

The Correlation between Sitting Duration and Physical Activity with the Quality of Life of the Elderly in Sidoarjo

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ABSTRACT

Introduction: The rising elderly population in Indonesia brings significant challenges related to the decline in quality of life due to sedentary behavior, including prolonged sitting and low levels of physical activity. Understanding the impact of sitting duration and physical activity on the quality of life of older adults, especially in Sidoarjo, is crucial for developing effective interventions to improve their quality of life. This study aims to examine the relationship between sitting duration, physical activity, and quality of life among elderly individuals in Sidoarjo, Indonesia. **Methods:** This cross-sectional study employed a quantitative correlational approach. The sample size consisted of 60 elderly individuals aged 60-75 years who had active mobility. Data were collected using the World Health Organization Quality of Life (WHOQOL) questionnaire to assess quality of life and the International Physical Activity Questionnaire (IPAQ) to measure physical activity levels. Pearson correlation tests were used to analyze the data. **Results:** There was a significant negative correlation between sitting duration and quality of life in the psychology domain ($r = -0.608$; $p = 0.001$), social relationships ($r = -0.595$; $p = 0.001$), and environment ($r = -0.474$; $p = 0.001$). In contrast, physical activity had a significant positive correlation with quality of life in the physical domain ($r = 0.401$; $p = 0.001$), psychology ($r = 0.505$; $p = 0.001$), social relationships ($r = 0.501$; $p = 0.001$), and environment ($r = 0.315$; $p = 0.014$). **Conclusion:** Prolonged sitting duration has a negative impact on the quality of life of the elderly, especially in the psychology, social relationships, and environment aspects. In contrast, physical activity is positively related to increased quality of life in the physical, psychology, social relationships, and environment aspects.

Keywords: Elderly, Sitting Duration, Physical Activity, Quality of Life, Sidoarjo

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INTRODUCTION

Elderly or elderly according to WHO is a male or female individual with an age greater than or equal to 60 years. According to the Central Bureau of Statistics (BPS), the elderly are divided into three age groups: young elderly (60 to 69 years), middle elderly (70 to 79 years), and old elderly (80 years and above). The elderly, also known as senior citizens, are a growing population group in Indonesia as life expectancy increases. Based on data from BPS, life expectancy in Indonesia in 2020 reached 71.7 years for men and 75.3 years for women (Badan Pusat Statistik, 2022). Around the world, including in Indonesia, the increase in life

expectancy has led to an increase in the elderly population. In 2022, the Central Bureau of Statistics (BPS) reported that Indonesia's elderly population reached 29.3 million people, or about 10.8% of the total population. This number is expected to continue to increase in the coming decades. (Central Bureau of Statistics, 2022). This growth brings new challenges, especially in the aspect of maintaining the optimal quality of life of the elderly.

As they age, the elderly tend to experience a decline in physical and mental capacity due to the *aging* process. *Aging* is an unavoidable biological process, involving cellular and molecular damage that results in decreased physiological function, increased risk of disease,



and ultimately death. In the elderly stage, this decline in physical and mental abilities often leads to a significant decline in quality of life. *The World Health Organization* (WHO) says quality of life is a person's perception of where the individual is in their life in the context of the culture and value system in which they live, with regard to their goals, expectations, standards and priorities. (*World Health Organization*, 2012). Various components, such as physical conditions, psychology, social relationships, and environmental conditions, greatly affect the quality of life of the elderly.

Sedentary behavior is one of the causes of decreased quality of life characterized by prolonged sitting duration. Sedentary behavior has become a global concern due to its impact on health, including increased risk of cardiovascular disease, metabolic disorders, obesity, and decreased cognitive function (Tremblay *et al.* 2017; Biswas *et al.* 2015). Surveys show that the prevalence of sedentary behavior in older adults is increasing, with 20% of older adults in the United States sitting for at least eight hours a day, and 33% sitting for six to eight hours a day (Matthews *et al.*, 2012). Similar conditions are expected to occur in Indonesia, although specific data on the sitting duration of older adults in Indonesia is still limited. Sitting duration is defined as the amount of time a person spends in a sitting position during a day. Previous studies have linked long sitting duration with increased risk of chronic diseases and reduced quality of life, especially among the elderly (Katzmarzyk *et al.*, 2019; Stamatakis *et al.*, 2019).

