

The Relationship Between Physical Activity and the Risk of Falling in the Elderly

Nur Isni Mega Sukandar¹, Jerry Maratis², Kesit Ivanali³,
Miranti Yolanda Anggita⁴

^{1,2,3,4}Faculty of Physiotherapy, Esa Unggul University, Jakarta

Corresponding Author: Nur Isni Mega Sukandar

DOI: <https://doi.org/10.52403/ijrr.20230872>

ABSTRACT

Objective: To determine the relationship between physical activity and the risk of falling in the elderly at Gajah Mada Health Center.

Methods: This research is quantitative descriptive research with the type of observational research. The total sample of 35 elderly people at Gajah Mada Health Center was obtained by purposive sampling technique. Examination of physical activity using the International Physical Activity Questionnaire-Short Form (IPAQ-SF) showed a mean \pm SD value of physical activity 906.9 ± 3926.5 and a fall risk measurement using the Functional reach test (FRT) showed a mean \pm SD value of $18.58 \pm 7,238$.

Results: Spearman-rank correlation coefficient correlation test obtained a value of $p = 0.018$ where $p < \text{value of } \alpha (0.05)$ with a value of $r = -0.396$ which shows a negative correlation between the two variables which means that when the level of physical activity increases, the risk of falling tends to decrease. Conversely, when the level of physical activity decreases, the risk of falling tends to increase.

Conclusion: There is a relationship between physical activity and the risk of falling in the elderly at Gajah Mada Health Center.

Keywords: Elderly, physical activity, risk of falling, *International Physical Activity Questionnaire-Short Form (IPAQ-SF)*, *Functional reach test (FRT)*

INTRODUCTION

The Central Bureau of Statistics states that the number of elderly people has increased

from 18 million people (7.6%) in 2010 to 27 million people (10%) in 2020. This figure is expected to continue to increase to 40 million people (13.8%) in 2035. Based on the results of the 2016 inter-census population survey, it is estimated that the number of elderly (aged 60 years and over) in Indonesia is 22,630,882 people. This figure is expected to increase to 31,320,066 people in 2022 (Supriyono, 2022)

Susenas data for March 2022 explains that the most elderly people in Indonesia are the young elderly age group, namely 60-69 years. Based on the Central Bureau of Statistics for Riau Province in 2023, there are 370,533 elderly people aged 60-69 years.

Geriatric syndrome describes clinical conditions in the elderly that can affect quality of life and daily activities. Geriatric syndromes include delirium, falls, urinary incontinence, functional dependence and depression. Geriatric syndrome refers to health conditions in the elderly that occur due to disorders in the organ systems that make the elderly more vulnerable in dealing with activities in daily life (Inouye et al., 2007)

The problem that is often experienced by the elderly is impaired walking ability and dynamic balance. Problems with the ability to walk in the elderly occur because when they reach old age, physiologically the body experiences changes and decreases in muscle flexibility, muscle elasticity, muscle

strength, muscle contraction, visual disturbances, vestibular system disorders, loss of tissue ability slowly to repair and maintain normal function, slow in responding, decreased proprioception, and decreased function of controlling the body to stay balanced so that the elderly are more likely to experience the risk of falling.

The ability to walk requires good dynamic balance and coordination. Dynamic balance is needed by everyone in carrying out their daily activities, for example when in a sitting position, standing statically, walking upright, running, and other functional activities carried out by the elderly. For this reason, the elderly must maintain their physical condition so that they remain good in dynamic balance and daily functional activities, and avoid the risk of falling that they can experience by always getting used to practicing to stay healthy, fit and productive, especially exercises to improve walking ability (Maratis, 2020)

Physical activity that must be done by the elderly is about 150 minutes per week with a global prevalence of physical activity is 21.4%. Lack of physical activity in the elderly can lead to increased chronic disease. Physical activities that can be done in the elderly are such as daily routine activities, self-care, cooking, shopping and etc. Participation in physical activity for the elderly aims to maintain and improve quality of life, health, physical function and reduce the risk of falling. (Langhammer et al., 2018)

A fall is an intentional or unintentional event that results in a person lying on the floor or a lower place. Data from the Centers for Disease Control and Prevention (CDC), every 19 minutes an elderly person is declared dead from falling every day and every year, 3 million elderly people are treated in the emergency room due to injuries due to falls. In a CDC study of more than 1,700 seniors aged 65 years or older, they were declared to have a fear of falling. This fear can be caused because the elderly has fallen or fallen several times. But it can also happen because it never fell at all.

