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Research article

EXPLORING THE INTERPLAY OF PHYSICAL ACTIVITY LEVELS AND QUALITY OF LIFE IN ELDERLY MEN: A MULTIDIMENSIONAL PERSPECTIVE

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Abstract. *As the global population continues to age, understanding and addressing the complex interplay between physical activity (PA) and quality of life (QoL) among old people is becoming increasingly imperative. The aim of this study was to determine whether the level of PA is related to the QoL in elderly men. Using a set of eight variables of PA and four for quality of life assessment, an evaluation of physical activity and quality of life was performed on a sample of 666 senior men (67.37±5.68 years). The level of PA was measured using the IPAQ questionnaire, while the QoL was evaluated by the World Health Organization Questionnaire (WHOQoL-BREF). A canonical correlation analysis was conducted to identify any relationships. Statistical significance was set at p< .01. The results showed that statistically significant relationships were found between moderate PA and the Environmental Health domain of QoL (Sig.= .000). Additionally, relationships were found between overall Walking activity, total PA, and Leisure Physical Activity and Physical and Psychological Health, as well as Social Relationships (Sig.= .003). This study confirmed that different domains of PA are related to the quality of life in elderly men.*

Key words: *old men, exercise, physical health, psychological health, quality of life.*

1. INTRODUCTION

Elderly men represent a distinct demographic group characterized by unique health needs (Paltasingh & Jena, 2021) and behavioral patterns (Schrempft, Jackowska, Hamer, & Steptoe, 2019). As the world's population ages (Vollset, Goren, Yuan, Cao, Smith et al., 2020), it is becoming increasingly important to understand the complex relationships

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between physical activity and quality of life among the elderly. United Nations data indicates a 2% increase in the number of the elderly between 1950 and 2000, with projections estimating that they will make up 22% of the total population by the year 2050 (UNFPA, 2012). Simultaneously, the elderly population reduces overall physical activity (Hakman, Balatska, & Liasota, 2016), impacting their quality of life (QoL). It is currently recommended that older persons engage in 150–300 minutes of moderate-intensity exercise or 75–150 minutes of vigorous-intensity exercise per week. In order gain extra health benefits, it is also advised to perform strengthening exercises two or more days a week at a moderate to high intensity (WHO, 2020).

Physical activity represents a cornerstone in promoting physical health and well-being among elderly men. Regular exercise provides a comprehensive strategy for improving health outcomes in this population (Izquierdo, Merchant, Morley, Anker, Aprahamian et al., 2021), including cardiovascular benefits (Hall, Hyde, Bassett, Carlson, Carnethon et al., 2020), musculoskeletal improvements (Carcelén-Fraile, Lorenzo-Nocino, Afanador-Restrepo, Rodriguez-Lopez, Aibar-Almazan et al., 2023), and metabolic regulation (Pataky, Young, & Nair, 2021). Additionally, engaging in regular physical activity can help manage risk factors such as obesity (Koolhaas, Dhana, Schoufour, Ikram, Kavousi et al., 2017), high cholesterol levels (Chen, Luo, Su, Wang, Fang et al., 2024), and insulin resistance and diabetes (Shabkhiz, Khalafi, Rosenkranz, Karimi, & Moghadami, 2021) thereby mitigating the burden of cardiovascular disease.

Musculoskeletal health is paramount for maintaining mobility, independence, and quality of life in elderly men (Morie, Reid, Miciek, Lajevardi, Choong et al., 2010). Physical activity, particularly resistance training and weight-bearing exercises, has been shown to promote bone density (Maddalozzo & Snow, 2000), muscle strength (Granacher, Lacroix, Muehlbauer, Roettger, & Gollhofer, 2013), and joint flexibility (Stathokostas & Vandervoort, 2016), thereby reducing the risk of falls, fractures, and mobility limitations. Moreover, exercise interventions targeting musculoskeletal health have demonstrated efficacy in improving functional status and enhancing overall physical performance in elderly men (D'Onofrio, Kirschner, Prather, Goldman, & Rozanski, 2023).

