities (Zhai et al., 2020). A positive effect on improving the health condition and well-being of old-age people was also reported (Humpel N., 2002; Zhai Yujia, 2020). Nevertheless, significant limitations of the methods that were used in these studies should be noted. Most studies were based on the data of the assessment of the level of physical activity using self-reported questionnaires. However, these methods are susceptible to recall bias and may not accurately represent actual activity levels. Another problem is the lack of research focused on studying the relationship between physical activity, life satisfaction, emotional state, and physical working capacity of the elderly.

Our research was aimed at determining the impact of recreational activity in urban parks on key components of quality of life and life satisfaction, cognitive functions, physical working capacity, and emotional state of people aged 60-65 years.

Materials and methods.

The study involved 101 people aged 60-65 years, including 51 women and 50 men. Inclusion criteria were used in screening participants: the participant should be aged 60 and above, the participant did not need walking aids, received medical clearance to participate, and provided informed consent. Exclusion criteria were: decompensated state at the beginning of the study, inflammatory disease in the acute phase.

The study was conducted in accordance with the ethical principles of the World Medical Association Declaration of Helsinki. The study was conducted at the National University of Ukraine on Physical Education and Sport (Kyiv, Ukraine). Ethical approval was obtained from the Ethics Commission of the NUUPES (No. 2 on 16.12.2019). All the participants gave their written informed consent to the personal data processing, as well as to further processing of the obtained data for scientific purposes.

The program of health-enhancing and recreational activity in places of public recreation lasted 6 months (from April to October 2020). According to the schedule, group classes were offered three times a week (Monday, Wednesday, Saturday). The predominant activities were Nordic walking and mass sports events. The main purpose of the proposed program was to involve the elderly in health-enhancing and recreational physical activity in urban parks and to increase the effectiveness of the impact of recreational and health-enhancing physical activity on the physical and emotional condition of the elderly.

The program was designed to last six months and included three periods: preparatory, main, and maintaining. The preparatory period of the recreation and health-enhancing program lasted one month (4 weeks), the main period lasted from second month to fifth month, and the maintaining period lasted over sixth month of the program.

The preparatory period of the program was designed to effectively adapt the participants to the new social environment (microsociety), social group, sports community, norms, and rules; formation of motivation for systematic exercise classes, realization of opportunities, overcoming oneself, adherence to the norms of a

healthy lifestyle through responsible behavior in society. The main means of the period were aerobic activities with a moderate exercise load as well as cultural and educational trips and excursions.

The main period of the program was designed to encompass 16 weeks (from 5 to 19 week). The main purpose of this period was to acquire theoretical and practical knowledge for use later. Among the forms of activities organization in the main period were group classes, mass sports events, such as mass race "Active Life", sports quiz "Active Aging", and health promoting quest "Movement is Above All". The exercise classes included mainly aerobic activities.

The maintenance period lasted from 20 to 24 weeks, during this period the level of physical and emotional state of the elderly was maintained. During the maintenance period, the following tasks were addressed: achieving a long-term cumulative training effect, normalization of physical and emotional status of the elderly, and development of motivation for a healthy lifestyle.

The classes had conventional structure and included the preparatory part (warm-up), main part, and final part (cool-down). The preparatory part was focused on warming up the muscles and slow increasing the heart rate to values that correspond to the age characteristics of the elderly. Warm-up part increased the effectiveness of subsequent exercises and reduced the likelihood of injuries of the musculoskeletal system. During the warm-up, the main emphasis was given to moderate stretching of all muscle groups that allowed to increase and improve blood circulation. Furthermore, theoretical and methodological guidelines were provided in this part of the class that contributed to the development of motivation to a healthy lifestyle.

The main part lasted 30-40 minutes and involved the sets of aerobic exercises (walking, Nordic walking, and exercises at various park locations: bench, horizontal bar, Swedish wall, and stairs). During the exercises, special attention was paid to proper breathing and to the correct technique of exercise.

The final part of the classes lasted from 5 to 10% of the total class duration. The main tasks of this part were the gradual reduction of heart rate to a level close to normal and recovery of the functional state of the body. Simple general gymnastic exercises were performed in this part along with breathing exercises and stretching.

