

## RESEARCH ARTICLE OPEN ACCESS

# Fear of Falling Avoidance Behavior on Daily Living Activities and Physical Activity in Older Adults: A Cross-Sectional Study

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**Received:** 6 December 2024 | **Revised:** 24 January 2025 | **Accepted:** 26 January 2025

**Funding:** The authors received no specific funding for this work.

**Keywords:** activities of daily living | falling | fear of falling | older adults | physical activity

## ABSTRACT

The aim of this study was to investigate the effect of avoidance behavior due to fear of falling on dependency levels in activities of daily living and physical activity levels in older adults. This study is a cross-sectional research design. Data were collected between November 2023 and March 2024. A total of 506 individuals aged 65 years and over participated in the study (mean age 71.26). It was determined that the older adults had low level of fear of falling avoidance behaviors were fully independent in activities of daily living and had low level of physical activity. The multiple linear regression analysis showed that age, marital status, education, living with and fear of falling avoidance behavior affected daily living activities; age, place of residence, gender, income status, chronic disease status, and fear of falling avoidance behavior affected physical activity level ( $R^2 = 0.183$ ;  $R^2 = 0.197$ , respectively). This study revealed the necessity of interventions to prevent fear of falling avoidance behaviors in order to increase the activities of daily living and physical activity levels among older adults.

## 1 | Introduction

The older population is rapidly increasing alongside advancements in medicine and technology. The population aged 60 and over worldwide was approximately 1 billion in 2019, and this number is estimated to increase to 2.1 billion by 2050 (World Health Organization 2022). In Türkiye, it has been reported that the population aged 65 and over was 8 million 722 thousand 806 people in 2023 and the proportion of the older population in the total population has increased to 10.2% (Turkish Statistical Institute (TUIK) 2024). With the increase in the elderly population, protecting the health and independence of elderly individuals and improving their physical activity are important and serious public health issue (Vaishya and Vaish 2020). In this

context, under the leadership of the World Health Organization, the United Nations General Assembly declared the years 2021–2030 as the Decade of Healthy Aging, urging governments, national and international organizations, professionals, and other stakeholders to take action on healthy aging (World Health Organization 2020).

During the aging process, individuals' physical and mental functions tend to decline, while their levels of dependency increase. One of the most important problems faced by older adults in this process is falls. Falls may lead to injuries, pain, disabilities, loss of independence, reduced quality of life, and even premature death (Vaishya and Vaish 2020). Due to these consequences, elderly individuals may experience fear of

This study was presented as an oral presentation at the 8th International 19th National Nursing Congress between 25 and 28 September 2024.

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## Summary

- Increased avoidance behavior due to fear of falling increases dependency on daily activities and decreases physical activity.
- The study revealed that in order for older adults to be more independent and active in daily living activities, fear of falling avoidance behaviors should be addressed along with demographic factors such as age, gender, education level, and place of residence.
- In line with these findings, it is important to provide training on balanced and safe physical activities and environmental regulations to reduce the fear of falling in elderly individuals.

falling. According to the National Institute on Aging National Institute on Aging (2024), many older adults may experience fear of falling even without prior fall experiences (National Institute on Aging 2024). Studies report that 28%–55% of individuals aged 65 and over living at home have a fear of falling, and that this rate gradually increases and reaches 50%–65% among those who have fallen before (Liu et al. 2021; Nawai et al. 2022; Zijlstra et al. 2007). Fear of falling negatively affects not only the physical health but also the psychological and social well-being of older adults (Baltes et al. 2023). Community-dwelling older adults may restrict their living spaces, become isolated, and avoid social interactions due to fear of falling (Lee and Tak 2023). Moreover, avoidance behaviors due to fear of falling can lead to decreased physical activity and consequent muscle weakness. These physical and psychosocial limitations may significantly impact older adults' quality of life (Akosile et al. 2021; Öztürk and Özer 2022; Xu et al. 2024). Studies have revealed that older adults with a fear of falling experience demonstrate loss of balance, decreased muscle strength (Rodrigues et al. 2023; Sapmaz and Mujdeci 2021; Sawa et al. 2020), and restrictions in activities of daily living (National Institute on Aging 2024; Xu et al. 2024). Specifically, research by Liu et al. (2021) indicated that fear of falling led to restrictions in mobility (22.5%–41.3%), personal care (30.0%–55.0%), and household activities (18.8%–36.3%) among older adults. These findings clearly demonstrate that fear of falling is a significant factor affecting older adults' daily lives (Liu et al. 2021). Furthermore, these problems arising from fear of falling may lead to an increased risk of falls among older adults. Additionally, fear of falling has been observed to cause pain (Nawai et al. 2022), loss of self-confidence, depression, and anxiety (Luo et al. 2022) in older adults.

