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Associations between fear of falling, dual task performance, participation and activity: A cross-sectional study in older adults

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Abstract

Fear of falling (Fof) is frequent in older adults and often limits mobility and participation. Understanding how Fof relates to dual-task (DT) performance, activity, and participation may help identify targets for interventions aimed at preserving independence in aging populations. The purpose of this study is to assess the association between Fof, DT performance, participation and activity in older adults. A total of 101 participants (mean age 73.44 ± 5.53 years; 68.3% female) participated in this cross-sectional study. To comprehensively assess functional status, Fof was measured using the Falls Efficacy Scale-International (FES-I). DT performance was evaluated with the Timed Up and Go Test (TUGT) administered under single-task (ST), motor dual-task (MDT), and cognitive dual-task (CDT) conditions. Balance performance was assessed with the functional reach test (FRT). In addition, levels of activity and participation were determined using the Oxford Participation and Activities Questionnaire (Ox-PAQ). Significant associations were found between Ox-PAQ total and subdomain scores and FES-I and TUGT scores under all conditions ($p < 0.05$). Ox-PAQ scores and TUGT times differed significantly across low, moderate, and high Fof groups ($p < 0.05$). The findings of the present study indicate significant associations between fear of falling, balance performance, and levels of activity and participation in community-residing older adults.

Keywords: Aged, balance, participation

Introduction

Social participation is linked to favourable health outcomes in older adults. Recognised as a fundamental component of successful ageing, social participation has been linked to increased longevity, enhanced cognitive and physical function, and improved emotional well-being [1]. Studies have demonstrated that social participation positively affects older adults' ability to perform tasks necessary for independent living [2]. In older adults, the capacity to participate in everyday activities has been associated with increased life satisfaction, improved physical function and functional independence [3],

as well as enhanced social and emotional well-being, cognitive function [4], and quality of life [5,6].

Fear of falling (Fof) is known to be related with lower levels of participation and diminished quality of life [7]. Additionally, Fof has been reported to correlate with decreased physical mobility and motor performance [8]. Moreover, Fof may develop following a previous fall or may arise independently in individuals who have never experienced a fall. Importantly, the presence of Fof can impose restrictions on daily activities comparable to those resulting from actual falls. In community-residing older adults, maintaining normal walking, balance, and mobility requires not

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only an intact sensory-motor system but also preserved cognitive and executive functioning [9]. Motor functions such as walking and maintaining postural stability represent highly complex processes that rely on the seamless integration of sensory-motor pathways and cognitive mechanisms. This interaction enables individuals to adapt their movements to changing environmental demands and maintain functional independence in daily life. Consequently, the age-related slowing of cognitive processing speed cannot compensate for deterioration in sensory-motor functions, potentially compromising the motor planning and responses necessary for balance maintenance [10]. Dual-task (DT) refers to the simultaneous execution of two distinct tasks. Most daily tasks require individuals to simultaneously manage motor and cognitive demands while responding to environmental stimuli [11]. Gait alterations observed during DT conditions are more strongly linked to future fall risk than those assessed under single-task (ST) conditions [12].

According to the International Classification of Functioning, Disability, and Health (ICF), participation in social roles, alongside body functions, constitutes an essential component of health [13]. In this context, it is important to consider not only the impairments in body function but also the relationship between Fof, activity, and participation in older adults. Promoting activity and participation may help reduce fall risk in older adults, regardless of whether they have previously experienced a fall [14]. As maintaining independence in daily activities and enhancing social participation are key goals for healthy ageing, identifying factors associated with these parameters is critically important for informing future health service provision [6]. Considering these factors, the aim of this study is the examination of the association between balance, Fof, activity and participation in older adults.

Material and Methods

Design and participants

This cross-sectional study was undertaken at the University of Health Sciences and involved a cohort of 101 community-residing older adults. Data collection was conducted between December 2022 and December 2023. Individuals who fulfilled the eligibility requirements were thoroughly informed about the study's objectives, procedures, and ethical principles before providing consent for participation. All participants provided written informed consent prior to their inclusion in the study. Ethical approval was granted by the institutional review board (Decision No: 2022-145), and all procedures were carried out in accordance with the principles of the Declaration of Helsinki.

Participants were considered eligible if they were 65 years of age or older and demonstrated cognitive competence with a Mini-Mental State Examination (MMSE) score of 24 or higher. Those with diagnosed neurological, orthopedic, or cognitive impairments, or who were unable to ambulate independently without an assistive device, were excluded from participation.