To assess the effectiveness of the proposed outdoor program for the elderly in the urban park environment, the study was conducted. At the beginning of the study, no significant differences in physical and emotional state between the participants of the study were observed.

To assess the quality of life the Medical Outcomes Study Questionnaire Short Form (SF-36) was used.

The level of physical activity was assessed using Framingham Physical Activity Index. To assess the life satisfaction of the subjects, we used the Life Satisfaction Index A (LSIA) developed by Bernice L. Neugarten et al. (1961) and adapted by N.V. Panina (1993).

Physical performance was assessed using the PWC150 test. The PWC150 test includes the assessment of individual's power output at a standard exercise load, at which heart rate (HR) reaches 150 bpm that is the maximum for old age people. ,

Emotional status was assessed with the Well-being-Activity-Mood (WAM) technique (Doskin et al., 1973). The Mini-Mental State Examination (MMSE) test was used to evaluate cognitive status of the subjects. The level of success of psychosocial adjustment was evaluated using the modified Rogers and Dymond's questionnaire.

Systematization and primary analysis of the data were performed with Microsoft Excel 2010 spreadsheets. Statistical analysis of the data was performed using the STATISTICA 8.0 software. The Wilcoxon test was used to analyze the statistical significance of the differences between the data. To measure the association between variables, the Pearson correlation coefficient were calculated. In each case, the hypothesis was tested and the *p*-value was calculated. Conclusions in significance testing were made at a significance level of 0.05.

Results.

At the end of the study the subjects had the high level of the following indicators of quality of life: physical activity was 81.3 ± 0.6 points in men and 85.8 ± 0.6 points in women, general health was 76.4 ± 0.3 points in men and 75.4 ± 0.3 points in women, social activity was 72.3 ± 0.7 points in men and 78.5 ± 0.9 points in women, viability was 72.6 ± 1.1 points in men and 83.4 ± 1.3 points in women, and mental health was 72.6 ± 1.1 points in men and 76.4 ± 0.7 points in women.

The results of the study showed an increase in the number of the subjects with the medium level (from 3.6% to 5.7% in women and from 3.7% to 4.1% in men) and the high level (from 1.1% to 2, 9% in women and from 1.5% to 2.1% in men) of specially organized physical activity during the day. It should be noted that during the study, the physical activity index (PAI) was found to have a trend to increase both in men and women aged 60-65 years (Table 1).

Table 1

Daily physical activity of persons aged 60-65 years in places of public recreation (parks) at the beginning and at the end of the study (n=101)

Level of physical activity	Women, n=51				Men, n=50			
	baseline mean		follow-up mean		baseline mean		follow-up mean	
	year	points	year	points	year	points	year	points
Basal level	10.03	10.03 ± 0.63	9.67	9.67 ± 0.63	10.15	10.15 ± 0.84	9.86	9.86 ± 0.63
Sedentary level	8.81	9.69 ± 1.17	8.49	9.34 ± 1.17	8.4	9.24 ± 2.26	8.71	9.58 ± 1.17
Light level	4.03	6.05 ± 1.04	3.77	5.66 ± 1.04	4.2	6.3 ± 1.78	3.94	5.90 ± 1.04
Moderate level	0.86	2.07 ± 0.85	1.37	3.29 ± 0.85	0.89	2.13 ± 0.73	0.98	2.36 ± 0.85
High level	0.26	0.32 ± 0.82	0.69	3.45 ± 0.82	0.36	1.8 ± 0.86	0.50	2.52 ± 0.82
Daily physical activity index	28.16 ± 2.24		31.41		29.62 ± 3.28		30.22	

The assessment of psychosocial adjustment of the subjects showed that, at the beginning of the study, self-perception, perception of others, and emotional comfort were at a low level. However, at the end of the study, there was a tendency to an improvement in all indicators of psychosocial adjustment ($p < 0.05$).

The data of the study indicate the correctness of the conclusion that health-enhancing and recreational activities have a positive effect on life satisfaction indicators (Fig. 1). Statistically significant differences were found between the indicators at the beginning and at the end of the study ($p < 0.05$).

