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RELATIONSHIP BETWEEN FALLS AND FEAR OF FALLING AND SELF-REPORTED DUAL-TASK DIFFICULTIES, COGNITIVE AND PHYSICAL FUNCTIONS IN OLDER ADULTS

YAŞLI BİREYLERDE DÜŞME VE DÜŞME KORKUSU İLE ÖZ-BİLDİRİME DAYALI İKİLİ GÖREV ZORLUKLARI, BİLİŞSEL VE FİZİKSEL FONKSİYONLAR ARASINDAKİ İLİŞKİNİN İNCELENMESİ

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ABSTRACT

Objective: The relationship between falls and fear of falling and self-reported dual-task difficulties and cognitive and physical functions is yet to be determined. The aim of this study was to investigate the association between falls and fear of falling and self-reported cognitive and physical functions and dual-task difficulties in older adults.

Method: Fifty older adults were enrolled in this study (29 females/21 males, median age:69). The Falls Efficacy Scale-International (FES-I) was used to assess fear of falling, physical functioning subscale of the 36-item Short-Form Health Survey (PFS) was applied to assess perceived physical function, Cognitive Failure Questionnaire (CFQ) was used to assess perceived cognitive impairment, and Dual-task Questionnaire (DTQ) was administered to evaluate perceived dual-task difficulties. The presence of falls and the number of falls were also documented.

Results: A moderate correlation was found between the number of falls and FES-I, CFQ, and PFS (rho=-0.394 to 0.499, p<0.05). However, it was strongly correlated with DTQ (rho=0.553, p<0.05). FES-I was weakly correlated with DTQ (rho=0.287, p<0.05), moderately correlated with the number of falls (rho=0.412), and strongly correlated with PFS (rho=-0.732, p<0.05). There was no correlation between FES-I and CFQ (r=0.243, p<0.05). Regression analysis showed that PFS was the determinant of fear of falling, and the model explained the 51% variance of the FES-I.

Conclusion: Overall, the findings suggest that falls and fear of falling may be associated with self-reported physical, cognitive, and dual-task measures and these perceived abilities may be an important screening tool for better-identifying persons with fall risk and fear of falling.

Key Words: Older Adults, Falls, Balance

ÖZ

Amaç: Düşme ve düşme korkusu ile öz-bildirime dayalı ikili görev zorlukları, bilişsel ve fiziksel işlevler arasındaki ilişki henüz belirlenmemiştir. Bu çalışmanın amacı yaşlı bireylerde düşme ve düşme korkusu ile öz-bildirime dayalı bilişsel ve fiziksel fonksiyonlar ve ikili görev zorlukları arasındaki ilişkinin incelenmesiydi.

Yöntem: Elli yaşlı yetişkin bu çalışmaya dahil edildi (29 kadın/21 erkek, ortanca yaş: 69). Düşme korkusunu değerlendirmek için Uluslararası Düşme Etkinliği Ölçeği (DEÖ), algılanan fiziksel fonksiyonları değerlendirmek için 36 maddelik Kısa Form Sağlık Anketinin fiziksel işlevsellik alt ölçeği (FİAÖ), algılanan bilişsel durumu değerlendirmek için Bilişsel Durum Ölçeği (BDÖ) ve algılanan ikili görev zorluklarını ölçmek için İkili Görev Ölçeği (İGÖ) anketleri uygulandı. Ek olarak, düşme varlığı ve düşme sayısı rapor edildi.

Bulgular: Düşme sayısı ile DEÖ, BDÖ ve FİAÖ arasında orta düzeyde bir korelasyon bulundu (rho=-0,394-0,499, p<0,05). Ancak, İGÖ ile düşme sayısı arasında güçlü bir korelasyon vardı (rho=0,553, p<0,05). DEÖ, İGÖ ile zayıf korelasyon (rho=0,287, p<0,05), düşme sayısı ile orta düzeyde korelasyon (rho=0,412) ve FİAÖ ile güçlü düzeyde korelasyon (rho=-0,732, p<0,05) gösterdi. DEÖ ile BDÖ arasında anlamlı korelasyon bulunmadı (r=0,243, p<0,05). Regresyon analizi FİAÖ 'nin düşme korkusunun belirleyicisi olduğunu ve modelin DEÖ varyansını %51 oranında açıkladığını gösterdi.