In contrast, physical activity has been shown to play an important role in maintaining and improving quality of life in older adults. Physical activity refers to any form of body movement that increases energy expenditure, including daily activities, work and exercise (*World Health Organization*, 2020). In its 2020 global guidelines, *the World Health Organization* (WHO) recommends that older people should remain physically active to maintain their physical and mental health and reduce the risk of disease (Bull *et al.* 2020). Regular physical activity can help older people in many ways, including improving cognitive function,

improving mental health, and maintaining mobility and independence (Warburton *et al.* 2006).

Previous research has widely discussed the impact of physical activity on the quality of life of the elderly, which shows that doing routine physical activity can improve the quality of life of the elderly (Bull *et al.*, 2020; Chodzko-Zajko *et al.*, 2009). While previous studies also prove that there is an impact caused by physical activity in improving the quality of life of the elderly (Bize *et al.* 2007; Schuch *et al.* 2016). A study by Dogra *et al.* (2017) in Canada also found that long sitting duration and low levels of physical activity were associated with decreased quality of life in the elderly.

Similar studies in the context of older populations in Indonesia are limited and particularly in Sidoarjo. Sidoarjo is an urban area in East Java that shows an increasing trend in the number of elderly people, in line with the growth in national life expectancy. Based on BPS data, the total population of Sidoarjo district reached 2,082,801 people in 2020, with a population density of 2,916 people/km². Although specific data on the elderly population in Sidoarjo has not been detailed, the national increase in the elderly population of 10.8% of the total population is a relevant indicator for this study (BPS, 2020, 2023). Older people in Sidoarjo have unique characteristics, such as high participation in social and economic activities, both through formal employment and community activities. As a growing region, Sidoarjo also faces the risk of an increase in sedentary lifestyles due to urbanization, which can affect older people's quality of life (Statistics Indonesia, 2023; BPS East Java, 2023). The novelty of this study lies in the simultaneous exploration of these two variables in the specific context of Sidoarjo, which is expected to enrich the existing literature and this study is important to fill the local data gap on the relationship between sitting duration, physical activity and quality of life of older people, while providing a scientific basis for efforts to improve the quality of life of older people through the development of more effective physical activity interventions for older people in Sidoarjo.



METHODS

Research Design

This study used a quantitative method with a correlational approach and a *cross-sectional study* design. This design was chosen to explore the relationship between sitting duration, physical activity and quality of life among older adults in Sidoarjo. The *cross-sectional* approach allows data collection at a single point in time, which makes it easier to identify relationships between variables without the need to follow changes in variables over time. This study was designed and reported in accordance with STROBE guidelines for observational studies with a *cross-sectional* design. With this approach, the study aims to provide a descriptive and analytical picture of the relationship between variables in the context of an elderly population in urban Sidoarjo.

Population and Sample

The population in this study consisted of elderly people aged 60-75 years, both men and women, who live in Sidoarjo. The elderly who were included had to meet the inclusion criteria, namely having active mobility, not being in *bedrest* conditions, having a final education level of at least junior high school, and willing to participate in the study by signing *informed consent*. The research sample was taken using *purposive sampling* method, which is a *non-random* sample selection technique based on predetermined inclusion and exclusion criteria.

Initially, 80 respondents were recruited to participate in this study. However, after the data validation process, 20 respondents were excluded from the analysis due to not completing the questionnaire questions completely. Thus, the total number of samples analyzed in this study was 60 elderly people. This selection was done to ensure that the data used in the analysis matched the predetermined criteria.

The study also applied exclusion criteria to ensure data quality, including excluding older adults who had cognitive or mental impairments that could hinder questionnaire completion, as well as older adults with significant chronic or acute illnesses. Direct observation by enumerators or family reports were used to identify these conditions. In addition, participants who decided to withdraw after giving consent or

experienced sudden health problems during data collection were also excluded from the study.