Outcome measures

Information was collected on the participants' age, gender, weight, height, level of education, marital status, living arrangements, use of medication, exercise habits and number of falls in the past year.

The cognitive status of the patients was evaluated using the standardized MMSE. The highest score that can be obtained is 30. A total score of 24 points and above is considered normal cognitive function [15].

Fof was assessed using the Falls Efficacy Scale-International (FES-I), a validated instrument developed to evaluate the extent of concern individuals feel about falling during daily activities. Each item is scored on a 4-point Likert scale, with higher scores indicating a greater level of fear [16]. Based on established cut-off values, participants were categorized into three groups according to their FES-I scores: low Fof (16–19), moderate Fof (20–27), and high Fof (28–64) [17].

Participation and activity were assessed using the The Oxford Participation and Activities Questionnaire (Ox-PAQ). The scale, consisting of 23 items, and 3 areas: routine activities (14 items), social engagement (4 items), and emotional well-being (5 items). The raw score obtained from the scale was converted into a score range of 0–100 using the formula "total score from the dimension / ((4 × number of the questions in the dimension) × 100)". A higher score indicates more problems with participation and activity [18].

Balance performance was evaluated using the Timed Up and Go Test (TUGT) and the Functional Reach Test (FRT). In the TUGT, the duration, in seconds, required for a participant to rise from a chair, walk 3 meters at a self-selected, comfortable speed, turn, return to the chair, and sit down was recorded. This test was conducted under ST condition, cognitive dual-task (CDT) condition and motor dual-task (MDT) condition. In the ST condition, individuals did not perform any concurrent task during testing. In the CDT condition, they simultaneously verbalized words beginning with the letter "K" while performing the test. In the MDT condition, participants carried a tray with a glass of water while completing the task. After the test was explained to the participant, the order of the ST, MDT and CDT conditions was decided randomly. A shorter completion time reflected better balance and mobility performance [19,20]. For the purpose of conducting the FRT, study participants were requested to extend one arm forward as far as was feasible in a horizontal plane, whilst ensuring that both heels were in contact with the ground. The measurement of the distance between the starting and finishing positions of the fingertips was utilised to calculate the score [21].

Statistical Analysis

All statistical analyses were performed using SPSS version 25 (SPSS Inc., Chicago, IL, USA). The distribution of the data was evaluated through both analytical tests and graphical methods.

As the variables did not demonstrate a normal distribution, non-parametric statistical procedures were applied. The relationships between activity participation, fear of falling, and balance performance were examined using Spearman’s rank correlation analysis. Correlation strength was interpreted as follows: $r > 0.76$ as strong, $0.51\text{--}0.75$ as good, $0.26\text{--}0.50$ as moderate, and $r < 0.25$ as weak [22]. Differences in activity participation and balance performance among the fear of falling categories were analyzed using the Kruskal–Wallis test. When significant group differences were detected, Mann–Whitney U tests were conducted for post hoc pairwise comparisons. Statistical significance was set at a p-value < 0.05 .

Results

Evaluation was made of 101 in community-residing older adults. Most of the participants were female (68.3%), married (67.3%),

living with family (71.3%), and had not a exercise habit (70.3%). In addition, rate of participants who had fallen in the last year was reported as 34.7%. The descriptive characteristics of all the older adults are showed in Table 1.

The participants' activity and participation, Fof and balance performance measurement results are given in Table 2.

The Ox-PAQ total and subscale scores and FES-I scores, as well as TUGT times under ST, MDT and CDT conditions were significantly correlated ($p<0.05$). Only Ox-PAQ total score and Ox-PAQ emotional well-being score were significantly correlated with FRT ($p<0.05$) (Table 3).

A significant difference was observed between the Ox-PAQ-Routine Activities and Ox-PAQ-Emotional well-being, Ox-PAQ-Total score, TUGT times performed under ST, MDT and

Table 1. Sociodemographic characteristics of the participants

Variables	Outcomes	Mean ± Standart deviation
Age (years)		73.44 ± 5.53
Height (cm)		160.56 ± 10.31
Weight (kg)		73.72 ± 13.65
Body Mass Index (kg/m2)		28.65 ± 4.98
Number of drugs used		2.59 ± 2.63
MMSE score		26.75 ± 2.31, N (%)
Gender	Female	69 (68.3)
	Male	32 (31.7)
Marital Status	Single	4 (4)
	Married	68 (67.3)
	Widowed	29 (28.7)
Living Status	Living alone	22 (21.8)
	Living with family	72 (71.3)
	Living with relative/caregiver	7 (6.9)
Exercise habit	No exercise	71 (70.3)
	Less than two hours per week	12 (11.9)
	Two hours or more per week	18 (17.8)
Educational Status	≤ 5 years	68 (67.4)
	> 5 years	33 (32.6)
Fall history in the last one year	Yes	35 (34.7)
	No	66 (65.3)
Fear of Falling	Low (FES-I score ≤ 19)	32 (31.7)
	Moderate (19 < FES-I score <28)	29 (28.7)
	High (FES-I score ≥ 28)	40 (39.6)