Those who have a history of previous falls have a higher fear of falling than those who have never fallen at all. So this causes the elderly to limit social activities and physical activities (Thiamwong and Decker, 2020)

The International Physical Activity Questionnaire-Short Form (IPAQ-SF) is a questionnaire to measure physical activity in the elderly. This questionnaire evaluates various physical activities consisting of high-intensity, moderate-intensity to walking activities with 7 questions based on physical activity in the last 7 days. Meanwhile, moderate intensity physical activity is done ≥ 10 minutes/day, walking physical activity is done more than ≤ 30 minutes/day and high intensity physical activity is done ≥ 30 minutes/day. Physical activity assessed in the IPAQ-SF such as daily activities, walking, gardening, sports, etc. The IPAQ-SF score is calculated based on each type of activity that requires energy specified in the MET. MET is the ratio of a person's average working metabolic rate to the resting metabolic rate. One MET is defined as the amount of energy sitting still and is equivalent to 1 kcal/kg/hour of calories. 3.3 MET time spent in light activity (walking activity), 4 MET time spent in moderate intensity activity and 8 MET for time spent in vigorous activity. (Dharmansyah and Budiana, 2021)

The Functional Reach Test (FRT) is a tool to measure the maximum distance a person can reach forward beyond the arms while maintaining the feet in a standing position. This measuring instrument can be used to see physical balance in the elderly who have a history of Parkinson's disease, weakness in muscle atrophy, vestibular dysfunction and stroke. In the FRT test, the patient will be asked to stand parallel to a wall, close but not touching. Feet shoulder-width apart with 90 degrees of shoulder flexion and closed fists. In this position, the patient's fist can be measured (see 3rd metacarpal). Then instruct the patient to "Reach as far forward as you can without taking a step." without moving your feet. The score is determined by assessing the difference between the

initial and final positions. FRT was performed three times, with three trials and the average of the last two trials recorded (Merchán-Baeza et al., 2014)

LITERATURE REVIEW

Research conducted (Al Mubarroq et al., 2022) in Pakis Village, Beringin District, Semarang Regency explains that the majority of the work of the elderly in Pakis Village is farming. The elderly in Pakis Village is farming for a living so they can spend up to 8 hours in 1 day farming. The results of the study explain that the elderly who work as farmers have a high level of physical activity. The people of Pakis Village generally walk to work as farmers and farming is an activity with a heavy and high level of physical activity because when farming the elderly will hoe and lift heavy or light loads.

Whereas in a study (Anlya et al., 2023) in the city of Malang, the results showed that there were more elderly women, with the most age being 65 years and a history of work being housewives. This shows that someone with programmed work has a higher fitness value than someone who does not work. The conclusion from the research results is that there is a relationship between physical activity and fitness in the elderly community in Malang City, where the majority do a moderate level of physical activity.

Based on the statistical results, it was found that the value of fall risk was measured by the Functional reach test (FRT) which showed that the risk of falling experienced by the elderly at the Gajah Mada Health Center was a relatively low level of risk of falling. Research conducted (Pradnyanini et al., 2019) elderly will experience a decrease in musculoskeletal function due to the aging process. Decreased musculoskeletal function causes various health problems, one of which is an increased risk of falling, the risk of falling can increase due to lack of physical activity. This research was conducted on the elderly in West Denpasar with 41 respondents, the majority of which

consisted of female respondents. The results of this study indicate that more respondents have a low risk of falling because many elderly people participate in active physical activities in everyday life. This study indicates that the elderly who are physically active compared to those who are not active in doing physical activity will have a lower risk of falling.

The research above is also supported by research conducted (Sidik, 2021) at the Harapan Kita Panti Palembang with 38 respondents showing that most respondents have a low risk of falling. Elderly who has a good level of physical activity have a low risk of falling because the joints and muscles are always used to move so that they do not cause joint stiffness and reduced muscle mass.

MATERIALS & METHODS

This research is quantitative research, namely the process of research approach that goes straight to the ground using hypotheses and data analysis using aspects of measurement, calculation, formulas and certainty of numerical data. The type of research used is the type of observational research. The research design that will be used is descriptive analysis with a cross-sectional study, namely research conducted at a certain time and no other research has been carried out at different times to be compared during the research.