Instruments and Data Collection Procedures

Before data collection began, preparations were made which included the preparation of questionnaires, and training for enumerators involved in data collection. This study was conducted based on research ethics. Before the data collection process began, each participant was given an explanation of the purpose and procedures of the study. They were also given the right to withdraw from the study at any time without any consequences. In addition, they were asked to sign an *informed consent* before the data collection process began.

Data were collected through direct interviews with respondents using questionnaire instruments that have been tested for validity and reliability. (The variables of sitting duration, physical activity were measured with the *International Physical Activity Questionnaire (IPAQ)* while quality of life was measured with the *World Health Organization Quality of Life (WHOQOL)* questionnaire.)

IPAQ was used to measure the physical activity level of the respondents. IPAQ classifies physical activity into three categories: *Low Activity* (<600 METs), *Moderate Activity* (600-1500 METs), and *High Activity* (>1500 METs). The use of the *International Physical Activity Questionnaire (IPAQ)* was chosen because this instrument is able to measure various dimensions of physical activity, including work-related activities, transportation, household, and leisure time. Based on the research of Craig *et al.* (2003) the validity of IPAQ has been tested with a correlation value of 0.30 to 0.40, while its reliability has an ICC value of 0.76 to 0.93. The instrument measures a range of physical activities from light, moderate to vigorous, which is suitable for describing the variation in physical activity of older people in an urban environment such as Sidoarjo, especially with the heterogeneity of their activities. The IPAQ is also relatively easy to use, both through interviews and self-completion by respondents. Most of the elderly population in Sidoarjo are still actively working at 51.7 percent, making the occupational domain of the IPAQ relevant. In addition, for



older people who are not working, the work domain can be adapted to take into account their daily physical activities such as household chores or community activities. IPAQ has been widely used in various populations including the elderly, with well-proven validity and reliability.

Meanwhile, WHOQOL was used to measure respondents' quality of life. There are four dimensions or domains of quality of life measured, including physical, psychological, social relations, and environmental conditions. Furthermore, each domain has an interpretation of quality of life assessment which is categorized into four levels, namely *High Functioning* (score 81-100), *Intermediate Functioning* (score 61-80), *Medium Functioning* (score 41-60), and *Low Functioning* (score 20-40). The validity of WHOQOL has been confirmed through cross-cultural testing in more than 15 countries, showing strong relationships between quality of life domain scores (physical, psychological, social, and environmental) and individual health indicators. Reliability of the WHOQOL is also excellent, with *Cronbach's alpha* coefficients above 0.70 for all domains, indicating high internal consistency. In addition, the consistent stability of scores across various populations, including the elderly, ensures that the instrument is reliable for measuring overall quality of life (Skevington *et al.*, 2004).

All data collected were processed and analyzed using the IBM SPSS statistical program version 26. To ensure normal data distribution, the *Kolmogorov-Smirnov* normality test was used. The *Pearson Correlation* test was used in data analysis to identify the strength and direction of the linear relationship between two continuous variables: sitting duration and quality of life, and physical activity and quality of life (Schober *et al.*, 2018). The *Pearson Correlation* test was used to identify the relationship between sitting duration (X1), physical activity (X2), and quality of life (Y1). The Pearson correlation test was used because the data were normally distributed, as indicated by the results of the normality test. the Pearson correlation coefficient (r) provides an

indication of the strength and direction of a linear relationship between two continuous variables. The value of r ranges between -1 and 1, where $r = 1$ indicates a perfectly positive relationship, $r = -1$ indicates a perfectly negative relationship, and $r = 0$ indicates no linear relationship.

RESULTS

The relationship between sitting duration and physical activity with the quality of life of the elderly in Sidoarjo City was analyzed. The number of samples analyzed was 60 respondents. The results of the analysis of normality test with *Kolmogorov-Smirnov* and correlation between variables with *Pearson Correlation* test.

