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Fear of falling in older adults: The role of fear of dependency and tiredness as key determinants

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ABSTRACT

Fear of falling (FoF) is a multifactorial condition with adverse health outcomes. Objective: This study explored factors associated with FoF in community-dwelling older adults, with a particular focus on the role of fear of dependency and tiredness as potential determinants, building on the Multifactorial Causation Model of Falls and Fear of Falling proposed by Hadjistavropoulos et al.
Methods: A cross-sectional study of 509 adults aged ≥65 evaluated sociodemographic, clinical, and psychological factors. Simple and multiple linear regressions were used to identify FoF-related factors.
Results: FoF was significantly higher in women and increased with age. Other significant predictors included greater fear of dependency, poorer visual acuity, lower levels of physical activity, greater number of falls in the previous year, higher anxiety, tiredness, and lower mobility/balance (TUG) – which showed the strongest association with FoF ($p < 0.05$). The multiple regression model explained 47.3% of the variance in FoF.
Conclusion: Fear of dependency and tiredness were significant predictors of FoF and may represent additional determinants of FoF in community-dwelling older adults.

Introduction

Falls are widely recognized as a major geriatric syndrome due to their high prevalence and significant impact on morbidity, functional decline, institutionalization, and mortality among older adults.[1-5] As a multidimensional event, falls result from the complex interaction of physical, cognitive, psychological, and environmental vulnerabilities.[2,3,6-8] In this context, FoF has emerged as a condition closely related to falls. Although conceptually distinct from the fall event itself, FoF refers to a psychological and behavioral response that can develop after a fall, or even in individuals with no previous history of falling.[1,9-12] Growing evidence indicates that FoF influences mobility, activity participation, and quality of life, and may also serve as an independent risk factor for future falls.[1,2,6,11,13,14] Its prevalence varies widely due to population differences and measurement methods,[15-17] ranging from 6.96% to 90.34%, with an overall estimate of 48.40% in community-dwelling older adults.[2] In Portugal, FoF prevalence is reported at 54.1%.[18]

FoF is influenced by physiological, psychological, and environmental factors, with risk factors including female sex, advanced age, lower education, and marital status (separated/divorced).[19,20] It is linked to adverse outcomes such as depressive symptoms,[21,22] physical inactivity,[23-25] functional decline, and difficulty with daily activities.[23] Additionally, FoF increases fall risk, worsens self-perceived health,[23,25,26] reduces social interactions, lowers quality of life, and is linked with higher mortality rates.[23,25,27]

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Understanding the mechanisms underlying FoF is essential for developing effective prevention and intervention strategies. In an influential theoretical reconceptualization, Hadjistavropoulos, Delbaere, and Fitzgerald (2011) proposed the *Multifactorial Causation Model of Falls and Fear of Falling,*[1] aiming to clarify the relationship between FoF, balance confidence, and fall risk, and to challenge the assumption that FoF merely reflects previous fall exposure or objective balance impairment. The model partly builds on Bandura's Social Cognitive Theory,[28] acknowledging the role of self-efficacy and perceived confidence in regulating behavior but explicitly distinguishes FoF from falls efficacy or balance confidence, conceptualizing them as related but distinct constructs. At the same time, it incorporates elements from fear-avoidance models, originally developed in the context of chronic pain, as well as broader psychological theories of fear and anxiety, including processes of threat appraisal, learning, and behavioral avoidance.[1,29]

Within this framework, FoF is understood as a multidimensional phenomenon influenced by the interaction of several factors, including fall history, balance performance, balance confidence, anxiety, personal beliefs, social support, and behavioral responses such as activity restriction.[1] One of the key contributions of this model is recognizing that FoF does not affect fall risk solely through indirect pathways, such as avoidance and subsequent physical deconditioning. Instead, Hadjistavropoulos and colleagues argue that anxiety-related processes may directly impair balance and gait control. At the same time, the role of activity avoidance as a consistent predictor of future falls remains uncertain. Consequently, the model departs from traditional linear conceptualizations based on a fear–avoidance spiral and proposes a more dynamic and multifactorial explanation for the relationship between FoF and fall risk in older adults.[1]

While FoF's multidimensional nature and its impact on older adults' health have been widely studied,[15,19,20,22,27,30] few models integrate these contributing factors. Peeters et al.[17] revisited Hadjistavropoulos' model, confirming strong links between balance, falls, and FoF, but weaker evidence for cognitive factors like attention and sensory processing. These interactions make FoF assessment particularly challenging.[1,17]

Recent research suggests adding fear of dependency and tiredness to the FoF model. Older adults often fear losing independence, while tiredness can impair balance and coordination, increasing FoF.[19,30-33] Fear of dependency reflects concerns about appearing weak or relying on others.[31,34] Both factors may influence FoF by affecting physical abilities and amplifying psychological fears of dependence.