It should be noted that at the beginning of the study, cognitive impairments and mild dementia were found in 3.9% of women and 4.0% of men aged 60-65 years. However, at the end of the study, their condition improved. Cognitive impairments were not found in either women or men aged 60-65 years that confirms the positive impact of the proposed technology.

One of the important components of the program was an increase in the level of physical and mental working capacity of persons aged 60-65.

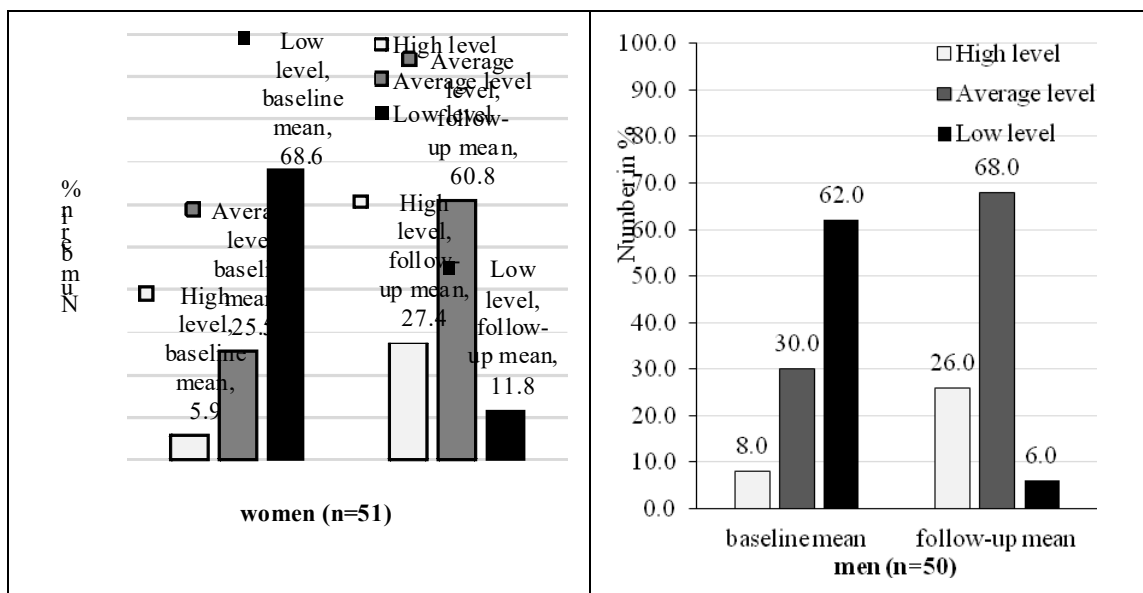


Figure 1. Life Satisfaction Index (LSI) in old-age persons at the beginning and at the end of the study (by B. L. Neugarten et al. (1961) technique adapted by N.V. Panina (1993), %).

At the end of the study, the percentage of men with a higher than average level of physical performance increased to 42.0%, 34.0% of men had an average level, and 16.0% had a high level (Fig. 2). At the end of the study, most of the women had an average (41.2%), a higher than average (25.5%), and a lower than average (17.6%) levels of physical working capacity. Among the men, 16% had a high and 42% had a higher than average levels; and among the women, 4.0% had a high and 30.0% had a higher than average levels of physical working capacity ($p = 0.05$).