The benefits of physical activity extend beyond physical health to encompass mental well-being among elderly men. Regular exercise has been associated with reduced risk of depression (Currier, Lindner, Spittal, Cvetkovski, Pirkis et al., 2020), anxiety (Kazeminia, Salari, Vaisi-Raygani, Jalali, Abdi et al., 2020), and cognitive decline (Law, Lam, Chung & Pang, 2020), as well as improved self-confidence (Franco, Tong, Howard, Sherrington, Ferreira et al., 2015). Furthermore, participating in group-based physical activities can foster social connections, provide a sense of purpose, and enhance overall quality of life in later years (Vagetti, Barbosa Filho, Moreira, Oliveira, Mazzardo et al., 2014). Despite the potential benefits, elderly men may face barriers when engaging in physical activity, including health concerns, lack of social support, and environmental constraints (Spiteri, Broom, Bekhet, De Caro, Laventure et al., 2019). Understanding how different exercise levels interact with physical, psychological, social, and environmental domains of QoL could affect the overall well-being in elderly men.

The World Health Organization (WHO, 1997) defines quality of life (QOL) as “an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards, and concerns”. Therefore, quality of life is a multidimensional concept and encompasses physical, psychological, social, environmental, and personal factors (Sinha, 2019).

Improving overall health can positively impact quality of life, but addressing particular domains is also essential for enhancing overall well-being.

Understanding the nuanced impacts of varying levels of physical activity on the quality of life (QoL) domains in elderly men is paramount for crafting targeted interventions that truly enhance their overall well-being. Low-intensity activities, such as walking or gentle stretching, facilitate mobility (Morie et al., 2010), life satisfaction (An, Chen, Wang, Yang, Huang et al., 2020), and a connection to the natural environment, thereby promoting physical health and a sense of tranquility. Moving to moderate-intensity exercises like cycling or swimming, elderly men not only experience improvements in cardiovascular fitness, and reduce the risk of heart failure (Aune, Schlesinger, Leitzmann, Tonstad, Norat et al., 2021), but also enjoy significant enhancements in psychological well-being, including increased mental health (Marconcin, Werneck, Peralta, Ihle, Gouveia et al., 2022). Meanwhile, high-intensity activities such as resistance training provide robust benefits for physical health (Bai, Soh, Omar Dev, Talib, Xiao et al., 2022) and psychological well-being (An et al., 2020), though they may pose challenges that need to be addressed.

Although evidence demonstrates that, for older adults, PA improves Health-Related Quality of Life (HRQoL) and well-being when compared with minimal or no-treatment controls, there are some interesting mixed results which undermine the claim about the effectiveness of physical activity in improving QoL among the elderly (Marquez et al., 2020). Namely, a study conducted by Baxter et al. (2016) that intended to assess the effectiveness of interventions across the transition to retirement was inconclusive because of insufficient evidence. Another study (Chou, Hwang, & Wu, 2012) revealed no discernible difference in the QoL between Tai Chi, resistance, aquatic, and flexibility exercise groups and control groups among frail elderly individuals. According to Marquez's (2020) systematic review of physical activity and quality of life and well-being, several studies provided too few results to reach conclusions about the relationship between PA and QoL. The inconsistent findings from previous research highlight the importance of further investigation into the relationship between different levels of physical activity and various domains of QoL, especially in particular demographics such as frail older persons, elderly people with different health conditions, elderly men/women, etc. Therefore, it is imperative to delve deeper into these relationships to provide more consistent and conclusive evidence, which can inform interventions and policies aimed at enhancing the well-being of older adults.

Our goal in this study is to clarify the complex relationship that exists between various physical activity levels and elderly men's quality of life in terms of their physical, psychological, social, and environmental domains. Through a multidimensional approach and interdisciplinary collaboration, we endeavor to empower elderly men to lead active, fulfilling, and meaningful lives as they navigate the complexities of aging.