This study aimed to identify factors associated with FoF in community-dwelling older adults, building on the Hadjistavropoulos theoretical model,[1] adding fear of dependency and tiredness as two potential determinants.

Material and methods

Study design and participants

This cross-sectional study examined FoF correlates in community-dwelling older adults. Data were collected from a proportional stratified random sample of 509 participants (January 2020-October 2022). The target population was older adults aged 65 and over living in the community, registered in five primary health care units in the municipality of Vila Real (North Portuguese region) Inclusion criteria were: age ≥65, community living (i.e., not residing in a nursing home or similar institution), absence of cognitive impairment assessed using the Mini-Mental State Examination (MMSE)[35] according to education-adjusted Portuguese cutoff scores (≤22 for 0–2 years of schooling, ≤24 for 3–6 years, and ≤27 for ≥7 years), and voluntary participation through signed informed consent.

Data collection

Data were collected face-to-face using a protocol developed by the authors, including a comprehensive questionnaire on sociodemographic and health data based on routine geriatric assessments in Nursing Health Consultations for older adults in the Primary Health Care services. The protocol followed a comprehensive geriatric assessment approach, including clinical, functional, emotional, and social domains. Interviews lasted approximately 90 minutes. To maintain participants' attention and engagement, the assessment alternated between interview-based questions and functional performance tests (e.g., Timed Up and Go), allowing natural variation in activities during the evaluation. The study protocol was approved by the Ethics Committee for Health of the North Regional Health Administration (approval no. 123/2019).

Measures

The selection of variables was guided by the multidimensional nature of FoF and by the theoretical framework proposed by Hadjistavropoulos et al.,[1] which emphasizes the interaction between perceived vulnerability, threat appraisal, and coping responses. Accordingly, variables representing physical, psychological, and social determinants were included to comprehensively examine factors associated with FoF in community-dwelling older adults.

Sociodemographic data

Collected variables included sex, age, marital status, number of years of schooling, place of residence, living conditions (alone or accompanied), and monthly income.

Clinical data

The clinical assessment covered vision and hearing acuity, waist circumference, pain, tiredness, usual medication, diagnosed illnesses, and self-perception of health.

Visual acuity was measured using the Snellen optometric scale at 5 meters, aligning line 8 with the level of the examinee's eyes. Scores vary between 0.1 and 2, with higher values indicating better acuity.[36]

Hearing acuity was assessed using the whisper test, in which the evaluator stands behind the older adult, out of sight, at ~33 cm, whispered a low-tone question ("Where do you live?") in each ear. A correct response indicated normal hearing.[37]

Waist circumference (WC) was assessed with a tape measure at the narrowest abdominal point, with the participants standing, relaxed, and with their feet together after exhaling. Two measurements are taken, with the tape removed after the first and calculating the arithmetic mean. Distinct cut-off points for women (> 80 gt; 80 cm WC high; > 88 gt; 88 cm WC very high) and for men (> 94 gt; 94 cm WC high; > 102 gt; 102 cm WC very high) were considered.[38]

Pain was assessed using the face assessment scale, converted into a numerical scale from 0 (no pain) to 5 (maximum pain).[39]

Tiredness was assessed with the question "Do you feel tired?", rated on a 5-point Likert scale ranging from 1 (never) to 5 (always). Single-item measures have been used in previous studies as simple indicators of perceived tiredness in older adults.[40-42] The use of a brief item was chosen to reduce participant burden within the comprehensive geriatric assessment protocol.

Diagnosed illnesses and medication data were collected from medical records using the International Classification of Primary Care-2 (ICPC-2). Developed by WONCA, this classification standardizes clinical records in Primary Health Care, aiding in the categorization of consultations, diagnoses, and procedures for data analysis.[43]

Self-perceived health was assessed with the question, "In general, how would you rate your health?", using a 5-point Likert scale from 1 (very bad) to 5 (very good). Despite its subjectivity, this measure strongly correlates with objective health and quality of life.[44]

Functional capacity

Functional Independence (Barthel Index), Brief Physical Activity Tool (BPAAT), Timed Up and Go (TUG), Morse Fall Scale (MFS), and a history of falls were used to assess functional capacity.