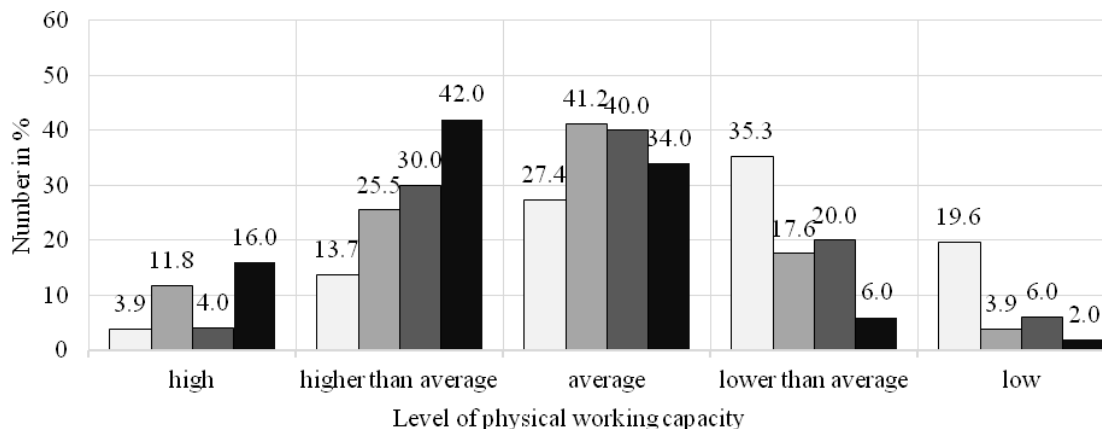


Figure 2. Physical working capacity of the subjects at the beginning and at the end of the study (n=101), %:

The data of the assessment of mental working capacity at the end of the study demonstrated the similar trend. For example, 13.7% of women and 18.0% of men were found to have a very high level, and 23.5% of women and 38.0% of men had a high level of concentration. It should be noted that, at the end of the study, no persons were identified with low mental working capacity.

Assessment of the psycho-emotional state of the elderly in both gender groups at the beginning of the study revealed the low level of the indicators of well-being, activity, and mood, which ranged from 2.8 to 3.4 points. Furthermore, there was no significant difference between the groups (Table 2).

At the end of the study, the indicators of well-being, activity and mood of the elderly (assessed by the WAM technique) (n=101) showed a significant increase in activity from 3.4±0.3 to 6.2±0.2 points in women and from 3.0±0.2 to 5.5±0.4 points in men.

Discussion.

The continuous increase in the proportion of the old-age people is one of the most significant challenges of the 21st century. Maintaining the health of the elderly is impossible without preventive measures including moderate physical activity, healthy nutrition, hardening the body, and regular medical checkups. Systematic physical exercise has a positive effect on the mental condition of the elderly, increases physical activity, improves emotional condition and mood, and reduces anxiety (Andrieieva O. et al.,2019; Federici A. et al., 2019; Eliane Aparecida Franco et al., 2021).

Table 2

Psycho-emotional state of the subjects at the beginning and at the end of the study assessed using Well being-Activity-Mood (WAM) technique (n=101), points

Component	Women (n=51)				Men (n=50)			
	baseline mean		follow-up mean		baseline mean		follow-up mean	
	\bar{x}	m	\bar{x}	m	\bar{x}	m	\bar{x}	m
Well-being	3.4	0.3	6.1	0.2	2.9	0.5	5.8	0.3
Activity	2.8	0.5	6.2	0.3	3.0	0.2	5.5	0.4
Mood	3.0	0.1	5.9	0.4	3.4	0.3	6.1	0.2

Studies on the involvement of the elderly in physical activities in urban parks are promising (Chulhwan Choi, 2019). One strategy for increasing physical activity is to create and enhance access to park space. Scientists note that physical activities in urban parks are accessible and safe for the elderly (Cohen DA, 2017). The studies have assessed the influence of physical exercises in parks on the level of physical activity of the elderly. In particular, it is noted that the level of motor activity is influenced by the size of the park, the availability of specially designed routes, special areas for exercise, and the necessary inventory and equipment (Li D Deal, 2018). It is emphasized that the use of traditional and innovative means of physical activity has a positive effect on the health of the elderly (Federici A., Palanca R., 2019). In particular, it is noted that the use of exercise equipment in parks can significantly increase the physical activity of the elderly as they are significantly limited in the ability to use exercise equipment indoors.

Scientists have demonstrated the positive effect of Nordic walking on the body of the old-age people (Williamson S, 2017). A large body of studies shows the effectiveness of using outdoor activities to improve psycho-emotional state and to increase the level of physical and mental working capacity of older people (Chulhwan Choi, 2019). Researchers point out that regular physical activities in an outdoor format helps to

reduce morbidity, improve the quality and duration of active life, prevent disease and overcome illness (Dewulf B, 2016).

The results of our study confirmed the published data on improving the quality of life and life satisfaction in people engaged in outdoor physical activities (Hakman A. et al., 2020; Humpel N., 2002; Levy-Storms Lene, 2017; Williamson S., 2019). Our data are consistent with the findings on the effectiveness of involvement of the elderly in regular exercise in urban parks.