One of the main objectives of care strategies in geriatric health-care should be to maintain and enhance older adults' health status, muscular strength, cognitive function, and consequently, their quality of life (Oliveira et al. 2022). In this context, diagnosing the avoidance behavior due to fear of falling in older adults, their addiction status in daily life activities, physical activity level and determining the affecting factors may contribute to the development of preventive and rehabilitative care strategies for the elderly (Okuyan and Bilgili 2018). This study examined the effect of fear of falling avoidance behaviors on activities of daily living and physical activity levels.

## Research Questions

1. Does avoidance behavior due to fear of falling affect the level of independence in basic activities of daily living as measured by the Katz Activities of Daily Living Scale?
2. Does avoidance behavior due to fear of falling affect physical activity levels as measured by the Physical Activity Scale in the Elderly?

## 2 | Methods

### 2.1 | Study Design and Participants

This cross-sectional study was conducted in accordance with the STROBE checklist guidelines. The research was conducted with older adults aged 65 and over who applied to Ankara, Bayburt and Kırşehir Family Health Centers in Türkiye. In this study, family health centers in these three different cities were listed and one family health center was selected using the simple random sampling method. The population of the research consisted of older adults registered in these centers. The sample size was evaluated using G\*Power 3.1.9.7 software. The effect size was taken as 0.05 according to multiple regression analysis (Öztürk and Özer 2022). The sample size was calculated as at least 262 with 95% power (1- $\beta$  error probability), 5% type 1 error rate ( $\alpha$ ), and 0.05 effect size ( $df=260$ ;  $F=3.878$ ). The sample size was calculated as at least 262 with 95% power (1- $\beta$  error probability), 5% type 1 error rate ( $\alpha$ ), and 0.05 effect size ( $df=260$ ;  $F=3.878$ ). A total of 550 people were approached during the data collection process, of whom 506 agreed to participate in the study. The research was conducted with 506 older adults aged 65 years and above, who participated voluntarily, demonstrated cognitive ability to understand and respond to questions, and did not have communication problems. Individuals under the age of 65 and those with communication problems were excluded from the study.

### 2.2 | Instruments and Questionnaire

#### 2.2.1 | Descriptive Characteristics Questionnaire

The form was prepared by the researchers based on the literature (Öztürk and Özer 2022; Sapmaz and Mujdeci 2021). It included sociodemographic data such as gender, age, and education level, and 17 questions describing fall-related characteristics such as fall history and hospital stay due to fall.

#### 2.2.2 | Fear of Falling Avoidance Behavior Questionnaire (FFABQ)

The scale developed by Landers et al. (2011) consists of 14 items and 2 subscales: challenging balance demands in daily life (e.g., going up, going down, walking on different surfaces, exercising, sitting on a chair and getting up) and instrumental activities of daily living and socialization (e.g., taking a shower or bathing, doing housework, entertainment and leisure activities). Items are scored between 0 and 4 points. The minimum score that can be taken from the scale is 0 and the maximum score is 56. A

high score indicates activity limitation and participation restriction due to fear of falling (Acaröz Candan, Demircioğlu, and Şahin 2021). (Acaröz Candan, Demircioğlu, and Şahin 2021) adapted the scale to Turkish, and Cronbach's alpha coefficient was found to be 0.95.

### 2.2.3 | Katz Activities of Daily Living Scale

This scale was developed by Katz et al. (1963) and adapted to Turkish by Pehlivanoglu et al. (2018). The scale includes six items: bathing, dressing, toileting, transferring, continence, and feeding. Items are scored as 0 for dependent and 1 for independent. According to the score obtained from the scale, 0–2 points are considered as dependent, 3–4 points are considered as semidependent, and 5–6 points are considered as independent (Pehlivanoglu et al. 2018).

### 2.2.4 | Physical Activity Scale in the Elderly (PASE)

PASE scale was developed by Washburn et al. (1993) to determine the physical activity levels of individuals aged 65 and over. The scale consists of 12 items, 6 of which evaluate leisure activities and 6 evaluate home activities. PASE score is calculated according to the weighted scores of the physical activities participants have done in the last 7 days. The total score can vary between 0 and 400, and a higher score indicates a higher level of physical activity (Ayvat, Kilinc, and Kirdi 2017). Ayvat, Kilinc, and Kirdi (2017) adapted the scale to Turkish, and Cronbach's alpha coefficient was found to be 0.71.