The Barthel Index assesses independence in ten basic activities of daily living, with scores ranging from 0-100: walking, going up and down stairs, transferring from chair to bed, personal hygiene, bathing, using the toilet, sphincter control, dressing/undressing, and eating. The Barthel Index has demonstrated good validity and reliability in older populations and is widely used in geriatric and rehabilitation research.[45]

The BPAAT assesses physical activity based on the frequency and duration of moderate to vigorous exercise intensity per week. Scores range from 0 to 8, classifying individuals as insufficiently active (0-3) or sufficiently active (≥4). BPAAT is a brief screening tool with acceptable validity for identifying physical activity levels in clinical and community settings.[46]

The TUG assesses functional mobility, gait performance, and the risk of falls. Participants stand up, walk 3 meters, turn around, walk back, and sit down; a shorter time indicates better functional performance. The TUG has demonstrated good reliability in Portuguese older adults.[47]

The MFS evaluates fall risk through six items: previous history of falls, existence of a secondary diagnosis, walking aids, intravenous therapy, posture when walking and transferring, and mental state. Scores range from 0 to 125 points, with higher scores indicating greater fall risk. The MFS is a widely used instrument with established reliability and validity for assessing fall risk.[48]

The number of previous falls was determined using the question: "Have you had any falls in the last year?" (with an affirmative answer indicating a history of falls) and recording reported falls.

Emotional state

A 14-item scale with subscales for anxiety (7 items) and depression (7 items), the Hospital Anxiety and Depression Scale (HADS) was used. Total score (emotional distress) ranges from 0 to 42; depression and anxiety scores range from 0 to 21 each. Responses are rated on a four-point Likert scale (0-3), with scores ranging from: 0-7 “normal”, 8-10 “mild”, 11-14 “moderate”, and 15-21 “severe”. The higher the scores, the higher the levels of emotional distress, depression, and anxiety. The HADS is a widely used instrument with demonstrated reliability and validity for assessing symptoms of anxiety and depression in clinical and community populations.[49]

The Fear of Dependency Scale (FDS) is a 4-item scale that measures fear of being dependent on others in old age, of being a burden, of looking old, and of not being able to reciprocate help. The total score ranges from 4 to 20 points, with higher scores indicating more fear of dependency. The FDS has demonstrated good psychometric properties in the European Portuguese version, including good internal consistency, supporting its use for assessing fear of dependency among community-dwelling older adults.[31,34]

Social indicators

The Lubben Brief Social Network Scale (LSNS-6) assesses social integration and risk of isolation in older adults in the context of family and friendship networks. Scores range from 0 to 30, with ≤12 indicating social isolation. LSNS-6 has demonstrated good reliability and validity for assessing social support and social network size among older adults.[50]

Fear of falling

The Falls Efficacy Scale International (FES-I) assesses the FoF during daily, physical, and social activities using 16 items rated on a 4-point Likert scale (1-4). Scores range from 16 to 64, with higher scores indicating greater FoF.[51] Based on Hoang et al.,[52] fear levels are classified as low (16-19), moderate (20-27), and high (28-64). FES-I is a validated instrument widely used to assess FoF in older adults.[51]

Statistical analysis

Continuous variables were described using minimum, maximum, mean, and standard deviation, while categorical variables were presented as frequencies (n, %). Scale reliability (HADS, Barthel Index, FDS, LSNS-6, and FES-I) was assessed using Cronbach’s alpha (≥0.70 considered adequate).[53]

Simple linear regression models assessed the individual influence of each independent variable (possible determinants included in the study) on the fear of falling (FES-I score), while a multiple linear regression model identified factors (determinants) influencing FoF (FES-I – dependent variable), adjusted for confounders. A stepwise method selection variable was applied, with the p-value of 0.05 for inclusion and 0.10 for exclusion from the model. Normality and homoscedasticity of residuals were checked via Q-Q plots of the residuals and scatterplots of residuals versus predicted values. A significance level of 5% was considered. SPSS® – version 29 for Windows was used for the statistical analysis.