2. METHOD

2.1. The sample of respondents

The old male population, with an average age of 67.37±5.68 years, made up the sample of respondents. There were 666 respondents in the entire sample. The criteria for the selection of respondents was: aged between 60 and 80 years, being physically independent – able to walk 20 feet without assistance or rest, lack of cognitive abilities,

impairment and dementia, scored 24 points for educated and 18 points for unqualified respondents in the mini mental state assessment (McDowell, 2006). Also, respondents who recovered from an acute illness were excluded from the study. Participation in the study was voluntary and each respondent could withdraw from the study at any time. All of the respondents were fully informed about the risks and benefits of this study. Table 1 presents the basic characteristics of the respondents.

Table 1 Basic characteristics of the respondents

	Mean	SD
Age [years]	67.37	5.68
Body Hight[cm]	176.17	7.50
Body Weight [kg]	81.42	12.24
BMI [kg/m^2]	26.15	3.33

Legend: Mean – Arithmetic Mean; SD – Standard Deviation

2.2. The sample of measuring instruments

2.2.1. *Physical Activity*

The International Physical Activity Questionnaire, or IPAQ in its long version, was used as a self-assessment tool to estimate the degree of physical activity (Craig et al. 2003). The long IPAQ, with 27 items, gathers information on several domains (workplace, transportation, home, and recreational physical activity) and intensities (vigorous, moderate, and walking), as well as sitting time. For a study requiring a more thorough evaluation, this long format is advised (Craig, Marshall, Sjöström, Bauman, Booth et al., 2003). The metabolic equivalent (MET) concerning minutes per day was used to generate the scores for each reported level of PA. The total weekly MET-minutes (MET-min/wk) were calculated by adding MET-minutes for each PA intensity level (walking/low intensity = 3.3 METs; moderate intensity = 4.0 METs; high intensity = 8.0 METs). The study pattern was used to calculate the MET score (Craig et al., 2003). For all types of physical activity, an average MET score was calculated using the Ainsworth et al. (2011) Compendium. For example, to determine an average MET score for walking, different types of walking were taken into account collectively. The average MET scores for moderate- and vigorous-intensity activities were calculated using the same procedure. Previous research has demonstrated the validity and reliability of the IPAQ questionnaire (Battaglia, Bellafiore, Alesi, Paoli, Bianco et al. 2016; Tran, Do, Pham, Nguyen, Xuong et al. 2020).

2.2.2. *Quality of life*

A short form of the internationally standardized World Health Organization questionnaire, WHOQOL-BREF (Berlim, Pavanello, Cardieraro & Fleck, 2005), was used to measure quality of life. The survey consists of 26 items divided into 4 categories: the Physical Health, Psychological Health, Social relationships, and Environmental Health domain. Individual scores can be found for each category. Every question in the domain was given on a five-point Likert scale, with the following possible answers: (1) minimal, (2) little, (3) moderate, (4) very much, and (5) extreme. Greater values are indicative of a higher standard of living. The WHOQOL-BREF questionnaire validity and reliability were demonstrated in numerous studies (Hanestad et al., 2005; Ohaeri and Awadalla 2009; Ilić et al., 2019; Kalfoss et al., 2021).

2.3. Statistical analysis

The mean and standard deviation (Mean±SD), descriptive statistics of basic elements were computed for each variable. The Pearson correlation coefficient was used to find associations between physical activity and quality of life. A canonical correlational analysis was used to determine the impact of physical activity on the respondents' quality of life. Statistica v10.0 was used as the statistical software to process all of the data. The level of significance was set at .05.

2.4. Study design and procedures

To participate in the study, the respondents had to fill out a questionnaire about their levels of physical activity and quality of life. The researchers provided additional clarification and instructions to each participant about the questionnaires and how to complete them. The respondents filled out the questionnaire by hand. Answers to the questions could be submitted at any time. Participation in the study was completely voluntary, and each respondent had the right to cease their participation at any time while filling out the survey. Notification was given to the respondents that their responses would be kept confidential and that the information would only be utilized for research purposes. Incomplete questionnaires were not included in the further analysis. The questionnaire also contained sociodemographic inquiries. The study was conducted in accordance with the Declaration of Helsinki and standards for research involving human subjects (Christie, 2000; WMA, 2008). The Ethical Board of the Faculty of Sport and Physical Education of the University of Niš approved this research (No. 04-346/2).

