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Association between physical activity behavior and quality of life among older adults

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ABSTRACT

The aim of this study was to determine whether physical activity and health-related quality of life (HRQL) are associated in apparently healthy older adults. The study design was a cross-sectional study. Measurements were obtained from 164 community-dwelling older adults (52 men and 112 women; 70±8 years, mean±SD), selected using a convenience sampling technique from a community health center in Yogyakarta, Indonesia. Data were collected using a medical history questionnaire, HRQL from the Medical Outcomes Survey short form-36 questionnaire, and physical activity level from the Johnson Space Center physical activity scale. Subjects were separated into low (n=70) and high (n=94) physical activity groups according to the physical activity scale. The higher physical activity group had significantly higher HRQL scores across all eight domains (p<0.05). Compared with the less active group, the more active group had a lower prevalence of hypertension (52% vs. 71%, p=0.030), fewer women (49% vs. 63%, p=0.036), physical function (81±21 vs. 69±20, p=0.031), role physical (82±33 vs. 62±35, p=0.022), vitality (73±16 vs. 60±15, p=0.001), social function (91±19 vs. 84±20, p=0.044), and bodily pain (83±24 vs. 67±22, p=0.001). The two groups did not differ (p>0.05) in terms of mental health, role emotional, or general health. HRQL scores in both physical and mental domains were higher in healthy older adults who consistently engaged in moderate-intensity physical exercise for more than 1 hour per week compared to those who were less physically active. Because this study used a cross-sectional design, these associations should not be interpreted as causal; nevertheless, older adults who are less active or only moderately active may benefit from increasing their physical activity levels to improve their HRQL.

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Introduction

Physical, functional, social, and psychological well-being are among the many aspects of health that are included in successful aging (Serena et al., 2025). As the number of older adults rises, maintaining a decent standard of living into old age is becoming a more pressing public health concern. In fact, increasing the number and quality of years of healthy living is one of the main objectives of Healthy People 2018-2023 (Ministry of Health, R.I., 2018;2023). Health-related quality of life (HRQL) is the term for quality of life, which is often examined in studies to assess the health of both clinical and general populations (Shuyun et al., 2021). Physical and social functioning, emotional well-being, role activities, and personal health views are all essential components of an HRQL evaluation (Shuyun et al., 2021; Lawrance, et al., 2020).

According to the results of previous research, it has been stated that patients with depression (Khodadad et al., 2022), intermittent claudication (Lindy et al., 2016), cardiovascular disease (Ades, & Savage., 2021), and numerous organ dysfunctions (Malmgren et al., 2021) all benefit from physical exercise in terms of HRQL. Regardless of age, health, or activity level, a 2023 evaluation found that physical activity typically in the form of endurance and/or resistance training exercises was favorably correlated with HRQL (Shuyun et al., 2021; Ministry of Health, R.I., 2023). People who achieved the prescribed levels of physical activity had higher HRQL than their less active counterparts, according to data from the 2023 in numbers, which included a large sample with a variety of demographic and physical features. Few of these research, however, have examined the connection between physical activity and all dimensions of HRQL in older persons in good health (Ministry of Health, R.I., 2023; Rema et al., 2021). To date, no study conducted in Indonesia has systematically examined the association between physical activity and all eight SF-36 HRQL domains among apparently healthy, community-dwelling older adults; this specific gap is the novel contribution addressed by the present study.

The health benefits of physical activity in older people are widely recognized (Mora et al., 2018; Sangeeta et al., 2018; Moreno-Agostino et al., 2020). These benefits include a lower risk of cardiovascular disease, diabetes, hypertension, cancer, and all-cause mortality. Whether physical exercise enhances particular HRQL domains is unclear, though. In a carefully chosen sample of sedentary older persons with either high normal blood pressure or mild hypertension but no clinical signs of chronic diseases, physical activity was linked to less physical pain, according to a recent investigation (Chen et al., 2023). The limited variation in physical activity level of this sedentary sample may have contributed to the lack of correlation between physical activity and the other HRQL variables. Therefore, it may be important to examine both sedentary and physically active older persons in order to define the relationship between physical activity and HRQL. This study's primary goal was to ascertain whether physical exercise was related to HRQL in older, seemingly healthy participants.