Results

Sample characteristics

The sample consisted of 509 older adults aged between 65 and 98 years old (Mean = 76.0, SD = 6.8), 56.8% of whom were women. Most were married or lived in a de facto union (71.3%), resided in rural areas (60.9%), had a monthly income lower than 600 Euros (47.2%), and studied in an average of 5.6 years (SD = 4.0).

In terms of functional capacity, 84.9% were functionally independent, 52.6% had normal mobility and balance but 54.1% were inadequately active and 63.7% had a "very high" waist circumference. Nearly half of the participants (49.5%) rated their health as good or very good. Pain was reported by 38.5% of the participants.

On average, participants took 5.8 medications (SD = 3.0) and were diagnosed with 4.9 illnesses (SD = 2.7), with hypertension (68.2%), dyslipidaemia (57.6%), and diabetes (40.1%) being the most prevalent conditions.

Regarding falls, 24.6% reported having fallen at least once in the previous year: 19.6% fell once, and 4.9% fell between 2 and 4 times. The Morse Fall Scale classified 73.3% with no risk of falling, 24.0% with low risk, and 2.8% with high risk. FoF was categorized as low in 27.5% of participants, moderate in 27.7%, and high in 44.8%, ranging from 11 to 64.

A full description of the sample characteristics is presented in Table 1.

Factors associated with FoF (FES-I)

Simple linear regression analyses

Table 2 presents the results of the simple linear regression models assessing the influence of each independent variable on the FoF (FES-I score). Among sociodemographic variables, sex and age emerged as

Table 1
Sample characteristics (N = 509).

Characteristics		n (%) or Mean (SD) [range]
Sex	Male	220 (43.2%)
	Female	289 (56.8%)
Age	Mean (SD) [range]	76.0 (6.8) [65-98]
	65-74 years	262 (51.5%)
	75-79 years	92 (18.1%)
	≥ 80 years	155 (30.5%)
Marital status	Single	18 (3.5%)
	Married/de facto union	363 (71.3%)
	Widowed	115 (22.6%)
	Divorced/separated	13 (2.6%)
Years of school	Mean (SD) [range]	5.6 (4.0) [0-24]
Residence	Rural	310 (60.9%)
	Urban	199 (39.1%)
Living alone	No	417 (81.9%)
	Yes	92 (18.1%)
Monthly income	< 600 Euros	240 (47.2%)
	≥ 600 Euros	196 (38.5%)
	Do not know	73 (14.3%)
HADS depression	Mean (SD) [range]	6.1 (3.5) [0-19]
HADS anxiety	Mean (SD) [range]	6.7 (3.9) [0-18]
Functional independence (N = 508)	Dependent	77 (15.1%)
	Independent	432 (84.9%)
Fear of Dependency	Mean (SD) [range]	12.9 (4.1) [4-20]
Mobility and balance (TUG) (N = 508)	Mean (SD) [range]	12.1 (5.9) [5-50]
	Normal (≤ 10 seconds)	267 (52.6%)
	Good mobility (11 - 20 seconds)	206 (40.6%)
	Problems (≥ 21 seconds)	35 (6.9%)
Physical Activity (N = 508)	Mean (SD) [range]	3.2 (2.7) [0-8]
	Insufficiently active	275 (54.1%)
	Sufficiently active	233 (45.9%)
Visual acuity – Snellen scale	Mean (SD) [range]	0.65 (0.29) [0.1-2]
Hearing - Whisper Test	Without changes	375 (73.7%)
	With changes	134 (26.3%)
Waist circumference	Normal	73 (14.3%)
	High	112 (22.0%)
	Very high	324 (63.7%)
Pain assessment	Mean (SD) [range]	0.68 (1.05) [0-5]
	No pain	313 (61.5%)
	Pain	196 (38.5%)
Feeling tired (N = 508)	Mean (SD) [range]	2.9 (1.2) [1-5]
	1. Never	57 (11.2%)
	2. Sometimes	164 (32.3%)
	3. Often	130 (25.6%)
	4. Very Often	87 (17.1%)
	5. Always	70 (13.8%)
Health self-perception	Mean (SD) [range]	3.4 (0.8) [1-5]
	1. Very bad	10 (2.0%)
	2. Bad	56 (11.0%)
	3. Not good nor bad	191 (37.5%)
	4. Good	227 (44.6%)
	5. Very good	25 (4.9%)
Number of medicines	Mean (SD) [range]	5.8 (3.0) [0-16]
Number of diagnosed diseases	Mean (SD) [range]	4.9 (2.7) [0-17]
Diseases	Hypertension	347 (68.2%)
	Diabetes	204 (40.1%)
	Dyslipidaemia	293 (57.6%)
	Obesity	132 (25.9%)
	Respiratory diseases	73 (14.3%)
	Osteoporosis	49 (9.6%)
Social network (LSNS-6)	Mean (SD) [range]	15.2 (5.4) [0-30]
	With social isolation	127 (25.0%)
	No social isolation	382 (75.0%)
Falling risk (Morse Fall Scale)	Mean (SD) [range]	21.4 (12.3) [0-65]
	No risk (0-24)	373 (73.3%)
	Low risk (25-50)	122 (24.0%)
	High risk (50-125)	14 (2.8%)
Number of falls in last year	Mean (SD) [range]	0.31 (0.62) [0-4]
	None	384 (75.4%)
	1 fall	100 (19.6%)
	2 to 4 falls	25 (4.9%)
Fear of falling (FES-I)	Mean (SD) [range]	28.4 (11.1) [16-64]
	Low (16-19)	140 (27.5%)
	Moderate (20-27)	141 (27.7%)
	High (28-64)	228 (44.8%)