MMSE: Mini mental state examination; FES-I: Falls efficiacy scale-international

Table 2. Participants' activity and participation, fear of falling and balance measurement results

Variables	Median (Interquartile Range)
Ox-PAQ/ Routine activites	25 (33.93)
Ox-PAQ/ Social engagement	18.75 (40.63)
Ox-PAQ/ Emotional well-being	30 (42.5)
Ox-PAQ total score (sec)	29.34 (32.61)
FES-I	25 (14)
TUGTsingle (sec)	11.09 (5.64)
TUGTmotor (sec)	11.43 (5.40)
TUGTcognitive (sec)	14.80 (7.90)
FRT (cm)	28 (10.5)

Ox-PAQ: Oxford participation and activities questionnaire; TUGT: Timed up and go test; FRT: Functional reach test; FES-I: Falls efficiacy scale-international

Table 3. Relationship of activity and participation, fear of falling and balance performance

Variables	Values	Ox-PAQ/ Routine activites	Ox-PAQ/ Social engagement	Ox-PAQ/ Emotional well-being	Ox-PAQ/ Total score
FES-I	r	0.709	0.229	0.549	0.700
	p	<0.001	0.021	<0.001	<0.001
TUGT _{single}	r	0.521	0.317	0.252	0.466
	p	<0.001	0.001	0.011	<0.001
TUGT _{motor}	r	0.479	0.272	0.263	0.455
	p	<0.001	0.006	0.008	<0.001
TUGT _{cognitive}	r	0.509	0.279	0.300	0.485
	p	<0.001	0.005	0.002	<0.001
FRT	r	-0.188	-0.167	-0.210	-0.210
	p	0.060	0.095	0.035	0.035

Ox-PAQ: Oxford participation and activities questionnaire; TUGT: Timed up and go test; FRT: Functional reach test; FES-I: Falls efficiacy scale-international

Table 4. Activity participation and balance performance according to levels of fear of falling

Variables	3 group comparison				Pairwise comparisons		
	Low FoF (n = 32)	Moderate FoF (n = 29)	High FoF (n = 40)	Values	Low- Moderate FoF	Moderate-High FoF	Low-High FoF
	M (IQR)	M (IQR)	M (IQR)	P	p	p	p
Ox-PAQ/ Routine activites	10.7 (13.4)	23.2 (19.6)	46.4 (28.8)	<0.001	0.005	<0.001	<0.001
Ox-PAQ/ Social engagement	9.37 (34.4)	12.5 (56.3)	25 (43.8)	0.205	0.220	0.644	0.085
Ox-PAQ/ Emotional well-being	10 (23.8)	30 (27.5)	45 (43.8)	<0.001	0.004	0.019	<0.001
Ox-PAQ total score	15.2 (14.7)	26.1 (21.2)	45.1 (20.4)	<0.001	0.005	<0.001	<0.001
TUGT _{single}	9.18 (3.4)	12.2 (5.8)	13.3 (8.7)	<0.001	0.002	0.129	<0.001
TUGT _{motor}	9.85(3.3)	11.95(5.1)	14.4 (9.2)	<0.001	0.001	0.132	<0.001
TUGT _{cognitive}	12.28 (4.3)	15.16 (8.2)	16.4 (8.7)	<0.001	0.004	0.103	<0.001
FRT	30.5 (5.8)	27 (11)	26.5 (10.3)	0.073	0.126	0.580	0.025

Ox-PAQ: Oxford participation and activities questionnaire; TUGT: Timed up and go test; FRT: Functional reach test; FES-I: Falls efficiacy scale-international

CDT conditions in Low-Moderate-High Fof groups ($p < 0.05$). In pairwise comparisons, only TUGT times were found to be different between moderate-high Fof groups ($p > 0.05$) (Table 4).

Discussion

This study was planned to evaluate the relationship between Fof, balance performance under ST, MDT and CDT conditions, activity, and participation in community-residing older adults. Our findings indicate that increased Fof is associated with significant impairments in balance performance, psychosocial functioning, activity and participation. Sapmaz et al. reported that individuals with Fof exhibited significant performance deterioration in both MDT and CDT conditions [23]. Similarly, Merchant et al. demonstrated a significant association between Fof, activity restriction, and depression [24].