3. RESULTS

Basic descriptive characteristics of the predictor and criterion variables are shown in Table 2.

Table 2 Basic descriptive parameters of the predictor and criterion variables.

	Mean	Std. Dev
PA AT WORK	1275.48	2865.83
PA IN TRANSPORT	995.97	1986.80
PA AT HOME	2076.23	2936.96
LEISURE TIME PA	1134.40	2125.06
WALKING	1551.50	2323.86
MODERATE-INTENSITY PA	3000.71	4033.07
HIGH-INTENSITY PA	929.88	1889.49
TOTAL PA	5482.08	6032.22
PHYSICAL HEALTH	23.49	3.48
PSYCHOLOGICAL HEALTH	20.19	2.78
SOCIAL RELATIONSHIPS	9.84	2.04
ENVIRONMENT	27.29	4.81

The cross correlations of predictors and criteria are shown in Table 3. Based on the results shown in Table 3, it can be concluded that cross correlations between the predictors and criteria are low (r=.00-.16).

Table 3 Cross correlations of the predictors and criteria

	Physical Health	Psychological Health	Social Relationships	Environment Health
PA AT WORK	0.04	0.03	0.11	-0.2
PA IN TRANSPORT	0.08	0.07	0.12	0.04
PA AT HOME	0.05	0.08	0.01	0.08
LEISURE PA	0.11	0.16	0.08	0.10
WALKING	0.08	0.11	0.15	0.00
MODERATE-INTENSITY PA	0.12	0.15	0.07	0.12
HIGH-INTENSITY PA	-0.03	-0.04	0.07	-0.01
TOTAL PA	0.10	0.13	0.13	0.08

In order to determine the relationship between the level of physical activity and the quality of life of older men, a canonical correlation analysis was used (Table 4). It was determined that there is a statistically significant relationship between two pairs of canonical factors between the level of physical activity and the quality of life of the elderly men. In both canonical pairs, a statistically significant correlation was found at the level of p=0.00. The canonical correlation of the first pair was 0.23 (R=0.23), and in the second pair was 0.21 (R=0.21). Also, the coefficient of determination for the first pair was 0.05 (R^2=0.05), and for the other was 0.04 (R^2=0.04).

Table 4 An isolated canonical function for elderly men

	R	R^2	Chi-square	df	p
0	0.23	0.05	78.53	32	0.000**
1	0.21	0.04	43.30	21	0.003**
2	0.13	0.02	13.36	12	0.343
3	0.05	0.00	1.54	5	0.909

R – canonical correlation; R2 – coefficient of determination; Chi-square – Bartlett's Chi-square Test; df – degree of freedom; p – level of significance; ** - p<0.01.

Table 5 shows two canonical pairs presenting both the levels of physical activity and quality of life in older men. In the case of the first canonical pair, within the level of physical activity, the highest value was achieved by total Moderate physical activity (0.51), while the highest value within the quality of life was the Environmental Health domain (0.73). This factor could be named *"Factor of Moderate Physical Activity"*. Also, the highest negative values of the second canonical pair within the level of physical activity were determined for total Walking activity (-0.83), Total PA (-0.71), and Leisure PA (-0.61), while the highest negative values of the second canonical pair within quality of life were determined for Psychological Health (-0.75), Social Relationships (-0.77), and Physical Health (-0.63). This factor could be named "*Factor of Physical Activity at Spare Time*".

Table 5 Factor structure for the group of elderly men.