the strongest influential factors: FoF was higher in women (β = 0.36, B = 8.09, p < 0.001, R^2 = 13.0%) and increased with advancing age (β = 0.31, B = 0.51, p < 0.001, R^2 = 9.7%). Marital status, years of school, living alone, and monthly income also significantly influence FoF ($p < 0.05$).

Among the comprehensive geriatric assessment measures, mobility and balance (TUG) showed the strongest individual influence on FoF (β = 0.44, B = 0.82, p < 0.001, R^2 = 19.3%). Other significant factors associated with increased FoF included feeling tired, anxiety, low physical activity, poorer self-perceived health, reduced visual acuity, depression, and fear of dependency ($p < 0.001$). Additional variables such as functional independence, hearing, waist circumference, pain, number of medicines, number of diagnosed diseases, diabetes, osteoporosis, respiratory diseases, obesity, and social isolation also showed significant associations, although with smaller explanatory power (R^2 < 5%). A higher fall risk and a greater number of falls in the last year were also associated with increased FoF.

Multiple regression model

The multiple regression model identified nine key variables that significantly influenced the presence of FoF (Table 3). Mobility and balance (TUG) had the strongest effect on FoF (β = 0.27, B = 0.48, p < 0.001) - the lower the mobility and balance (higher TUG test time), the higher the FoF. The analysis also showed that FoF was higher in women (β = 0.19, B = 4.14, p < 0.001) and increased with age (β = 0.09, B = 0.14, p = 0.015). Other significant predictors included greater fear of dependency, poorer visual acuity, lower physical activity levels, a higher number of falls in the previous year, higher anxiety levels, and feeling tired. The final model explained 47.3% of the variance in FoF (R^2 = 0.473) (Table 3).

Discussion

This study identified two novel determinants of FoF: tiredness and fear of dependency. The final regression model explained 47.3% of the variance in FoF, highlighting the multifactorial nature of this phenomenon. Mobility and balance (TUG) showed the strongest association with FoF, followed by sex, fear of dependency, visual acuity, physical activity, fall history, anxiety, age, and tiredness. These findings highlight the complex interaction between physical, psychological, and behavioral factors underlying FoF in community-dwelling older adults, providing further insight into this multidimensional geriatric condition.

These findings are to be interpreted within the theoretical framework proposed by Hadjistavropoulos et al[1] as the variables correspond to different conceptual dimensions of the model. Measures of mobility and balance, visual acuity, and physical activity reflect perceived vulnerability related to functional capacity. Psychological variables such as anxiety, tiredness, and fear of dependency may influence threat appraisal processes, shaping the perception of fall risk. In addition, experiential factors such as fall history contribute to the appraisal of vulnerability and coping responses. Together, these findings support the multidimensional nature of FoF proposed by the model.[1]

Fear of dependency emerged as the third most significant factor associated with FoF in our study. To the best of our knowledge, this association has not been previously reported, highlighting the innovation of our data. As people get older, fears related to dependency, such as institutionalization and loss of one's ability to live without being helped by other people, often arise.[34] Dependency is often linked to functional decline, decreased well-being, and increased anxiety related to aging.[34] Moreover, fear of dependency significantly impacts physical and psychological health, contributing to lower well-being levels.[54] Negative stereotypes of aging may further

Table 2
Simple regression models for fear of falling (FES-I – dependent variable) (N = 509).