Method

Study design and participants recruitment

The design of this study was cross sectional with a survey study to ascertain whether physical activity and HRQL were associated in older, seemingly healthy, Yogyakarta, Indonesia. A total of 164 individuals (52 male and 112 female) between the ages of 60 and 89 were selected using a convenience sampling technique from among the elderly who were actively enrolled at the closest health care location in the community and who lived in the Yogyakarta community health center's working area. Prior to the trial, each participant completed a signed consent form. This study covered both males and women who were 60 years of age or older. Due to the potential confounding effects that cardiovascular diseases may have on both physical activity and HRQL, participants with a history of overt cardiovascular disease (i.e., myocardial infarction, stroke, congestive heart failure, lower extremity revascularization, and peripheral arterial disease confirmed by an ankle/brachial index<0.90) or chronic obstructive pulmonary disease were excluded. Illustrates the participant's recruitment flow chart based on the consort diagram on Figure 1.

Procedures and Instruments

Demographic measures and medical history

Each participant provided a thorough medical history. All of the aforementioned exclusion criteria were covered in the medical history, along with other concomitant diseases such diabetes, hypertension, dyspnea, hyperlipidemia, and arthritis. Measuring flexibility of the elderly using instruments chair and sit reach test with the CSR test has good stability reliability for both men (R=0.92) and women (R=0.96) and that its criterion validity correlations (r=0.76 for men and .81 for women) (Jessie et al., 2013). Participants were classified using WHO standards based on their BMI (Liao et al., 2024). Using a statometer, height was measured to the closest 0.1 centimeters, with a maximum capacity of 200 meters. Using a balance scale, weight was determined to the closest 0.1 kg, with a maximum capacity of 120 kg. Body mass index (BMI) was then calculated using height and weight measurements: BMI=(weight in kilograms)/(height in meters)^2, before measuring BMI, the instrument is calibrated to ensure accurate results (WHO, 2019). A Critikon automatic Dinamap sphygmomanometer was used to assess blood pressure and heart rate after ten minutes of supine rest (Ades, & Savage., 2021). The research protocol was approved by the human ethics committee of Universitas Negeri Yogyakarta (Agreement No.T/143.3/UN34.9/PT.01.04/2025).

Physical activity

According to their scores on the Johnson Space Center physical activity scale, subjects were categorized into either a lower or greater physical activity group, as previously reported (Szczepan et al., 2023). Scores on this scale include the following: 0 represents avoiding physical activity; 1 represents light physical activity done occasionally; 2 represents moderate physical activity done regularly for less than an hour per week; 3 represents moderate physical activity done regularly for more than an hour per week; 4 represents heavy physical activity performed regularly for less than thirty minutes per week; 5 represents heavy physical activity performed regularly between thirty and sixty minutes per week; and 6 represents heavy physical activity performed regularly between one and 7 is defined as engaging in vigorous physical exercise on a regular basis for more than three hours per week. The participants were asked to choose the number that most accurately reflected their level of physical activity throughout the preceding month. The low physical activity group (n=70) consisted of subjects with a score of 2 or lower, and the high physical activity group (n=94) consisted of subjects with a score of 3 or higher. Subjects who score less than three on this Likert scale were significantly behind the American College of Sports Medicine's and the Centers for Disease Control's minimal physical activity standards (Andrew et al., 2019), while those who score three or more are either meeting or surpassing these recommendations. Peak oxygen uptake (Szczepan et al., 2023), and monitored physical activity ($r=0.44$, $p< 0.001$) in older persons (Liao et al., 2021) can both be measured using the Johnson Space Center physical activity assessment. Additionally, gender-specific models and a generalized model that includes both men and women have verified the prediction of peak oxygen uptake using the Johnson Space Center physical activity scale (Peter et al., 2018).

Health-related QoL

HRQL was evaluated throughout the preceding four weeks using the Medical Outcomes Survey Short Form-36 (MOS SF-36) questionnaire (Garratt & Stavem, 2017). A popular, accurate, and trustworthy criteria measure of HRQL in many populations is the MOS SF-36 (Shuyun et al., 2021). Eight areas of HRQL related to both physical and mental health are measured by scoring the 36 questions in the MOS SF-36 questionnaire (Brazier et al., 2020; Lins et al., 2016). The domains of vitality, social functioning, role limitations due to emotional health (role-emotional), and mental health comprised the mental component of HRQL, while the domains of physical functioning, role limitations due to physical health (role-physical), bodily pain, and general health comprised the physical component (Brazier et al., 2020). The MOS SF-36 has strong internal consistency, with cronbach's alpha ranging from 0.76 to 0.90 across all questionnaire areas (Roser et al., 2019).