## 2.3 | Data Collection

Data were collected between November 2023 and March 2024 face to face. Contact was established with individuals aged 65 and older following their medical examinations at the family health centers during weekday hours (08:00–12:00). This time period was chosen because it is the busiest time for applications to these. The purpose of the study was clearly and comprehensibly explained to the older adults contacted, and they were informed that they could withdraw from the study at any time. Additionally, it was emphasized that participation was entirely voluntary. After obtaining informed consent from those who volunteered to participate, the questionnaire was administered. The interview process and questionnaire administration were conducted in a separate room. A total of 550 people were approached during the data collection process and 506 people agreed to participate in the study. Implementation of data collection tools took approximately 15–20 min.

## 2.4 | Ethical Approval

The ethical approval for this study was obtained from the Bayburt University Ethics Committee (Date 14.09.2023 and number 22/4). Institutional permissions were obtained from Ankara, Bayburt, and Kırşehir Provincial Health Directorates. This study was conducted according to the guidelines of the Declaration of Helsinki (as revised in Brazil 2013). Research

data were stored in a secure environment accessible only to the research team. All data were anonymized to protect participant confidentiality.

## 2.5 | Statistical Analysis

G\*Power version 3.1.9.7 program was used to calculate the sample size. Data were analyzed using IBM SPSS 25.0 (IBM Corp., Armonk, NY). The suitability of the data set for normal distribution was evaluated with Skewness-Kurtosis values ( $\pm 2$ ), and the data were determined to be normally distributed. Descriptive statistics were presented as numbers, percentages, mean and standard deviation values. Intragroup comparisons were evaluated with t-test and one-way analysis of variance in independent groups. Post hoc analyzes (Bonferroni if the variances were homogeneous, Games-Howell if the variances were not homogeneous) were used to determine the source of the difference in intragroup comparisons. The relationship between scale scores was determined by Pearson correlation. Those affecting activities of daily living and physical activity levels were determined by multiple linear regression analysis (enter method). Before the multiple linear regression analysis, it was determined that there was no multicollinearity in the data set and that the data set was suitable for normal distribution (Model 1 VIF < 10, Durbin-Watson = 1.686; Model 2 VIF < 10, Durbin-Watson = 1.766). The significance level was accepted as  $p < 0.05$ .

## 3 | Results

The mean age of older adults participating in the study was  $71.26 \pm 5.41$  years (65–93 years). The mean number of falls for older adults with a history of falls was  $1.58 \pm 1.03$  (1–5 times). Among the participants, 68.6% lived in a small city, 50.6% were male, 50.8% were primary school graduates, 77.7% were married, 69.0% had income equal to expenses, 77.7% lived with their family, 53.8% had no fear of falling, 76.3% had no history of falling, 4% were hospitalized due to falls, 83% had a chronic disease, 57.3% of those with chronic disease had hypertension, and 58.5% used an assistive device among which 50.6% were wearing glasses. Descriptive characteristics of the participating older adults are presented in Table 1.

The mean score of older adults on the FFABQ was  $17.93 (\pm 16.04)$ , the Katz Activities of Daily Living (ADL) Scale was  $6.69 (\pm 0.88)$ , and the mean score on the Physical Activity Scale in the Elderly (PASE) was  $77.10 (\pm 55.10)$  (Table 2). The total and subscale mean scores of the scales are shown in Table 2.

The relationship between older adults' scale scores is shown in Table 3. There was a statistically significant, negatively linear relationship between the FFABQ and the Katz ADL Scale ( $r = -0.298$ ;  $p < 0.001$ ). There was a statistically significant, negatively linear relationship between the FFABQ and the PASE ( $r = -0.262$ ;  $p < 0.001$ ). There was a statistically significant, positive linear relationship between the PASE and the Katz ADL Scale ( $r = 0.248$ ;  $p < 0.001$ ).

A comparison of the descriptive characteristics of older adults and their scale score means is shown in Table 4. There was no

**TABLE 1** | Descriptive characteristics of participating older adults ( $n = 506$ ).

Sociodemographic characteristics	<i>n</i> (%)
Mean Age $\pm$ SD (Min-Max)	71.26 $\pm$ 5.41 (65–93)
Number of Falls* Mean $\pm$ SD (Min-Max)	1.58 $\pm$ 1.03 (1–5)
Where one lives	
Metropolitan	159 (31.4)
Small city	347 (68.6)
Gender	
Female	250 (49.4)
Male	256 (50.6)
Educational background	
Not literate	58 (11.5)
Literate	99 (19.6)
Primary school	257 (50.8)
High school and above	92 (18.2)
Marital status	
Single	113 (22.3)
Married	393 (77.7)
Income status	
Income is less than expenses	113 (22.3)
Income equals expenses	349 (69.0)
Income exceeds expenses	44 (8.7)
Who does one live with?	
Family (spouse/child)	393 (77.7)
Alone	81 (16.0)
Other (Relative)	32 (6.3)
Fear of falling	
Yes	234 (46.2)
No	272 (53.8)
Fall history	
Yes	120 (23.7)
No	386 (76.3)
Hospitalization due to fall	
Yes	20 (4.0)
No	486 (96.0)
Chronic Disease	
Present	420 (83.0)
None	86 (17.0)