Independent variable	Reference category/ units	Regression coefficients		p	R^2
		β	B (95%CI)		
Sociodemographic					
Sex: female	Male	0.36	8.09 (6.27, 9.92)	<0.001	13.0%
Age	Years	0.31	0.51 (0.37, 0.65)	<0.001	9.7%
Marital status: married/de facto union	Single, widowed, divorced/separated	-0.18	-4.51 (-6.61, -2.40)	<0.001	3.4%
Years of school	Years	-0.17	-0.48 (-0.72, -0.24)	<0.001	3.0%
Residence: urban	Rural	0.01	0.30 (-1.69, 2.29)	0.767	0.0%
Living alone: yes	No	0.12	3.40 (0.90, 5.90)	0.008	1.4%
Monthly income: ≥ 600€	< 600 Euros	-0.21	-4.59 (-6.63, -2.55)	<0.001	4.3%
Comprehensive Geriatric Assessment (CGA)					
HADS depression	Score 0-21	0.25	0.80 (0.53, 1.07)	<0.001	6.3%
HADS anxiety	Score 0-21	0.37	1.07 (0.84, 1.30)	<0.001	13.9%
Functional independence: independent	Dependent	-0.22	-0.45 (-0.62, -0.27)	<0.001	4.7%
Fear of dependency	Score 4-20	0.24	0.66 (0.43, 0.89)	<0.001	5.8%
Mobility and balance (TUG)	Seconds	0.44	0.82 (0.68, 0.97)	<0.001	19.3%
Physical activity	Score 0-8	-0.33	-1.34 (-1.67, -1.00)	<0.001	10.9%
Visual acuity (Snellen scale)	Score 0.1-2	-0.28	-10.70 (-13.96, -7.45)	<0.001	7.6%
Hearing (Whisper Test): with changes	Without changes	0.13	3.16 (0.98, 5.35)	0.005	1.6%
Waist circumference					
High	Normal	0.02	0.53 (-2.69, 3.76)	0.745	4.3%
Very high	Normal	0.22	5.08 (2.30, 7.85)	<0.001	
Pain assessment	Score 0-5	0.14	1.54 (0.62, 2.45)	0.001	2.1%
Feeling tired	Score 1-5	0.39	3.59 (2.86, 4.33)	<0.001	15.5%
Health self-perception	Score 1-5	-0.28	-3.81 (-4.94, -2.68)	<0.001	7.9%
Number of medicines	Number	0.14	0.51 (0.19, 0.84)	0.002	1.8%
Number of diagnosed diseases	Number	0.13	0.55 (0.19, 0.91)	0.003	1.7%
Hypertension: yes	No	0.00	-0.02 (-2.10, 2.06)	0.984	0.0%
Diabetes: yes	No	-0.14	-3.16 (-5.12, -1.21)	0.002	1.9%
Dyslipidaemia: yes	No	0.02	0.34 (-1.62, 2.30)	0.736	0.0%
Osteoporosis: yes	No	0.16	6.05 (2.81, 9.29)	<0.001	2.6%
Respiratory diseases: yes	No	0.10	3.29 (0.54, 6.04)	0.019	1.1%
Obesity: yes	No	0.10	2.48 (0.28, 4.68)	0.027	1.0%
Social network (LSNS-6)	Score 0-30	-0.19	-0.40 (-0.57, -0.22)	<0.001	3.7%
Risk of falling and history of falls					
Falling risk (Morse Fall Scale)	Score 0-125	0.26	0.23 (0.16, 0.31)	<0.001	6.7%
Number of falls in last year	Number	0.20	3.69 (2.15, 5.23)	<0.001	4.2%

NOTE: each row shows the results of a simple regression model with the variable in the row as the independent variable and the score of FES-I as a dependent variable.
β – Standardized regression coefficient; B – Unstandardized regression coefficient; 95%CI – 95% Confidence Interval; p – p-value of the unstandardized regression coefficients; R^2 – R squared.

amplify fears of dependency, fostering concerns about appearing old, becoming a burden, and losing autonomy.[31,34]