The findings of our study suggest that women had a higher level of life satisfaction compared to men. These results seem to be consistent with other research (Boguszewski, Adamczyk & Ochal, 2012), which found that women are happier, more vigorous, and have a higher level of mental health because physical activity is an important factor in the physical and psychological well-being of people. The similar results were obtained regarding physical working capacity of women. In contrast, men participated in regular physical exercise had higher rates of mental working capacity.

The present study has some limitations that should be considered. We used a convenient sample of seniors visiting the parks who volunteered to participate in the study. It is uncertain whether this population group displayed characteristics that may influence the physical activity data systematically. Future studies should consider combining pedometers, accelerometers, heart-rate monitors for more accurate estimates of activity intensity, activity duration, and energy expenditure.

Conclusion.

We have studied the influence of the outdoor program including health-enhancing and recreational physical activities on the basis of urban parks on physical and emotional status of the elderly. The effect of the program was observed in increasing the levels of physical activity and mental and physical working capacity, improving quality of life and life satisfaction, psychosocial adjustment, cognitive functions, and emotional state of the elderly. As a result of pedagogical influence the indicators of motor activity, quality and satisfaction of life, mental and physical working capacity, rates of ageing, social and psychological adaptation, cognitive functions, psychoemotional state at realization of author's technology in places of public entertainment have improved. Indicators of well-being, activity and mood of the people under study at the end of the study (according to the method of Well-being-Activity-Mood) ($n = 101$), show a significant increase in activity from 3.4 ± 0.3 points to 6.2 ± 0.2 points in women and from 3.0 ± 0.2 points to 5.5 ± 0.4 points in men. Physical performance at the end of the study also improved. In men, a high level of physical performance corresponded to 16%, above average - 42%; in women, a high level corresponded to 4.0%, and above average - 30.0% ($p = 0.05$). The recommendations were implemented in the practice of health-enhancing and recreational activities of urban parks of Kyiv and Chernivtsi as well as were used to develop and substantiate the social project "Active parks are healthy locations in Ukraine".

The obtained data reveal the possibilities and horizons of using health-improving and recreational motor activity in Ukraine to increase the number of people involved in physical activity in order to meet the leisure needs of the elderly, improve their quality of life, active longevity.

Conflict of Interest. The authors declare that there is no conflict of interest that could be perceived as interfering with publication of the article.

Competing Interests. The authors declare that they have no competing interests.

Ethical Approval. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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References

- Andrieieva, O., Hakman, A., Kashuba, V., Vasylenko, M., Patsaliuk, K., Koshura, A., & Istyniuk, I. (2019). Effects of physical activity on aging processes in elderly persons. *Journal of Physical Education and Sport*, 19, 1308–1314. <https://doi.org/10.7752/jpes.2019.s4190>
- Andrieieva, O., Kashuba, V., Carp, I., Blystiv, T., Palchuk, M., Kovalova, N., & Khrypko, I. (2019). Assessment of emotional state and mental activity of 15-16 year-old boys and girls who had a low level of physical activity. *Journal of Physical Education and Sport*, 19, 1022–1029. <https://doi.org/10.7752/jpes.2019.s3147>
- Barbosa, B.T., Santos, R.L., Chaves, A.B., Brindeiro-Neto, W., Pereira, T., Silva, A.I., Soares, L.I., & Brasileiro-Santos, M.S. (2019). Self-related quality of life of elderly submitted to a 12-week aquatic training program. *Journal of Human Sport and Exercise*, 14(2), 281-291. doi:<https://doi.org/10.14198/jhse.2019.142.03>