The characteristics of the research data are shown in Table 1 with the majority of respondents aged between 55-65 years or the young elderly category (60%), 66-74 years old middle elderly (28%) and 75-90 years old elderly (11%) with an average age of 65.95 ± 4.64 years. Based on gender, 56.7% were female and 43.3% were male. In terms of the education level of the elderly, it was found that 38.3% had a junior high school education and 36.7% had a high school education, with another 25% having a Bachelor's or Diploma education. For employment status, 51.7% of the respondents were still actively working, while the other 48.3% were retired or not working.

Table 2 shows the descriptive results of the variables of sitting duration, physical activity, and quality of life in the elderly. The average sitting duration of respondents was 6.75 ± 2.95 hours per day. A total of 31.7% of respondents were in the *low activity* category, 41.7% in the *moderate activity* category, and 26.7% in the *high activity* category with an average physical activity score of 1121.63 ± 716.30 on the IPAQ measurement. Meanwhile, the average quality of life of respondents, measured by WHOQOL, with an average score of 66.77 ± 9.06 in the physical condition domain, 64.95 ± 8.76 psychological domain, 65.07 ± 8.59 social relationship domain, and 70.25 ± 13.03 environmental domain.



Table 1. Characteristics of Research Sample Data

Sample Characteristics Data	Category	(n = 60)	%	Mean± SD
Age (year)	Younger Elderly (55-65)	36	60	
	Middle Elderly (66-74)	17	28	65.95± 4.64
	Older Elderly (75-90)	7	11	
Gender	Male	26	43,3	
	Female	34	56,7	
Education	Bachelor/Diploma	15	25	
	HIGH SCHOOL	22	36,7	
	SMP	23	38,3	
Employment Status	Still Actively Working	31	51,7	
	Not working/retired	29	48,3	

Table 2. Results of Average Sitting Duration, Physical Activity and Quality of Life in the Elderly

Variables	Category	n=60	%	Mean± SD	Kolmogorov Smirnov
Sitting Duration per Day				6.75± 2.95	0,200
Physical Activity (IPAQ)	Low Activity (<600 METs)	19	31,7	1121.63± 716.30	0,056
	Moderate Activity (600-1500 METs)	25	41,7		
	High Activity (>1500 METs)	16	26,7		
Quality of Life (WHOQL)	Physical Condition			66.77± 9.06	0,071
	Psychological			64.95± 8.76	0,081
	Social Relationships			65.07± 8.59	0,064
	Environment			70.25± 13.03	0,058

*** Description:**

In the Kolmogorov-Smirnov test, if the *p* value is > 0.05, the data is considered normally distributed, while if the *p* value is ≤ 0.05, the data is not normally distributed.

The normality test uses *Kolmogorov-Smirnov* because the sample is > 50 people. Table 2 shows the results of the analysis of the normality test, all variables have a *p* value> 0.05, which means that all data variables are normally distributed, and can be analyzed using parametric statistical methods.

This study also analyzed the relationship between sitting duration, physical activity, and

quality of life using the *Pearson Correlation* Test. Table 3 shows the relationship between sitting duration and physical activity with the quality of life of the elderly based on various WHOQOL domains.

Table 3 shows that sitting duration has a significant negative relationship with three quality of life domains, namely psychological (*r* = -0.608; *p* = 0.001), social relationships (*r* = -



0.595; $p = 0.001$), and environment ($r = -0.474$; $p = 0.001$). This negative relationship indicates that the longer the sitting duration, the lower the quality of life of the elderly in the psychological, social relationship, and environmental aspects. However, the relationship between sitting duration and the physical condition domain was not significant ($r = 0.030$; $p = 0.820$), indicating that sitting duration did not directly affect perceived quality of life on physical condition.

In contrast, physical activity and all quality of life domains showed significant positive relationships. In the physical domain, physical activity had a moderate correlation ($r = 0.401$; $p = 0.001$), indicating that increased physical activity contributed to older adults' perception of their better physical condition. Physical activity also had a moderate positive relationship with the psychological domain ($r = 0.505$; $p = 0.001$) and social relationships ($r = 0.501$; $p = 0.001$), indicating that older adults with higher levels of physical activity tend to have better quality of life in psychological aspects and social interactions. In the environmental domain, physical activity showed a weak but significant positive correlation ($r = 0.315$; $p = 0.014$), indicating that older adults who are more physically active have better environmental perceptions.