To determine physical activity in the elderly, measurements were made using the International Physical Activity Questionnaire-Short Form (IPAQ-SF) while to see the risk of falling in the elderly, measurements were carried out using the Functional Reach Test. The criteria for taking the sample consisted of acceptance criteria (inclusion criteria), rejection criteria (exclusion criteria) and abortion criteria (drop out criteria), namely:

- a. Inclusion criteria
 - 1) Elderly registered at the Gajah Mada Tembilahan City Health Center
 - 2) Elderly aged >60 years

- 3) Elderly without walking aids
- 4) Elderly who are willing to be respondents by filling out the research consent form from start to finish cooperatively
- b. Exclusion criteria
 - 1) The elderly is in a bed-rest state
 - 2) Elderly who has decreased consciousness with a Glasgow Coma Scale (GCS) value of <10
 - 3) Elderly with disabilities
 - 4) Elderly who has a history of post op and fractures during the last <6 months
- c. Drop Out Criteria
 - 1) Elderly who withdrew from this study
 - 2) Elderly who experienced pain at the time of the study

3) Elderly died

STATISTICAL ANALYSIS

The processing of data in this study uses the Statistical Program for Social Science (SPSS) for windows. In analyzing the data obtained, the researcher used several statistical tests, namely the Shapiro Wilk normality test, which resulted in a concentration of $p < 0.05$, so the data was not normally distributed, so the hypothesis test used was a non-parametric test because the data was not normally distributed. Then the hypothesis test will use the Spearman correlation test.

RESULT

Table 1 Research sample categories

Category	Total	Percentage
Age	N	%
60-64 Years	7	20,1%
65-69 Years	24	68,7%
70-74 Years	2	5,7%
75-79 Years	2	5,7%
Gender	N	%
Man	17	48,6%
Women	18	51,4%
Employment history	N	%
Housewife	11	31,4%
Retired civil servants	5	14,3%
Farmer	13	37,1%
Self-employed	6	17,1%
BMI category	N	%
Underweight	6	17,1%
Normal	11	31,4%
Overweight	10	28,6%
Obesitas 1	8	22,9%
Physical activity index	N	%
Low physical activity	9	25,7%
Moderate physical activity	8	22,9%
High physical activity	18	51,4%
Fall risk index	N	%
Low fall risk	15	42,9%
Moderate fall risk	7	20,0%
The risk of falling is high	13	37,1%

Table 1 explains the sample categories in this study, namely the distribution of samples based on age, showing that of the 35 research samples, it was found that the highest percentage was 65.8% with an age range of 65-68 years (23 samples), 18 samples were female with a percentage of 51, 4%. This shows that in this study more

samples were female with the highest percentage. Then the most employment history with the highest percentage of 37.1% were farmers (13 samples) and the normal BMI category (11 samples) with the highest percentage of 31.4%. The results of calculating physical activity in the elderly at the Gajah Mada Health Center using the

International Physical Activity Questionnaire-Short Form (IPAQ-SF) as many as 51.4% of the elderly at Gajah Mada Health Center have high physical activity (18 samples). The results of measuring the risk of falling in the elderly at Gajah Mada Health Center using the Functional Reach Test (FRT) showed the highest percentage was 42.9% with a low risk of falling (15 samples).

Table 2 Variable measurement results

Variable	Mean	SD
Physical activity	906,9	3926,5
Risk of falling	18,58	7,238

Measurement of physical activity can be seen from the data in table 2 using the International Physical Activity Questionnaire-Short Form (IPAQ-SF) to measure the physical activity of the elderly which shows the mean value and standard deviation (SD) of 906.9 ± 3926.5 , which means activity Physical activity carried out by the sample in this study had a relatively high level of physical activity. The measurement of fall risk used the functional reach test (FRT) measuring instrument which showed a mean and standard deviation (SD) of 18.58 ± 7.238 , which means that the risk of falling experienced by the elderly at the Gajah Mada Health Center is a relatively low level of fall risk.

Table 3 Results of the Shapiro-Wilk normality test

No	Variable	p-value	Keterangan
1	Physical activity	0,001	Tidak normal
2	Risk of falling	0,001	Tidak normal

After the normality test was carried out using the Shapiro-Wilk test in Table 3, the data processing results were obtained from the independent variables, namely physical activity with a value of $p = 0.001$, which means $p < 0.05$, it can be said that the data is not normally distributed. Whereas for the dependent variable, namely the risk of falling, the value of $p = 0.001$ was obtained, which means $p < 0.05$, it can be said that the data is also not normally distributed. From

the results obtained in the normality test, it can be concluded that the hypothesis test in this study is a non-parametric test using the Spearman-rank correlation coefficient test.