(Continues)

**TABLE 1** | (Continued)

Sociodemographic characteristics	<i>n</i> (%)
Possessed chronic disease**	
Hypertension	290 (57.3)
Cardiovascular disease	113 (22.3)
Diabetes	206 (40.7)
Kidney diseases	52 (10.3)
Other***	77 (15.2)
Use of assistive devices	
Present	296 (58.5)
None	210 (41.5)
Assistive device used**	
Glasses	256 (50.6)
Walking stick	61 (12.1)
Hearing aid	11 (2.2)

\*Calculated based on older adults falling.

\*\*More than one option is marked.

\*\*\*Respiratory system diseases, musculoskeletal system diseases.

**TABLE 2** | Total and subdimension score means of the scales.

	Mean (SD)	Min-Max
Fear of Falling Avoidance Behavior Questionnaire (FFABQ)	17.93 (16.04)	0–56
Challenging Balance Demands in Daily Life	11.92 (10.67)	0–37
Instrumental Activities of Daily Life and Socialization	6.01 (6.06)	0–20
Katz activities of daily living (ADL) Scale	6.69 (0.88)	0–7
Physical Activity Scale for the Elderly (PASE)	77.10 (55.10)	0–262.89
Free time activities	32.71 (41.56)	0–206
Housework activities	43.11 (35.46)	0–171
Work-related activities	1.93 (14.76)	0–210

statistical difference between Katz ADL scores between older adults living in metropolitan and small cities ( $p > 0.05$ ). There was no statistical difference between the PASE scores of older adults who used and did not use assistive devices ( $p > 0.05$ ). There was a statistically significant difference between the descriptive characteristics of older adults and all scale scores, except income status ( $p < 0.05$ ).

The factors affecting the ADL (Model 1) and physical activity levels (Model 2) of older adults are given separately in Table 5. It was determined that the models created in the multiple



**TABLE 3** | Relationship between older adults' scale scores.

	FFABQ		Katz ADL Scale		PASE	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>	<i>R</i>	<i>p</i>
FFABQ	—	—	−0.298*	<0.001	−0.262*	<0.001
Katz ADL Scale	−0.298*	<0.001	—	—	0.248*	<0.001
PASE	−0.262*	<0.001	0.248*	<0.001	—	—

Note: The bold values represent statistically significant difference at  $p < 0.05$ .

\*Pearson correlation.

regression analysis were statistically significant and the variables included in the model explained 18.3% of the variance for Model 1 and 19.7% of the variance for Model 2 ( $R^2=0.209$  for Model 1/Adjusted  $R^2=0.183$ ,  $F=8.083$ ,  $p<0.001$ ;  $R^2=0.222$ /Adjusted  $R^2=0.197$  for Model 2;  $F=8.733$ ,  $p<0.001$ ).

Among the variables included in Model 1, it was determined that age, marital status, educational status, whom one lives with, and the mean score of the FFABQ affected the daily living activities of older adults ( $p<0.05$ ). In multiple regression analysis, those who were older ( $\beta=-0.236$ , 95% CI= $-0.053/-0.023$ ), were single ( $\beta=-0.266$ , 95% CI= $-0.903/-0.221$ ), those who were literate compared to primary school graduates ( $\beta=-0.151$ , 95% CI= $-0.536/-0.137$ ) and those who have high avoidance behavior due to fear of falling ( $\beta=-0.175$ , 95% CI= $-0.015/-0.004$ ) were determined to have lower mean scores of daily life activities ( $p<0.05$ ). Older adults living alone had higher activities of daily life than those living with their family ( $\beta=0.235$ , 95% CI= $0.203/0.926$ ).