- Blanka Dwojaczny, Tomasz Zegarski & Piotr Złomańczuk (2021). Body fat and cognitive performance in elderly women: role of physical activity. *Journal of Physical Education and Sport*, 21 (Suppl. issue 3), 2136-2141. <https://efsupit.ro/images/stories/iulie2021/Art%20272.pdf>
- Chulhwan Choi, Chul-ho bum (2019). Physical leisure activity and work for quality of life in the elderly. *Journal of Physical Education and Sport*. 19 (2). 1230–1235. <https://efsupit.ro/images/stories/iulie2019/Art%20178.pdf>
- Cohen DA, Han B, Evenson KR, Nagel C, McKenzie TL, Marsh T, Williamson S, Harnik P. (2017). The prevalence and use of walking loops in neighborhood parks: a national study. *Environ Health Perspect*. 125:170-174; <http://dx.doi.org/10.1289/EHP293>.
- Cranney L, Phongsavan P, Kariuki M, Stride V, Scott A, Hua M, et al. (2016). Impact of an outdoor gym on park users' physical activity: A natural experiment. *Health & Place*. 37:26–34. 10.1016/j.healthplace.2015.11.002
- Dewulf B, Neutens T, Van Dyck D, de Bourdeaudhuij I, Broekx S, Beckx C, et al. (2016). Associations between time spent in green areas and physical activity among late middle-aged adults. *Geospatial Health*. 11:225–32. 10.4081/gh.2016.411
- Drozdovska, S., Andrieieva, O., Yarmak, O., & Blagii, O. (2020). Personalization of health-promoting fitness programs for young women based on genetic factors. *Journal of Physical Education and Sport*, (1), 331–337. doi:10.7752/jpes.2020.s1046
- Dutchak, M.V. (2015). Paradigm of health-related motor activity: theoretical substantiation and practical application. *Theory and Methods of Physical Education and Sport*, 2,44-52. DOI: 10.32652/tmfvs. (in Ukrainian)
- Ebubekir Aksay (2021). Live online exercise programs during the Covid-19 pandemic – are they useful for elderly adults? *Journal of Physical Education and Sport*, 21 (4). 1650–1658. DOI:10.7752/jpes.2021.04209
- Eliane Aparecida Franco, Leticia Pechnicki Dos Santos, Claudia Oliveira Alberico, Roberto Simão & Rogério César Fermino (2021). Effect of strength training using resistive equipment in hydro gymnastics classes on functional fitness of middle-aged and older women. *Journal of Physical Education and Sport*, Vol 21 (Suppl. issue 3), pp 2150 – 2156 <https://efsupit.ro/images/stories/iulie2021/Art%20274.pdf>
- Federici A., Palanca R. (2019). Home-fitness: physical exercise and elderly's quality of life. *Journal of Physical Education and Sport*. Vol 19 (5). 1852-1855 <https://efsupit.ro/images/stories/october2019/Art%20273.pdf>
- Hakman, A., Andrieieva, O., Kashuba, V., Duditska, S., Horiuk, P., Khrypko, I., Lukashiv, T. (2021). Influence of physical working capacity on quality of life and life satisfaction in old-age population of Ukraine. *Journal of Human Sport and Exercise*. 16(2), 202-211.
- Hakman Anna, Andrieieva Olena, Kashuba Vitalii, Nakonechnyi Igor, Cherednichenko Serhiy, Khrypko Inna, Tomilina Yuliia, Filak Felix, & Moldovan Andriy (2020). Characteristics of biogeometric profile of posture and quality of life of students during the process of physical education. *Journal of Physical Education and Sport*, 20(1), 10, 79-85.
- Hakman, A., Andrieieva, O., Kashuba, V., Omelchenko, T., Ion, C., Danylchenko, V., & Levinskaia, K. (2019). Technology of planning and management of leisure activities for working elderly people with a low level of physical activity. *Journal of Physical Education and Sport*, 19, 2159–2166. <https://doi.org/10.7752/jpes.2019.s6324>
- Humpel N., Owen N., Leslie E. (2002). Environmental Factors Associated with Adults' Participation in Physical Activity: a review. *American Journal of Preventive Medicine*. 22(3). 188–199.
- Javad Sarvestan, Zuzana Kováčiková, Petr Linduška, Zuzana Gonosová, Zdeněk Svoboda (2020). Age-related effects on lower extremities muscular strength, sit-to-stand, and functional reaching tests among community-dwelling elderly females. *Journal of Physical Education and Sport*, Vol. 20 (6). 3391-3399 DOI:10.7752/jpes.2020.06459
- Kahlmeier S., Cavil N., Dinsdale H. (2011). Health Economic Assessment Tools (HEAT) for Walking and for Cycling. Methodology and User Guide. Economic Assessment of Transport Infrastructure and Policies. Copenhagen: WHO Regional Office for Europe, 39 p.
- Kashuba V., Andrieieva O., Hakman A., Grygus I., Smoleńska O., Ostrowska M., ... Zukow W. (2021). Impact of Aquafitness Training on Physical Condition of Early Adulthood Women. *Teoriã ta Metodika Fizičnogo Vihovannã*, (2), 152-157.
- Lee, D., Hong, S., Lee, K., & Lee, G. (2021). Analysis of the lower extremity muscle activity depending on the use of a knee aid in elderly people with osteoarthritis. *Journal of Human Sport and Exercise*, 16(2). 463-469. https://rua.ua.es/dspace/bitstream/10045/106102/6/JHSE_16-2_20.pdf
- Levy-Storms, Lene & Chen, Lin & Loukaitou-Sideris, Anastasia. (2017). Older Adults' Needs and Preferences for Open Space and Physical Activity In and Near Parks: A Systematic Review. *Journal of Aging and Physical Activity*. 26. 1-45. 10.1123/japa.2016-0354.
- Li D, Deal B, Zhou X, Slavenas M, Sullivan WC. (2018). Moving beyond the neighborhood: Daily exposure to nature and adolescents' mood. *Landsc Urban Plan*. 173:33–43. 10.1016/j.landurbplan.2018.01.009