Table 4 Spearman-Rank Correlation Coefficient test results

		Risk of falling	
Physical activity	r	-0,396	
	p	0,018	
	N	35	

Based on table 4 above, it can be seen that based on the Spearman-rank correlation coefficient test results, the value of $p = 0.018$ is obtained, where $p < \alpha$ value (0.05) indicates H_0 is rejected and H_1 is accepted. So it can be concluded that there is a relationship between physical activity and the risk of falling in the elderly at Gajah Mada Health Center. And the value of $r = -0.396$ which shows a negative correlation between physical activity and the risk of falling in the elderly at Gajah Mada Health Center. The conclusion is that the value of the correlation coefficient (r) shows a negative correlation between the two variables which means that when the level of physical activity increases, the risk of falling tends to decrease. Conversely, when the level of physical activity decreases, the risk of falling tends to increase. Then H_1 is accepted, that is, there is a relationship between physical activity and the risk of falling in the elderly at Gajah Mada Health Center, Riau Province.

DISCUSSION

Based on research that has been conducted at the Gajah Mada Health Center that physical activity is associated with the risk of falling in the elderly with characteristics that can increase risk factors, among the characteristics that affect physical activity with risk of falling are age, gender and work history. Physical activity plays an important role in improving quality of life and improving functional status in the elderly. Regular physical exercise can improve the function of the cardiovascular system,

aerobic fitness, structural and functional changes in the musculoskeletal system.

Besides that, physical activity can help stabilize diseases in old age such as diabetes, hypertension, atherosclerosis, osteoporosis, coronary artery disease, and can manage stress and obesity. A high level of physical activity will reduce the risk of weakness in the lower extremities so that it will reduce the risk of falling in the elderly.

There are many factors that can influence, one of which is the environment where you live. The lifestyle of the elderly living in cities and villages shows differences. In terms of the intensity and duration of doing physical activity, the elderly in rural areas tend to have higher physical activity than the elderly in urban areas. It can be interpreted that all aspects of physical function that occur in the elderly will experience a reciprocal effect, that is, the relationship between one aspect and another affects one another. So even though the elderly have not high physical activity, it is also possible if the elderly have a poor balance level (R.Nuramalita et al., 2022)

With age, followed by the aging process, there will be a decrease in physical abilities due to a decrease in organ systems, functions and body systems such as the musculoskeletal system, vestibular system, proprioceptive system, and visual disturbances caused by physiological degenerative processes. There are differences in the need for physical activity in elderly men and women, for example when men enter old age they will have fewer different activities than women even though they have entered old age, women will continue to do physical activity in the household so that elderly women are more active than elderly men.

However, hormonal changes that occur in elderly women cause a decrease in various body systems so that elderly women tend to have a less good balance than elderly men. Differences in balance between women and men can be influenced by different anthropometric factors where women have larger hips than men. Broad hips with

relatively short legs result in a low center of gravity. In an upright standing position, the center of gravity of women is not lower than that of men to support greater muscle strength, so that elderly women tend to have a lower balance than men. In addition, work is one of the factors that can be associated with physical activity and balance. When the work that is usually done requires moderate activity so that it will increase and maintain the level of balance in the elderly (Salsabilla et al., 2023).

The highest category of physical activity for the elderly in this study was high physical activity. This is because many respondents work as farmers so that they often lift excessive loads or activities that are classified as heavy, so that many respondents are included in heavy physical activity and this can affect the physical activity they do. Physical activity can reduce the risk of falling in the elderly which will affect the nervous system, namely by doing regular physical activity and exercise can help maintain cognitive function, improve balance and coordination, increase the use of visual sensory input, as well as somatosensory and improve integrative center processes in the brain.

CONCLUSION

Based on the research results and statistical analysis, it can be concluded that there is a relationship between physical activity and the risk of falling in the elderly. The higher the level of physical activity carried out, the lower the risk of falling that occurs in the elderly.