Among older adults residing in the community, female sex, diminished physical performance, and reliance on walking aids have been identified as significant risk factors contributing to Fof. Physical dysfunctions, such as gait impairment, mobility limitation, and difficulty in performing daily living activities, have been identified as the most important risk factors [25]. In our study, a high proportion of participants were female and did not engage in regular physical activity. In line with previous findings, approximately 60% of the participants experienced moderate to high levels of Fof. Although Fof may lead individuals to avoid physical activity, the causal relationship between these two factors remains unclear [17]. The high prevalence of physical inactivity observed in our sample may, at least in part, be attributed to the Fof.

This study revealed that increased Fof was related to more difficulties in activities of daily living and diminished emotional well-being in older adults. Individuals with high Fof were found to experience greater limitations. In the scientific literature, investigations addressing the interplay between Fof, activity restriction, and depressive symptoms in older adults have demonstrated that Fof is more frequently observed among individuals with a documented history of depression. Furthermore, approximately 40% of older adults experiencing this condition report avoiding certain activities as a direct consequence of their fear. These results show that Fof is strongly associated not only with physical, but also with psychological variables, and these variables should be considered as independent risk factors [26,27]. The findings of the present study demonstrate that the evaluation of emotional well-being can furnish significant information in determining the risk of Fof.

The evidence indicates an inverse relationship between Fof and social participation among older adults [28]. However, in our study, no statistically significant difference was found in the social participation dimension according to the level of Fof. This finding may be due to the fact that older adults in our country may preserve their social participation through strong family ties and social support networks. However, the level of social support was not directly assessed in our study, which

remains a limitation.

Fof is suggested to increase the risk of falling in older adults under normal and DT conditions [29]. Studies show that Fof is exacerbated during DT performance [23,30]. The current findings revealed a significant relationship between the degree of Fof and balance-mobility performance. It was observed that TUGT times were significantly longer as the Fof level increased, and this effect was more pronounced in CDT conditions. This suggests that Fof affects the motor performance of the individual more in situations requiring executive functions. In our study, the FRT, which assesses static balance, did not show a significant difference between the levels of Fof, suggesting that dynamic balance assessments may be more sensitive in detecting the effects of Fof.

One of the strengths of this study is that it comprehensively assessed Fof across both physical performance and activity/participation dimensions. Additionally, balance performance was assessed under ST as well as CDT and MDT conditions to better reflect the demands of daily life. However, due to its cross-sectional design, the study cannot provide definitive evidence of causal relationships. The fact that participants were selected from a relatively homogeneous sociodemographic profile may limit the generalisability of the findings to different cultural or geographical groups. There is also a risk of potential bias due to self-reporting, since the data were collected using self-report scales.

The findings of this study emphasise the pivotal necessity for gerontological healthcare providers to educate themselves and to implement new practices, in order to address the multifaceted impact of Fof on activity participation and functional mobility in older adults living in the community. Because elevated Fof is linked to decreased participation in daily activities and poorer performance in ST, MDT and CDT conditions, geriatric professionals should include comprehensive fall risk assessments that address both physical and psychosocial factors in their practice. In clinical practice, healthcare providers should implement multidisciplinary, person-centered interventions that combine physical rehabilitation with strategies to reduce fear and enhance confidence in mobility. Interventions such as dual-task training, cognitive-behavioral approaches, and environmental modifications may be particularly beneficial. Additionally, future research should explore tailored intervention models that simultaneously address motor, cognitive, and emotional factors influencing fall risk and participation.

Conclusion

To summarise, the present study highlights the intricate relationship between Fof, DT mobility performance, and levels of activity and participation in community-residing older adults. The findings indicate a correlation between physical activity and participation in older adults and their functional mobility in both ST and DT conditions. Furthermore, an elevated Fof has

been demonstrated to be associated with diminished activity and participation levels, as well as reduced mobility in both ST and DT scenarios. This complex interactions highlights the need for comprehensive assessment of functional mobility and Fof by gerontology professionals to promote activity and participation. A holistic, multidisciplinary approach may be beneficial to reduce Fof, increase functional mobility, and promote community participation in this population.

Conflict of Interests

The authors declare that there is no conflict of interest in the study.

Financial Disclosure

The authors declare that they have received no financial support for the study.

Ethical Approval

The study was obtained from the Güllhane Scientific Research Ethics Committee with the decision number 2022-145.

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