PA variables	Root 1	Root 2	QoL variables	Root 1	Root 2
PA AT WORK	-0.33	-0.46	Physical Health	0.44	-0.63
PA IN TRANSPORT	-0.09	-0.58	Psychological Health	0.54	-0.77
PA AT HOME	0.40	-0.17	Social Relationships	-0.26	-0.75
LEISURE PA	0.43	-0.61	Environmental Health	0.73	-0.15
WALKING	-0.22	-0.83			
MODERATE-INTENSITY PA	0.51	-0.55			
HIGH-INTENSITY PA	-0.32	-0.07			
TOTAL PA	0.16	-0.71			

Legend: PA – Physical Activity; Root – factor.

It can be concluded that a statistically significant association was found between Moderate PA and the Environmental Health domain of QoL (p=0.00). Also, a statistically significant association was found between total Walking activity, Leisure PA, and Total PA with Social Relationships, Physical, and Psychological Health (p=0.00).

4. DISCUSSION

The aim of this study was to determine whether physical activity of different intensity was related to the quality of life in elderly men. This study discovered indications for positive relationships between the physical activity of elderly men and several quality of life domains. The study findings showed that there were significant relationships between moderate PA and the Environmental Health domain of QoL. Furthermore, relationships were found between Total PA, overall Walking activity, and leisure PA on the one hand and Physical and Psychological Health, and Social Relationships domains of QoL on the other.

The findings revealed significant relationships between the level of moderate physical activity and the Environmental Health domain among the elderly men. Similar results were obtained in the study conducted by Fox et al. (2007). In their study, moderate physical activity was associated with environmental health, but also with physical and psychological health. According to the WHO (1998), the Environmental Health domain encompasses various aspects crucial to an individuals' overall well-being, including physical safety and security, the home environment, financial resources, accessibility and quality of health and social care, opportunities for acquiring new information and skills, participation in recreation/leisure activities, the physical environment (e.g., pollution, noise, traffic, climate), and transportation. The relationships found in our research suggest that elderly men who engage in moderate physical activity may experience improvements in their environmental segment of quality of life. This could imply that by being moderately physically active, these individuals may perceive their surroundings as safer, more conducive to their needs, and more supportive of their overall well-being. Physical activity of moderate intensity can enhance strength, joint flexibility, balance, and coordination, reducing the risk of falls and injuries (Stathokostas & Vandervoort, 2016; Papalia et al., 2020). Feeling physically stronger and more stable may lead elderly men to perceive their environment as safer and less daunting, thereby improving their overall sense of security. Moderate physical activity can potentially reduce healthcare costs by preventing or managing chronic conditions associated with aging, such as cardiovascular disease or diabetes (Hall et al., 2020; Shabkhiz et al., 2021). With improved health outcomes, elderly

men may experience less financial strain related to medical expenses, thereby enhancing their overall financial well-being.

Studies show that total physical activity, walking and leisure physical activity are connected to physical health, as a domain of QoL. The results of previous studies (Koltyn, 2001; Fox et al., 2007) also showed that leisure physical activity is associated with physical health. Leisure physical activity not only includes exercise as a means of improving physical health, but also some other psychological elements that can influence overall health and well-being. Engaging in regular physical activity, regardless of type, is associated with numerous physical health benefits (Hall et al., 2020; Pataky et al., 2021; Izquierdo et al., 2021; Carcelén-Fraile et al., 2023). Leisure activities such as exercise, household chores, or active transportation contribute to improved cardiovascular health, weight management, and overall fitness levels (Koolhaas et al., 2017; Hall et al., 2020; Shabkhiz et al., 2021). These improvements can lead to a higher perceived level of physical health and vitality.

Our results showed that walking is connected to a physical health. Walking is a low-impact form of exercise accessible to most individuals. Regular walking is linked to improvements in health-related physical fitness, and balance (Papalia et al., 2020; Bai et al., 2022), joint function (Stathokostas & Vandervoort, 2016), and overall mobility (Morie et al., 2010). Elderly men who engage in regular walking may experience reduced risk of chronic disease, improved balance, and enhanced stamina, contributing to a better perception of physical health.