- Meungguk Park, Emeka Anaza, Heejine Shin, Simon M. Pack & Morgan Chitiyo (2020). Relationship between physical activity and quality of life in older adults: A metaanalysis. *Journal of Physical Education and Sport*, 20 (6), 3467–3477. <https://efsupit.ro/images/stories/decembrie2020/art%20468.pdf>
- Minyong Lee, Sung-Jin Lee, Sheryl Renee Robinson & Kathleen R. Parrott (2021). Relationship between physical activity levels and perceived residential environment for rural older adults. *Journal of Physical Education and Sport*, 21 (3), 1317–1324. <https://efsupit.ro/images/stories/mai2021/Art%20167.pdf>
- Motor activity of different social groups: Collective monograph. In: Balatska L, Liasota T, Nakonechnyi I, Hakman A, Bezverkhnia H, Kljus O, et al., edited by. Riga, Latvia: “Baltija Publishing”; 2020. p. 104.
- Otávio Augusto Soares Machado, Sephans Vinicius Pires De Campos, Luiz Francisco Killian, Giovanna Athanasio Chaves Machado, Fábio Gianolla (2020). Effect of a single exercise session on blood glucose and blood pressure in elderly. *Journal of Physical Education and Sport*. 20 (5). 2637–2642. <https://efsupit.ro/images/stories/septembrie2020/Art%20359.pdf>
- Rentería, I., García, P.C., Cantón, E., Grandjean, P., & Jiménez, A. (2019). Salivary Immunoglobulin A responses to 6-minute walk test in elderly women. *Journal of Human Sport and Exercise*, 14(1). 225-235. https://rua.ua.es/dspace/bitstream/10045/81407/6/JHSE_14-1_19.pdf
- Roemmich, J. N., Johnson, L., Oberg, G., Beeler, J. E., & Ufholz, K. E. (2018). Youth and Adult Visitation and Physical Activity Intensity at Rural and Urban Parks. *International journal of environmental research and public health*, 15(8), 1760. doi.org/10.3390/ijerph15081760
- Samuel Honório, Marco Batista, João Petrica, Jorge Santos, João Serrano, Júlio Martins (2021). Pilates and satisfaction with life in elderly. *Journal of Physical Education and Sport*. 21 (1). 152–158. DOI:10.7752/jpes.2021.01021
- Stride V, Cranney L, Scott A, Hua M. (2017). Outdoor gyms and older adults - acceptability, enablers and barriers: a survey of park users. *Health Promot J Aust*. 28:243–6. 10.1071/HE16075
- Zhai, Yujia and Li, Dongying and Wang, De and Shi, Cheng (2020). Seniors' Physical Activity in Neighborhood Parks and Park Design Characteristics. *Frontiers in Public Health*. 8:322. doi.org/10.3389/fpubh.2020.00322