Among the variables included in Model 2, age, where one lives, gender, income status, chronic disease status, and the mean score of the FFABQ were found to affect the physical activity level of older adults ( $p<0.05$ ). In multiple regression analysis, those who were older ( $\beta=-0.138$ , 95% CI= $-2.318/-0.495$ ), those who live in the metropolitan city ( $\beta=-0.325$ , 95% CI= $-51.125/-25.895$ ), women ( $\beta=0.116$ , 95% CI= $2.702/22.952$ ), those with chronic diseases ( $\beta=0.133$ , 95% CI= $6.974/31.396$ ), and those with high avoidance behavior due to fear of falling ( $\beta=-0.240$ , 95% CI= $-1.181/-0.469$ ) were determined to have lower physical activity levels ( $p<0.05$ ). Additionally, it was found that individuals whose income equals their expenses ( $\beta=-0.145$ , 95% GA= $-28.541/5.855$ ) and those whose income exceeds their expenses ( $\beta=-0.136$ , 95% GA= $-45.957/-7.219$ ) have higher levels of physical activity compared to those with lower income than expenses.

#### 4 | Discussion

In this study, the aim was to investigate the effect of avoidance behavior related to the fear of falling in older adults on their dependency levels in ADL and their levels of physical activity. Findings of this study show that older adults' fear of falling avoidance behaviors is at low levels, their ADL are fully independent and their physical activity levels are low.

Regular physical activity in old age helps to maintain and improve health and reduce the need for hospitalization and the risk of premature death. In addition, physical activity contributes to

the prevention of various chronic diseases such as obesity, cardiovascular diseases, blood pressure, diabetes, and the development of social interaction and cognitive performance (Warburton and Bredin 2016; Feter et al. 2021; Kandola et al. 2019). In this study, the physical activity level of the elderly was found to be low ( $77.10 \pm 55.10$ ), and these activities were housework activities ( $43.11 \pm 35.46$ ), leisure activities ( $32.71 \pm 41.56$ ), and work-related activities ( $1.93 \pm 14.76$ ). According to the results of the current study, the highest level of physical activity in older adults was determined to be housework activities, while the lowest level was determined to be work-related activities. The low level of work-related activities is an expected result due to the fact that the majority of the participants are retired and the passive role that society attributes to older adults. Levels of sports-related leisure activities such as walking and exercising and work-related activities such as gardening need to be increased. While our findings are similar to those of another study conducted in Türkiye on physical activity (Sönmez Sari and Kitiş 2024), higher physical activity levels were determined in older people in studies conducted in Iran, Nigeria and China (Hatami et al. 2021; Okoye et al. 2022; Ying et al. 2022). It is an important finding of this study that elderly individuals have low physical activity levels despite being fully independent in meeting their self-care needs such as eating, dressing, toileting, and bathing. In addition, it is thought that the collection of study data in the winter season and the geography/culture in which the elderly live negatively affect physical activity levels.

In this study, age is a common determinant of both models and is an important variable. In the current study, it was found that ADL and physical activity levels decreased significantly in older adults as age increased. It was stated in a study conducted on older adults in Sri Lanka that strength decreases with increasing age and that physical activity in old age has a positive effect on increasing hand grip and leg strength (Wickramarachchi, Torabi, and Perera 2023). In order to prevent a decrease in physical activity levels in old age, it is thought to be important to acquire the habit of regular physical activity from childhood and to maintain this habit throughout adulthood and old age.

Avoidance behaviors related to fear of falling and physical activity levels were found to be significantly higher in older adults living in metropolitan cities than in small cities. This pattern suggests older adults in large urban areas avoid activities due to fear of falling, influenced by dense population, heavy traffic, and challenging transportation systems. Additionally, physical activity may be higher in metropolitan areas because of wider distances, frequent walking routes, and greater access to sports centers. Studies indicate that fear of falling and physical activity in older adults may vary with population density, environmental