The results also show that total PA, walking, and leisure physical activity are connected to Psychological Health, which is congruent with some previous studies (Vuillemin, Boini, Bertrais, Tessier, Oppert et al., 2005; Jurakic, Pedisic & Greblo, 2010). Regular PA is associated with reduced symptoms of anxiety, depression, and stress (Kazeminia et al, 2020; Currier et al., 2020). The release of endorphins during exercise can elevate mood and improve cognitive function (Law et al., 2020), leading to a greater sense of psychological well-being. Elderly men who incorporate regular walks into their routine may experience enhanced emotional resilience and psychological health (Marselle, Warber, & Irvine, 2019). Furthermore, engaging in leisure activities provides opportunities for enjoyment, creativity, and self-expression, which can contribute to positive mental health outcomes.

Our study shows that Total PA, Walking, and Leisure PA are related to Social Relationships. Results from a study by Fox et al. (2007) showed that walking is positively associated with the domain of social relations. That can be explained by the fact that physical activity often involves social interaction, whether through group exercise classes, team sports, or walking with friends. These social connections foster a sense of belonging and support, which are vital for maintaining positive social relationships. Elderly men who engage in regular physical activity may have broader social networks and more opportunities for social engagement (Živković, Milanović, Đošić, Vulpe, Purenović-Ivanović et al., 2024). Leisure PA also provides an opportunity for socializing and connecting with others, and building supportive social networks.

5. CONCLUSIONS

The results provided valuable insights into the correlation between physical activity and various domains of quality of life among elderly men, encompassing Physical Health, Psychological Health, Social Relationships, and Environmental Health. Understanding how different levels of physical activity impact their quality of life empowers elderly men to make informed decisions regarding their health and well-being. By leveraging this understanding, they can adjust their lifestyle to optimize their overall quality of life in their later years.

Moreover, this knowledge carries significant implications for institutions and organizations focused on elderly care. They can utilize these findings to develop tailored policies and programs that promote physical activity among elderly men, thereby supporting their well-being. Implementing initiatives aimed at encouraging physical activity and fostering a supportive environment for elderly men can contribute to a more fulfilling and enjoyable aging experience. The limitation of this study is primarily reflected in the subjective assessment of the respondents. It is assumed that better results would be obtained in the domain of physical activity if objective instruments were used for its assessment. Also, this study is transversal by design. It could be suggested that the study would be improved if it included an organized approach for monitoring physical activity and its relation to elderly men's quality of life.

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ISTRAŽIVANJE ODNOSA IZMEĐU NIVOA FIZIČKE AKTIVNOSTI I KVALITETA ŽIVOTA KOD STARIJIH MUŠKARACA: MULTIDIMENZIONALNI PRISTUP

Kako globalna populacija nastavlja da stari, razumevanje i rešavanje složene međuzavisnosti između fizičke aktivnosti (FA) i kvaliteta života kod starijih osoba postaje sve važnije. Cilj ove studije bio je da utvrdi da li je nivo FA povezan sa kvalitetom života kod starijih muškaraca. Korišćenjem seta od osam varijabli FA i četiri za procenu kvaliteta života, izvršena je evaluacija fizičke aktivnosti i kvaliteta života na uzorku od 666 starijih muškaraca (67,37±5,68 godina). Nivo FA je meren pomoću IPAQ upitnika, dok je kvalitet života procenjen putem upitnika Svetske zdravstvene organizacije (WHOQoL-BREF). Korišćena je kanonička korelaciona analiza za identifikaciju odnosa. Statistička značajnost je postavljena na p< .01. Rezultati studije su pokazali da su utvrđene značajne veze između umerene FA sa domenom kvaliteta života koji se odnosi na životnu sredinu (Sig.= .000). Pored toga, pronađene su veze između ukupne aktivnosti hodanja, ukupne FA i fizičke aktivnosti u slobodnom vremenu sa fizičkim i psihološkim zdravljem, kao i sa socijalnim odnosima (Sig.= .003). Ova studija je potvrdila da su različiti domeni FA povezani sa kvalitetom života kod starijih muškaraca.

Ključne reči: *stariji muškarci, vežbanje, fizičko zdravlje, psihološko zdravlje, kvalitet života.*