The results of this study show that prolonged sitting duration has a significant negative relationship with the quality of life of the elderly in several domains, namely psychological, social relationships, and environment. This suggests that the longer the duration of sitting, the worse the elderly perceived their psychological condition, the quality of social interaction, and the living environment. In contrast, physical activity showed a significant positive association with all quality of life domains. Elderly who have higher levels of physical activity tend to have better perceptions of their physical condition, psychological aspects, social relationships, and environment. Overall, these results confirm the importance of physical activity in improving various aspects of the quality of life of older adults, while prolonged sitting tends to have a negative impact.

Table 3. Results of the Relationship between Sitting Duration and Physical Activity with Elderly Quality of Life

Variable X	Variable Y	<i>r</i>	<i>p</i>
Sitting Duration	Physical Condition	0,030	0,820
	Psychological	-0,608	0,001
	Social Relationships	-0,595	0,001
	Environment	-0,474	0,001
Physical Activity	Physical Condition	0,401	0,001
	Psychological	0,505	0,001
	Social Relationships	0,501	0,001
	Environment	0,315	0,014

***Description:**

- r* indicates the *Pearson Correlation* coefficient (+ unidirectional, - opposite direction), while *p* indicates the level of significance.
- Correlation strength: very weak (0.00-0.19), weak. (0.20-0.39), Moderate (0.40-0.59), strong (0.60-0.79) and very strong (0.80-1.00)

DISCUSSION

The results showed that prolonged sitting duration was negatively associated with quality of life, while higher physical activity was positively associated with quality of life. This finding is in line with several previous studies that show that sedentary behavior and lack of physical activity adversely affect the well-being of the elderly, both in terms of psychological aspects, social relationships, and the environment. In this discussion, the results of the study will be further analyzed to understand the relationship of sitting duration and physical activity on the quality of life of the elderly in all WHOQOL domains, namely physical, psychological, social relations, and environmental conditions.

Relationship between Sitting Duration and Elderly Quality of Life

This finding shows a significant negative relationship between sitting duration and quality of life in several WHOQOL domains, namely



psychological ($r = -0.608$; $p = 0.001$), social relationships ($r = -0.595$; $p = 0.001$), and environment ($r = -0.474$; $p = 0.001$). This shows that the longer the duration of sitting, the worse the elderly's perception of their quality of life, especially in the psychological, social relationship, and environmental aspects.

In the psychological ($r = -0.608$; $p = 0.001$) and social relationship ($r = -0.595$; $p = 0.001$) domains, sitting duration showed a strong negative association. This confirms that prolonged sedentary behavior has a significant impact on the mental and social aspects of the elderly. In the psychological domain, the decline in quality of life can be caused by the negative effects of sedentary behavior on the mood, stress level, and cognitive function of the elderly. Elderly people with a long sitting duration tend to have less time for physical or social activities that can improve their mental health. The study by Palit *et al.* (2021) supports this finding by showing that long sitting duration increases the risk of decreased cognitive function and mental health, including depression and anxiety. Meanwhile, in the domain of social relationships, prolonged sitting duration can reduce older people's participation in social activities, thereby reducing the quality of interpersonal relationships. Seniors who are more sedentary tend to have less social interaction time, which contributes to a sense of isolation or loneliness. Seniors who are more sedentary may feel less motivated to interact or attend social activities, which can ultimately worsen the sense of isolation. The study by Dogra *et al.* (2017) supports these findings by showing that sedentary behavior correlates with low social engagement in the elderly, especially in those who live alone or have physical limitations.