**TABLE 4** | Comparison of descriptive characteristics and mean scale scores of older adults.

	FFABQ	Katz ADL Scale	PASE
	Mean (SD)	Mean (SD)	Mean (SD)
Where one lives			
Metropolitan	25.84 (12.83)	6.64 (0.95)	90.43 (55.35)
Small city	14.31 (16.07)	6.71 (0.84)	71.00 (53.98)
Test; p	8.636; < <b>0.001</b>	−0.900; 0.369	3.729; < <b>0.001</b>
Gender			
Female	22.50 (16.18)	6.56 (1.05)	68.00 (45.99)
Male	13.48 (14.61)	6.81 (0.64)	85.99 (61.54)
Test; p	6.572; < <b>0.001</b>	−3.176; <b>0.002</b>	−3.732; < <b>0.001</b>
Educational status			
Not literate <sup>a</sup>	25.58 (18.89)	6.55 (1.15)	62.64 (51.02)
Literate <sup>b</sup>	22.87 (16.28)	6.29 (1.39)	57.71 (47.09)
Primary school <sup>c</sup>	16.62 (15.33)	6.81 (0.56)	81.43 (54.46)
High school and above <sup>d</sup>	11.47 (12.09)	6.86 (0.49)	95.00 (59.72)
Test; p	14.089; < <b>0.001</b>	10.786; < <b>0.001</b>	9.655; < <b>0.001</b>
Post hoc	a > c > d, b > c > d <sup>a</sup>	b < c, b < d <sup>a</sup>	a < d, b < c, b < d <sup>b</sup>
Marital status			
Single	25.38 (17.78)	6.36 (1.28)	67.41 (55.62)
Married	15.79 (14.85)	6.78 (0.70)	79.89 (54.70)
Test; p	−5.226; < <b>0.001</b>	3.388; <b>0.001</b>	2.129; <b>0.034</b>
Income status			
Income is less than expenses	19.50 (17.20)	6.76 (0.56)	77.32 (56.58)
Income equals expenses	17.66 (15.84)	6.64 (1.00)	76.24 (55.02)
Income exceeds expenses	16.11 (14.42)	6.88 (0.32)	83.37 (52.68)
Test; p	0.874; 0.418	2.015; 0.134	0.327; 0.721
Who does one live with?			
Family (spouse/child) <sup>a</sup>	16.00 (15.06)	6.76 (0.79)	80.05 (55.32)
Alone <sup>b</sup>	21.79 (16.22)	6.55 (0.83)	74.39 (51.32)
Other (Relative) <sup>c</sup>	31.96 (18.83)	6.18 (1.59)	47.76 (54.27)
Test; p	18.653; < <b>0.001</b>	7.674; <b>0.001</b>	5.284; <b>0.005</b>
Pos hoc	a < b < c <sup>a</sup>		a > c <sup>b</sup>
Fear of falling			
Yes	27.06 (15.30)	6.53 (1.04)	69.50 (50.80)
No	10.08 (12.01)	6.83 (0.69)	83.65 (57.85)
Test; p	13.724; < <b>0.001</b>	−3.711; < <b>0.001</b>	−2.900; <b>0.004</b>
Fall history			
Yes	24.70 (17.62)	6.45 (1.17)	62.55 (51.06)
No	15.83 (14.92)	6.76 (0.75)	81.63 (55.59)

(Continues)

TABLE 4 | (Continued)

	FFABQ	Katz ADL Scale	PASE
	Mean (SD)	Mean (SD)	Mean (SD)
Test; p	0.4988; < <b>0.001</b>	−2.710; <b>0.008</b>	−3.346; <b>0.001</b>
Chronic disease			
Present	20.00 (16.39)	6.65 (0.93)	71.79 (52.84)
None	7.82 (8.95)	6.90 (0.47)	103.06 (58.77)
Test; p	9.718; < <b>0.001</b>	−3.735; < <b>0.001</b>	−4.902; < <b>0.001</b>
Use of assistive devices			
Present	21.28 (16.20)	6.60 (1.06)	74.02 (55.35)
None	13.22 (14.58)	6.81 (0.50)	81.45 (54.58)
Test; p	5.846; < <b>0.001</b>	−2.900; <b>0.004</b>	−1.497; 0.135

Note: The bold values represent statistically significant difference at  $p < 0.05$ .

<sup>a</sup>Post hoc: Games-Howell.

<sup>b</sup>Post hoc: Bonferroni.

planning, transportation services, and land structures (Plaut et al. 2021; Curl, Fitt, and Tomintz 2020; Gao et al. 2015).

In this study, older men exhibited higher physical activity levels, consistent with previous findings (Parra-Rizo et al. 2022; Arazi, Izadi, and Kabirian 2022). In contrast, research in Serbia indicated equal declines in physical activity and functional capacity in older men and women (Milanović et al. 2013), and a French study reported low activity levels in both genders (Raberin et al. 2020). The elevated levels among men here may stem from past habits, social expectations, and physical strength. Additionally, women's domestic responsibilities, transportation barriers, and higher fear of injury (Arazi, Izadi, and Kabirian 2022) may restrict their engagement. The fact that the physical activity level of both groups in the study was not at the desired level for active aging indicates the need for policies to increase physical activity. In addition, it is necessary to design these interventions considering gender equality and to encourage and support women to increase their participation in physical activity.

In this study, the ADL level of literate participants was found to be lower than those with primary school education or above. It can be said that as the education level increases, older adults become more independent in their ADL. The findings of this study are similar to the literature (Kılıc and Uzuncakmak 2024; Abbasian et al. 2016).