Statistical Analysis

The HRQL and demographic assessments between the high active and low active groups were compared using unpaired t-tests on continuous variables. To find differences between the two groups in the prevalence of comorbid conditions derived from the medical history, chi-square tests were run on categorical data. After controlling for group differences in demographic and comorbid parameters, analysis of covariance was used to see if the differences in HRQL assessments between the high active and low active groups remained. $p=0.05$ was chosen as the threshold for statistical significance. Measurement results are expressed as mean±standard deviation (SD). Data were analyzed using SPSS® version 27.0 (IBM Corp., Armonk, NY, USA) with a significance level of 0.05, with a confidence level of 95% (MacCallum, 1996). No a priori sample-size or power calculation was performed for this analysis; the achieved sample size reflects the number of eligible volunteers recruited during the study period, and this is acknowledged as a limitation in the Discussion.

Results and Discussion

Table 1 <Subject Characteristics Between Those Who Have Lower and Higher Levels of Physical Activity>

Variables	Lower Physical Activity Group* (n=70)	Higher Physical Activity Group** (n=94)	Test Statistic***	p-value**** (95%CI)
Age (Years)	72 (8)	60 (8)	0,34	0,636 (0,567-1,023)
Weight (kg)	77,6 (15,3)	78,3 (15,8)	0,43	0.528 (0,429-1,203)
Height (cm)	157 (12,2)	160 (12,9)	0,39	0.619 (0,523-1,324)
Body Mass Index (kg/m^2)	28,4 (5,7)	27,9 (5,2)	0,91	0,324 (0,259-1,428)
Female (%)	63	49	0,29	0.036 (0,012-0,049)
Male (%)	20	32	0,32	0,712 (0,668-1,412)
Hypertension (%)	71	52	0,37	0.030 (0,010-0,048)
Fleksibilitas (%)	99	65	0,34	0.028 (0,001-0,047)

*Noted: *<150 minutes/week; **≥150 minutes/week; ***t-scores for continuous variables (age, weight, height, BMI); chi-square scores for categorical variables (sex, hypertension); ****significant (p<0,05)*

Table 1 shown the subjects' baseline characteristics in both physical activity groups. All data were comparable (p>0.05) across the two groups, with the exception of the prevalence of hypertension and the gender composition. Compared to the group reporting more physical activity, the lower physical activity group had a higher percentage of females (p=0.036) and a higher prevalence of hypertension (p=0.030).

Table 2 <Health-related Quality of Life Measures in Subjects Who Have Lower and Higher Levels of Physical Activity>

Variables	**Lower Physical Activity Group (n=70)**	**Higher Physical Activity Group (n=94)**	**Test Statistic***	**p-value** (95%CI)**
Physical Function	64 (25)	83 (16)	2,93	0,005 (0,001-0,049)
Role-physical	59 (40)	85 (25)	2,75	0,009 (0,013-0,076)
Role-emotional	70 (37)	92 (24)	2,30	0,026 (0,011-0,092)
Vitality	55 (20)	77 (13)	3,38	<0,001 (0,000-0,077)
Mental Health	75 (18)	85 (10)	2,19	0,032 (0,001-0,088)
Social Function	80 (17)	94 (17)	2,10	0,038 (0,011-0,708)
Bodily Pain	63 (27)	84 (18)	3,17	0,002 (0,000-0,587)
General Health	62 (20)	77 (16)	2,47	0,015 (0,000-0,198)

*Noted: *t-scores; chi square scores; **significant (p<0,05)*

Table 3 <Adjusted Health-related Quality of Life Measures in Subjects Who Have Lower and Higher Levels of Physical Activity>