In the environment domain, sitting duration showed a moderate negative correlation ($r = -0.474$; $p = 0.001$), indicating that the longer the sitting duration, the worse the elderly perceived their environment. One explanation for this relationship is the lack of active engagement of older adults with the physical space around them as sitting duration increases. Seniors who sit more at home tend to have a negative view of the environment, due to the lack of exploration or

direct interaction with public facilities such as parks or green open spaces. The study by Van Cauwenberg *et al.* (2018) supports this finding, where sedentary behavior limits individuals' participation in outdoor activities, which in turn affects their perception of environmental quality. Seniors who spend a lot of time sitting indoors are less likely to utilize public spaces or social facilities around them, which can worsen their view of the environment. With minimal outdoor activities, older people's interaction with the environment is limited, which negatively impacts their perception of neighborhood quality.

In the physical condition domain, the relationship between sitting duration and quality of life showed a very weak and insignificant correlation ($r = 0.030$; $p = 0.820$). This suggests that prolonged sitting duration did not directly affect the perceived physical quality of life of the elderly in this study. One of the reasons may be the body's adaptation to long sitting duration, especially in respondents who still have active mobility outside of their sitting time. The study by Katzmarzyk *et al.* (2019) supports this finding, where the association between sitting duration and physical health becomes weaker when individuals still perform sufficient daily physical activity, such as walking or light household activities. This insignificance could also be attributed to the characteristics of the respondents who had relatively stable physical conditions and did not experience serious health problems. The elderly in this study may have adapted to their sitting pattern without showing significant changes in their physical condition. In addition, the physical domain in WHOQOL measures subjective perceptions of general physical condition, which is influenced by various other factors, such as chronic pain, diet, and sleep quality. Seniors with long periods of sitting but no chronic health problems may not feel a negative impact on their perceived physical quality of life. Research by Bull *et al.* (2020) also supports that prolonged sitting duration is more likely to affect objective health outcomes, such as cardiovascular disease risk or obesity, than subjective perceptions of physical condition. These findings suggest that the effect of sitting duration on physical quality of life may be more influenced



by other factors, such as the physical activity undertaken by respondents or their overall state of health.

Overall, these results suggest that prolonged sitting has a significant negative impact on the quality of life of older adults, especially in the psychological, social relationship and environmental aspects. However, the association with physical conditions was not significant, indicating that other factors, such as physical activity or body adaptation, may have more influence on the perceived physical quality of life of the elderly.

Relationship between Physical Activity and Quality of Life of the Elderly

Physical activity showed a significant positive association with all WHOQOL quality of life domains. In the physical domain, physical activity had a moderate relationship ($r = 0.401$; $p = 0.001$), indicating that increasing physical activity can improve the elderly's perception of their physical condition. This finding is in line with research by Bize *et al.* (2007), which states that physical activity can improve body function and prevent chronic diseases. although the physical activity relationship is moderate variations in individual health conditions also potentially affect the strength of this relationship. Older people with chronic diseases or certain physical limitations may not fully experience the benefits of physical activity on their physical quality of life, even though they are physically active. Studies by WHO (2020) emphasize that the benefits of physical activity in older adults are more significant when integrated with an overall healthy lifestyle, including nutrition and stress management.

In the psychological domain, the relationship between physical activity and quality of life showed a moderate correlation ($r = 0.505$; $p = 0.001$). Physical activity has been shown to reduce depressive symptoms, elevate mood, and improve the mental well-being of older adults. The study by Schuch *et al.* (2016) corroborates that physical activity has a positive impact on the mental health and quality of life of older adults and is known to trigger the release of endorphins, hormones that improve mood and reduce symptoms of depression. However, this

relationship was moderate, which may be explained by the limited intensity of physical activity performed by the respondents. Most older adults' physical activity may be light, such as leisurely walking, which while beneficial, does not have as much psychological impact as higher intensity activities (Bize *et al.*, 2007). In addition, the moderate association on the psychological domain could also be due to other factors, such as social support, underlying mental health conditions or past trauma experiences, which were not measured in this study but could potentially affect psychological quality of life.