Consistent with previous research, our study found a significant association between higher anxiety levels and increased FoF.[16,19,22,55] Bahat Öztürk et al.,[55] for instance, concluded that individuals with anxiety were three times more likely to have FoF, and Birhanie et al.[19] showed a ninefold increase in likelihood. Anxiety is often exacerbated by the fear of losing independence.[56]

Another important new finding was the association between tiredness and higher FoF. Fatigue, a non-specific symptom of chronic diseases, often affects daily activities.[33] Conditions such as hypertension, diabetes, obesity, and dyslipidaemia increase fatigue, the risk of falling, and FoF.[19,24,57] Feeling tired, FoF, and poor balance independently distinguish older adults who fall from those who don't, highlighting the role of fatigue in assessing fall risk. Fatigue impairs coordination and muscle strength, reducing physical activity and increasing the risk of falling and frailty, creating a vicious cycle.[19,58] Addressing fatigue is crucial for reducing FoF and improving the safety and quality of life for older adults.

Identifying fear of dependency and tiredness as key FoF factors highlights the need for a comprehensive geriatric assessment. Addressing these aspects can help manage FoF, promote independence, prevent falls, and improve older adults' quality of life.

Although the new results regarding fear of dependency and tiredness are important and of added relevance, our study reaffirms the significant role of physical and psychological factors already well established in FoF research. Mobility and balance were the strongest predictors FoF, with longer TUG test times (indicative of poor mobility/balance), linked with higher FoF. These results are in line with other studies highlighting a strong association between TUG test times and FoF.[14,52] Older adults with FoF tend to reduce their mobility and lead a more sedentary lifestyle due to concerns about falling, which can further affect physical abilities, including strength, balance, and overall frailty.[21] Also, age-related changes in gait and balance contribute to increased FoF, as older adults may depend on their physical condition to assess their self-efficacy and capabilities.[30]

Physical performance both influences and is affected by FoF.[22] Systematic reviews confirm strong associations between FoF, mobility, and balance.[2,16,27,59] In Hadjistavropoulos et al.'s model, these factors shape fall risk perception, triggering emotional and behavioral responses to maintain safety and independence.[1]

The relationship between mobility/balance, physical activity, and falls is complex.[2,55] Regular physical activity plays a crucial role in mitigating FoF among older adults. Our study also found that lower levels of physical activity were significantly associated to higher FoF. Consistent with previous studies, higher FoF correlates with reduced physical activity, leading to decreased muscle strength, mobility, and increased fall risk.[19] Encouraging regular physical activity is crucial for reducing FoF and enhancing older adults' health and well-being.[24]

Our study demonstrated that a higher number of falls in the previous year correlated with a greater FoF, reinforcing that recurrent falls

Table 3
Multiple regression model for fear of falling (FES-I – dependent variable).

Independent variables	Reference category/ units	Regression coefficients		
		β	B (95%CI)	p
Mobility and balance (TUG)	Seconds	0.27	0.48 (0.35, 0.61)	<0.001
Sex: female	Male	0.19	4.14 (2.67, 5.61)	<0.001
Fear of dependency	Score 4-20	0.18	0.48 (0.30, 0.67)	<0.001
Visual acuity (Snellen scale)	Score 0.1-2	-0.16	-6.07 (-8.59, -3.56)	<0.001
Physical activity	Score 0-8	-0.16	-0.61 (-0.88, -0.34)	<0.001
Number of falls in last year	Number	0.12	2.14 (1.00, 3.29)	<0.001
HADS anxiety	Score 0-21	0.12	0.34 (0.14, 0.55)	0.001
Age	Years	0.09	0.14 (0.03, 0.25)	0.015
Tiredness	Score 1-5	0.08	0.69 (0.03, 1.36)	0.042
Model: ANOVA: $F(9,496) = 48.45$, $p < 0.001$; $R^2 = 0.473$				
Method for variables selection: stepwise with $p < 0.05$ for including the variable and $p > 0.10$ for excluding the variable.				
Variables excluded: marital status, years of school, residence, living alone, HADS depression, functional independence, hearing (Whisper Test), waist circumference, waist circumference, pain assessment, self-perceived health, number of medicines, number of diagnosed diseases, hypertension, diabetes, dyslipidaemia, osteoporosis, respiratory diseases, obesity, social network (LSNS-6), falling risk (Morse Fall Scale).				

β – Standardized regression coefficient; B – Unstandardized regression coefficient; 95%CI 95% Confidence Interval; p – p-value of the unstandardized regression coefficients; R^2 – R squared.

are a determinant factor for FoF.[16,18,26] In MackKay et al.'s[16] systematic review, 88.5% of the studies found an association between prior or incident falls and the presence of FoF.