Health problems that occur in old age, loss of spouse, and retirement status negatively affect the income status of the elderly (American Psychological Association 2024). Recent data indicate that the poverty rate among the elderly in Türkiye is about 21.7% in 2023 (Turkish Statistical Institute (TUIK) 2024). In this study, those whose income surpassed their expenses exhibited higher physical activity levels. Similarly, a Korean study showed that older adults with lower socioeconomic status displayed reduced activity compared to wealthier peers (Yang et al. 2023). Another Turkish investigation yielded comparable outcomes (Kılıc and Uzuncakmak 2024). As the income level of individuals increases, their interest in sports may increase, and they may

have the necessary spending opportunities for sports in making use of their free time. It is thought that policies that will support the income status of the elderly would help increase their physical activity levels.

The study also revealed that married older adults had higher independence in daily living. Interaction with family members, sharing household chores, and assuming responsibilities can enhance physical activity and sustain autonomy. However, in this study, it was found that older adults living alone were more independent while performing their daily living activities. This finding is similar to the findings of studies in the literature (Kılıc and Uzuncakmak 2024; Abbasian et al. 2016). This situation can be associated with the fact that lonely people take responsibility for their lives alone. The independence of the elderly in ADL may vary depending on cultural differences, social structure, support systems, and individual preferences.

In this study, individuals without chronic diseases displayed higher physical activity levels, aligning with previous findings (Olokunlade et al. 2024; Srivastava et al. 2021). Regular physical activity not only reduces chronic disease risk but also supports disease management (Srivastava et al. 2021; Steinhoff and Reiner 2024; Suryadinata et al. 2020). In older adults with chronic diseases, it may be possible to increase physical activity levels by creating an individualized physical activity plan.

It was found that the individual's age, marital status, education level, who s/he lives with, and avoidance behavior due to fear of falling affected ADL by approximately 18.3%, according to the first regression model used in this study. The individual's age, where one lives, gender, income status, chronic disease, and avoidance behavior due to fear of falling was found to affect the physical activity level by 19.7% in the second regression model. Avoidance behavior due to fear of falling affects the ADL and physical activity levels of the elderly at a statistically significant level in both models. In this study, it was determined that as their avoidance behavior due to fear of falling increased, older adults became more dependent on their ADL and their physical

**TABLE 5** | Factors affecting older adults' activities of daily living and physical activity levels (*N* = 506).

Independent Variable	Model 1						Model 2							
	Unstandardized Coefficients		Standardized Coefficients		95% Confidence Interval		Unstandardized Coefficients		Standardized Coefficients		95% Confidence Interval			
	B	SE	$\beta$	t	p	Lower Bound	Upper Bound	B	SE	$\beta$	t	p	Lower Bound	Upper Bound
(constant)	9.604	0.522		18.395	0.000	8.578	10.629	217.069	32.321		6.716	0.000	153.564	280.573
Age	-0.038	0.007	-0.236	-5.232	<0.001	-0.053	-0.023	-1.407	0.464	-0.138	-3.033	0.003	-2.318	-0.495
Where one lives (ref: Metropolitan)														
Small city	-0.038	0.104	-0.020	-0.367	0.714	-0.242	0.166	-38.510	6.421	-0.325	-5.998	<0.001	-51.125	-25.895
Gender (ref: Female)														
Male	0.161	0.083	0.091	1.936	0.053	-0.002	0.325	12.827	5.153	0.116	2.489	0.013	2.702	22.952
Marital status (ref: married)														
Single	-0.562	0.173	-0.266	-3.241	0.001	-0.903	-0.221	-4.640	10.738	-0.035	-0.432	0.666	-25.739	16.459
Educational status (ref: Primary school)														
Not literate	0.020	0.128	0.007	0.159	0.874	-0.230	0.271	-4.920	7.899	0.028	0.623	0.534	-10.599	20.439
Literate	-0.336	0.102	-0.151	-3.311	0.001	-0.536	-0.137	-8.821	6.291	-0.064	-1.402	0.162	-21.181	3.540
High school and above	-0.104	0.105	-0.045	-0.987	0.324	-0.310	0.103	5.440	6.498	0.038	0.837	0.403	-7.328	18.208
Income status (ref: Income less than expenses)														
Income equals expenses	-0.176	0.093	-0.092	-1.891	0.059	-0.360	0.007	-17.198	5.773	-0.145	-2.979	0.003	-28.541	5.855
Income exceeds expenses	0.058	0.159	0.019	0.365	0.716	-0.255	0.371	-26.588	9858	-0.136	-2.697	0.007	-45.957	-7.219
Who does one live with (ref: Family)														
Alone	0.565	0.184	0.235	3.071	0.002	0.203	0.926	12.305	11.389	0.082	1.080	0.281	-10.074	34.683