A moderate positive association was also found in the social relationships domain ($r = 0.501$; $p = 0.001$), which suggests that physical activity can increase social participation and interaction between individuals. Physically active older adults are more likely to engage in community activities, which strengthens their social relationships (Rejeski & Mihalko, 2001). However, this relationship is not entirely strong, which can be attributed to limited access to group activities in the neighborhoods where older adults live. Research by Van Holle *et al.* (2016) showed that the presence of adequate sports facilities or social spaces plays an important role in increasing social engagement through physical activity. In addition, cultural factors and individual preferences may also influence this relationship. For example, older adults who tend to be more introverted or less comfortable interacting in large groups may not experience the social benefits of physical activity than those who are more open or extroverted.

In the environmental domain, physical activity showed a weak but significant relationship ($r = 0.315$; $p = 0.014$), indicating that older people's environmental perceptions are influenced by their level of physical activity. An environment that supports physical activity, such as parks or sports facilities, can increase older people's satisfaction with their environment. This weak but significant relationship in the environment domain indicates that older people's perceived quality of life in the environment aspect is only slightly influenced by their level of physical activity. The explanation for this weak relationship can be attributed to external factors



that more dominantly influence older people's perceptions of the environment, such as the accessibility of public facilities, environmental safety, and the physical condition of the place of residence (Bull *et al.*, 2020). For example, older adults living in areas with limited access to green spaces or sports facilities may have poorer neighborhood perceptions, regardless of their physical activity levels. In addition, the physical activity levels of the older adults in this study may have tended to be light to moderate, thus not contributing greatly to neighborhood perceptions. The study by Van Cauwenberg *et al.* (2018) showed that more intense physical activity, such as walking in a park or participating in outdoor community activities, had a greater impact on neighborhood perceptions than physical activity done inside the home.

The findings from this study point to the importance of interventions that focus on reducing sitting duration and increasing physical activity to improve older people's quality of life. In the context of the older population in Sidoarjo, these results provide a scientific basis for developing health programs that can help older people stay physically active and reduce time spent sitting. Such programs could include providing elderly-friendly sports facilities, promoting active lifestyles and health education on the dangers of sedentary behavior. Thus, this study provides empirical evidence for the literature regarding the negative impact of long sitting duration and the importance of physical activity in improving the quality of life of older adults. The strength of this study is the use of valid and reliable instruments, such as the WHOQOL and IPAQ, which are able to provide a comprehensive picture of the quality of life and physical activity of older adults. The focus on the urban elderly population in Sidoarjo also makes the results of this study relevant to support local health policies. The findings provide a scientific basis for the development of community-based interventions aimed at improving older people's physical activity and quality of life.

While this study provides important knowledge, there are some limitations to consider. First, data collection relies on *self-report* from respondents, which may cause

subjectivity bias in the measurement of physical activity and sitting duration. Second, this study did not directly assess the cognitive status of participants because it was only based on the subjectivity of enumerators or respondents' family reports, so the possibility of active participation of elderly people with mild cognitive impairment could not be completely avoided. Third, there is no more objective measurement tool in this study to support data validation, especially regarding sitting duration per day. The hope for future research is to use more objective measurement tools on respondents, such as accelerometers, *smartwatches* or other *wearable devices* to improve data accuracy, especially in measuring sitting duration per day. In addition, more standardized methods, such as the Mini Mental State Examination (MMSE), can be applied to evaluate baseline cognitive function more accurately. Development of methods to validate respondents' self-reports is also needed to minimize subjectivity bias. In addition, future studies can utilize a longitudinal design to explore the pattern of relationships between physical activity, sitting duration, and quality of life over time. The findings are expected to strengthen the scientific evidence and provide a basis for developing more effective and targeted interventions for the elderly.

CONCLUSION

This study shows that there is an association between sitting duration and physical activity with the quality of life of older adults in various WHOQOL domains. Prolonged sitting duration had a significant negative impact, especially on psychological, social relationship, and environmental aspects, while higher physical activity was positively correlated with improved quality of life on all domains, including physical, psychological, social relationship, and environmental. The findings support the importance of public health strategies that encourage older adults to be more physically active and reduce sitting duration in an effort to improve the quality of life of older adults.



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