Visual acuity significantly predicted FoF, as poor vision impacts mobility, daily activities, and social interaction.[15,18] This finding acknowledges the relationship between visual acuity and FoF as central to a comprehensive approach to falls and balance, as outlined in Hadjistavropoulos'[1] reference model. Sensorial input, including vestibular, proprioceptive, and visual components, plays a vital role in maintaining balance.[17]

Sex and age were significant sociodemographic factors influencing FoF, with higher levels observed in women and increasing with age. These results corroborate previous studies linking female sex and advanced age to FOF.[18,19,22,26] In older women, FoF is associated with chronic diseases, loss of muscle mass, low bone density postmenopause, musculoskeletal fragility, and difficulty in physical activities.[26]

Marital status, schooling, living alone and income have a significant impact on FoF. Previous studies have associated marriage, low schooling,[19,30,57] living alone,[60] and low income[19] with a higher FoF. Limited educational and financial resources may limit access to health services and fall prevention strategies, heightening FoF. Conversely, living alone increases the FoF due to the lack of immediate assistance in the event of a fall, increasing awareness of the risks and consequences, thus generating anxiety and avoidance behaviors, creating a vicious cycle.[1] The Hadjistavropoulos' model emphasises the interaction between individual characteristics, environmental factors, and cognitive and emotional processes in the formation of fear-related behaviors.

Worthwhile highlighting is also the fact that in our study, FoF was influenced, though to a lesser extent, by functional independence, hearing acuity, waist circumference, pain, number of medications, number of diagnosed diseases, diabetes, osteoporosis, respiratory diseases, obesity, and social isolation. These variables directly impact older adults' perception of safety and confidence in their abilities. Their association with FoF are in parallel with findings from several recent systematic reviews.[2,16,27,59]

From a clinical and nursing perspective, these findings highlight the importance of addressing FoF within a comprehensive geriatric assessment framework that integrates physical, psychological, and social dimensions. Although the assessment of FoF often emphasizes physical aspects such as mobility and balance, the present findings suggest that subjective factors, including fear of dependency and perceived tiredness, should also be considered in routine geriatric and nursing assessments. Fear of dependency may reflect concerns about loss of autonomy or becoming a burden to others, which may lead older adults to restrict their activities and increase functional vulnerability.[34] Similarly, perceived tiredness may indicate reduced physiological reserve and functional vulnerability that may affect balance and mobility.[12,30]. Incorporating these dimensions into routine geriatric and nursing assessments may help identify individuals at higher risk of FoF and support the development of person-centred interventions aimed at preventing falls and mitigating the consequences of FoF

Although our study provides valuable insights for the conceptualization of FoF, some limitations should be acknowledged. The focus on community-dwelling older adults limits generalizability to institutionalized populations. Additionally, as a cross-sectional study, it identifies associations rather than causality. Tiredness was assessed using a single self-reported item rather than a validated multidimensional fatigue scale, which may limit the depth of measurement of this construct. Future studies should consider using validated fatigue instruments specifically developed for older adults. Nevertheless, the study has several strengths, including a large sample size, extensive in-person data collection, analyses based on a theoretical model, and the introduction of fear of dependency and tiredness as key FoF determinants.

Conclusions

This study highlights the multifactorial nature of FoF among community-dwelling older adults, emphasizing the interplay between physical, psychological, and social factors in a condition with notably high prevalence. Consistent with Hadjistavropoulos' theoretical model[1], our findings suggest that effective FoF interventions should extend beyond improving mobility and balance. Specifically, interventions should also address fear of dependency and perceived tiredness. Adopting such a holistic approach may contribute to improving the quality of life and well-being of older adults.

Declaration of competing interest

The authors, Patrícia Pires, Joana Carvalho, Telma Pires, Carlos Pires and Oscar Ribeiro declare no conflict of interest.

CRediT authorship contribution statement

Patrícia Maria Pires: Writing – review & editing, Writing – original draft, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Joana Carvalho:** Writing – review & editing, Validation, Supervision, Formal analysis. **Telma**

Pires: Methodology, Investigation, Data curation. **Carlos Pires:** Software. **Oscar Ribeiro:** Writing – review & editing, Validation, Supervision, Formal analysis.

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