(Continues)



TABLE 5 | (Continued)

Independent Variable	Model 1						Model 2					
	Unstandardized Coefficients			Standardized Coefficients			95% Confidence Interval			Unstandardized Coefficients		
	B	SE	p	$\beta$	t	p	Lower Bound	Upper Bound	p	B	SE	p
Other/Relative	0.320	0.209	0.126	0.088	1.531	0.126	-0.091	0.732		-3.205	12.957	
Fear of falling (ref: Yes)												
No	-0.059	0.096	0.540	-0.033	-0.613	0.540	-0.247	0.129		-0.570	5.924	
History of falls (ref: Yes)												
No	0.145	0.094	0.123	0.070	1.546	0.123	-0.039	0.329		3.130	5.796	
Chronic disease (ref: Yes)												
No	0.028	0.103	0.785	0.012	0.272	0.785	-0.174	0.230		19.467	6358	
Using assistive devices (ref: Yes)												
No	0.099	0.081	0.226	0.055	1.213	0.226	-0.061	0.259		7.727	5.036	
FFABQ	-0.010	0.003	<b>0.001</b>	-0.175	-3.288	<b>0.001</b>	-0.015	-0.004		-0.825	0.181	

Note: Model 1: Dependent Variable: KATZ ADL; Durbin-Watson = 1.677; F = 8.083, p < 0.001; R = 0.457; R<sup>2</sup> = 0.209; Adjusted R<sup>2</sup> = 0.183. Model 2: Dependent Variable: PASE; Durbin-Watson = 1.871; F = 8.733, p < 0.001; R = 0.471; R<sup>2</sup> = 0.222; Adjusted R<sup>2</sup> = 0.197.

Abbreviations: ref: reference; SE: standard error;  $\beta$ : standardized regression coefficient.

activities decreased. Due to the fear of falling, ADL and physical activities of older adults may be restricted (Baltes et al. 2023; Lee, Choi, and Kim 2017; Okuyan and Bilgili 2018; Sapmaz and Mujdeci 2021; Sawa et al. 2020). It is thought that interventions aimed at increasing physical activities and ADL would reduce avoidance behavior due to fear of falling.

#### 4.1 | Strengths and Limitation

The strength of this study is that it was conducted on older adults living in three different cities, two small cities and one metropolitan city. However, the study has some limitations. Although older adults with the cognitive level to understand and answer the questions were included in the study, older adults with undiagnosed mild cognitive impairment may have also participated. Data were based on self-report by older adults. Most of the data collection period coincided with the winter season, which may have affected the dependent variables.

#### 5 | Conclusion

Older adults are fully independent on their ADL, and their fear of falling avoidance behaviors and physical activity levels are low. Age, marital status, educational status, whom one lives with, and fear of falling avoidance behavior affected ADL; age, where one lives, gender, income status, chronic disease status and fear of falling avoidance behavior affect the level of physical activity.

It is important to plan interventions that will increase ADL and physical activity levels in older adults and reduce avoidance behavior due to fear of falling. In this regard, nurses should encourage older adults to increase their physical activity through regular health screenings and consultancy services. In addition, it is of great importance to include family members in this process and provide them with the knowledge and skills to recognize and reduce the risk of falling. It is also important for local governments to cooperate with health institutions to make age-friendly environmental arrangements and to design exercise programs that are integrated into their daily lives.

#### 6 | Relevance for Clinical Practice

It is essential to plan interventions that increase ADL and physical activity levels in older adults while reducing avoidance behavior due to fear of falling. In this regard, nurses should encourage older adults to increase their physical activity through regular health screenings and consultancy services. In addition, including family members in this process and providing them with the knowledge and skills to recognize and reduce the risk of falling is crucial. It is also important for local governments to cooperate with health institutions to create age-friendly environments and design exercise programs that are integrated into older adults' daily lives.

#### Author Contributions

**Sultan Türkmen Keskin:** conceptualization, writing – original draft, methodology, validation, visualization, writing – review and editing,

formal analysis, supervision. **Ebru Sönmez Sari:** writing – original draft, methodology, validation, visualization, writing – review and editing, formal analysis, supervision. **Şahinde Canbulat:** writing – original draft, writing – review and editing, supervision, methodology. **Fatma Özlem Öztürk:** conceptualization, supervision, writing – original draft, writing – review and editing, methodology, validation.

#### Ethics Statement

Approval was received from the Bayburt University Ethics Committee (Date 14.09.2023 and number 22/4).

#### Conflicts of Interest

The authors declare no conflicts of interest.

#### Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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