Declaration by Authors

Ethical Approval: Approved

Acknowledgement: The researcher realizes that without the help and support of various parties, this research would not have been able to run well. In this case the researcher has received a lot of moral and material assistance and guidance. So the researchers would like to thank all the teaching lecturers and staff of the Faculty of Physiotherapy,

University of Esa Unggul, who have provided knowledge while the writer was studying at the Faculty of Physiotherapy, University of Esa Unggul and for giving permission regarding this research activity.

The researchers also thanked all the staff of the elderly polyclinic at the Gajah Mada Health Center who had assisted in the process of collecting research data and providing facilities and infrastructure during the study. As well as the elderly in the Gajah Mada Health Center elderly poly who have agreed to be respondents in the study. Do not forget to thank the Indonesian Physiotherapy Association for hosting researchers in the Indonesian Physiotherapy Association.

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Al Mubarroq, F. A., Putra, K. P., & Rayanti, R. E. (2022). Cognitive Function and Physical Activity in Elderly Farmers. *Journal of Mental Nursing*, 10(1), 17. <https://doi.org/10.26714/jkj.10.1.2022.17-22>
2. Anlya, G., Yuliadarwati, N. M., & Lubis, Z. I. (2023). Correlation between Physical Activity and Elderly Fitness in Elderly Communities in Malang City. 14(1).
3. Dharmansyah, D., & Budiana, D. (2021). Indonesian Adaptation of The International Physical Activity Questionnaire (IPAQ): Psychometric Properties. *Indonesian Journal of Nursing Education*, 7(2), 159–163. <https://doi.org/10.17509/jpki.v7i2.39351>
4. Physiotherapy, J., No, V., Nurámalia, R., Abdullah, M. M., & Dzakirah, M. K. (2022). Overview of Physical Activity, Balance and Cardiorespiratory Fitness in the Elderly Introduction Every human being will experience the aging process which is the final stage of da. 6(2), 79–86.
5. Inouye, S. K., Studenski, S., Tinetti, M., & Kuchel, G. (2007). Geriatric Syndromes: Clinical, Research and Policy Implications of a Core Geriatric Concept in older adults related to primary and secondary prevention. *Journal of the American Geriatrics Society*, 55(5), 780–791.
6. Langhammer, B., Bergland, A., & Rydwik, E. (2018). The Importance of Physical Activity Exercise among Older People. *BioMed Research International*, 2018, 3–6. <https://doi.org/10.1155/2018/7856823>
7. Maratis, J. (2020). The Effect of Rhythmic Auditory Stimulation (RAS) Gymnastics on the Ability to Walk in the Elderly in Kohod Village, Tangerang Regency. *Journal of Physiotherapy*, 20, 25–31.
8. Merchán-Baeza, J. A., González-Sánchez, M., & Cuesta-Vargas, A. I. (2014). Reliability in the parameterization of the functional reach test in elderly stroke patients: A pilot study. *BioMed Research International*, 2014, 8–11. <https://doi.org/10.1155/2014/637671>
9. Pradnyanini, I. A. M., Adhitya, I. P. G. S., & Muliarta, I. M. (2019). Elderly Less Have a Higher Risk of Falling Compared to Active Elderly in West Denpasar. *Indonesian Physiotherapy Scientific Magazine*, 7(1), 45–49.
10. Salsabilla, D., Yuliadarwati, N. M., & Lubis, Z. I. (2023). Relationship between Physical Activity and Balance in the Elderly in the Malang Community. 14(1).
11. Sidik, A. B. (2021). The Relationship between Physical Activity to Reduce the Risk of Falling in the Elderly at the Harapan Kita Home Palembang 2021. *Indonesian Journal Of Community Service*, 2(2), 99–105.
12. Supriyono, P. (2022). Powerful Elderly, Prosperous Nation (H. Hira (ed.)). Center for Data and Information of the Ministry of Health of the Republic of Indonesia.
13. Thiamwong, L., & Decker, V. B. (2020). Overcoming an Irrational Fear of Falling: A Case Study. *Clinical Case Studies*, 19(5), 355–369. <https://doi.org/10.1177/1534650120942322>

How to cite this article: Nur Isni Mega Sukandar, Jerry Maratis, Kesit Ivanali, Miranti Yolanda Anggita. The relationship between physical activity and the risk of falling in the elderly. *International Journal of Research and Review*. 2023; 10(8): 545-551. DOI: <https://doi.org/10.52403/ijrr.20230872>