Variables	**Lower Physical Activity Group* (n=70)**	**Higher Physical Activity Group** (n=94)**	**Test Statistic*****	**p-value**** (95%CI)**
Physical Function	69 (20)	81 (21)	4,92	0,031 (0,012-0,056)
Role-physical	62 (35)	82 (33)	5,39	0,022 (0,001-0,091)
Role-emotional	76 (32)	89 (31)	3,16	0,078 (0,010-0,098)
Vitality	60 (15)	73 (16)	10,97	<0,001 (0,000-0,036)
Mental Health	80 (12)	82 (14)	2,70	0,102 (0,098-1,343)
Social Function	84 (20)	91 (19)	3,77	0,044 (0,000-0,104)
Bodily Pain	67 (22)	83 (24)	9,89	<0,001 (0,000-0,096)
General Health	65 (14)	75 (13)	2,78	0,111 (0,056-1,781)

*Noted: Value were adjusted for gender and hipertention; *<150 minutes/week; **≥150 minutes/week; ***t-scores; chi square scores; ****significant (p<0,05)*

Table 2 shows that all eight HRQL domains were greater (p<0.05) in the high active group compared to the low active group. The following five HRQL categories continued to be higher in the high active group after controlling for gender and hypertension (Table 3): physical functioning (p=0,031), role-physical (p=0.022), vitality (p=0.001), social functioning (p=0.044), and bodily pain (p=0.001). After controlling for gender and hypertension, the dimensions of role constraints resulting from emotional health, mental health, and general health were no longer different (p>0.05) between the two exercise groups.

Discussion

The investigation's main conclusions were that healthy older persons who engaged in frequent, at least moderately intense physical activity for more than an hour a week had higher values in all eight HRQL domains than those who did not. The group with increased physical activity showed higher values in five of the HRQL areas than the group with reduced physical activity, even after controlling for gender and hypertension.

High-intensity exercise programs have been found to improve HRQL in both healthy and ill groups (Bracewell et al., 2022; Jacobsen et al., 2022; Sloan et al., 2021). Our research expands on previous findings by demonstrating that, in healthy older individuals, a variety of HRQL variables are positively correlated with less structured and intense physical activity (Raquel et al., 2018; Levy et al., 2020). Maintaining an active lifestyle helps older persons maintain their physical function (Wangui et al., 2019), which may lead to higher HRQL ratings in physical health-related areas. Habitual physical activity level was linked to reduced physical pain in a carefully chosen cohort of sedentary older individuals, but not with the other HRQL dimensions (Chen et al., 2023).

A physically active lifestyle is positively correlated with aspects of mental health in older individuals in addition to the physical health measurements of HRQL (Shuyun et al., 2021). The mental health domains of vitality and social functioning continued to be higher in the more physically active group after controlling for group differences in gender composition and the prevalence of hypertension, while the role-emotional and mental health domains were no longer different between the two groups. Therefore, independent of gender and hypertension, higher levels of physical activity are linked to improved vitality and social functioning scores (Chen et al., 2023).

This study's primary disadvantage is its cross-sectional design, which makes it impossible to determine a true causal relationship. It is plausible that HRQL influences physical activity, even if physical activity may influence HRQL. It should be mentioned that our recruitment strategies favored older people who reacted to flyers placed in public spaces and newspaper ads. Furthermore, without measuring different forms of physical activity, the Johnson Space Center questionnaire establishes a general level of physical activity (Jessie et al., 2013; Szczepan et al., 2023). Lastly, a somewhat small convenience sample of healthy older persons with minimal co-morbid illnesses was used in this investigation. As a result, the results of this study cannot be applied to older persons with more severe medical issues. The use of a cross-sectional design, which prevents the establishment of a meaningful causal relationship, is the primary weakness of this study. HRQL may influence physical activity, but it's also conceivable that HRQL influences physical activity. It should be mentioned that older people who reacted to newspaper ads and flyers displayed in public spaces were the target of our recruitment strategies.

Conclusions

In conclusion, compared to individuals who were less physically active, healthy older persons who engaged in regular physical exercise of at least moderate intensity for more than an hour each week had higher values in all eight HRQL domains. In five of the HRQL domains, the group with increased physical activity had higher values than the group with lower activity after controlling for gender and hypertension. These results support earlier findings that increased physical activity levels may enhance HRQL. As this study used a cross-sectional design, these associations should not be interpreted as causal, and reverse causation (poorer HRQL leading to reduced activity) cannot be ruled out. With this caveat in mind, adding more than an hour of moderate-intensity physical activity per week to the lifestyles of inactive or mildly active older people may enhance their HRQL.

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