Sonuç: Çalışmamız, düşme ve düşme korkusunun öz-bildirime dayalı fiziksel, bilişsel ve ikili görev ölçümleri ile ilişkili olabileceğini ve bu algılanan yeteneklerin düşme riski ve düşme korkusu olan kişileri daha iyi tanımlamak için önemli bir tarama aracı olabileceğini göstermektedir.

Anahtar Kelimeler: Yaşlı Yetişkinler, Düşme, Denge

INTRODUCTION

Falls are a major public health concern in older adults because of their high prevalence and the serious consequences, such as injury, reduced mobility, loss of independence, and increased mortality. In a recent meta-analysis, the global prevalence of falls in older adults of the world was found to be 26.5% [1]. As the world's population ages, this prevalence may increase, and therefore, understanding the factors that contribute to falls becomes increasingly important for developing effective prevention strategies [2]. Among these factors, fear of falling (FoF) has emerged as an important psychological concern, as it can independently contribute to increased fall risk and is associated with reduced physical and cognitive functioning. It is also a common problem in older adults, with a prevalence of 49.6% [3].

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Many factors have been found to be associated with falls and FoF in older adults. Demographic factors such as higher age, lower education, and female sex have been linked to falls and FoF. Physical functions, including balance, coordination, gait speed, gait symmetry, gait adaptability, and muscle strength and power are also well-known risk factors in many populations [4-9]. Cognitive functions, mainly attention and executive functions, are crucial for navigating complex environments and managing the simultaneous tasks often required in daily life [10]. Recent research also supports the importance of dual-tasking abilities, which are used to manage cognitive and motor tasks simultaneously and to be a key indicator of fall risk [11]. Overall, these findings indicate the link between falls and FoF and physiological and demographic factors. However, self-reported measures have the potential to provide valuable insights into an individual's subjective experience of their health status, capturing aspects that may not be evident through objective assessments alone [12].

Current evidence reveals a lack of data examining the relationship between falls and FoF with self-reported dual-task difficulties, cognitive and physical functions. However, self-reported difficulties can provide early warning signs of functional decline and highlight areas where interventions can be targeted to reduce the risk of falls. Hence, this study aimed to investigate the complex relationships between falls, FoF and self-reported cognitive and physical functions in older adults. By examining these relationships, we aim to gain insight into the multifactorial nature of falls and the role of perceived symptoms in fall risk and provide insights into the development of comprehensive interventions that improve both cognitive and physical health, ultimately reducing falls and improving the quality of life of older people.

METHOD

Study Design and Participant

This cross-sectional study recruited 50 participants. Participants were selected using a convenience sampling method, including individuals who could be reached through personal networks of the research team. Inclusion criteria included age ≥65 years. Exclusion criteria included cognitive problems hindering understand questions, being ambulate in daily life, and any disorder might potentially affect gait and balance such as, neurological disorders (e.g., Parkinson's disease, stroke), musculoskeletal disorders (e.g., arthritis, osteoporosis), vestibular disorders (e.g., vestibular neuritis), peripheral neuropathy, or any sensory deficits.

The sample size calculation was decided based on the regression analysis. At least 10 participants were considered for each variable to be examined in the regression analysis [13]. Therefore, it was aimed to evaluate at least 40 participants for the four independent variables (FoF, self-reported physical functioning, self-reported cognitive deficits, and self-reported dual-task difficulties).

Outcome Measures

Fall History: Patients were asked about the number of falls in the past six months. Following the World Health Organization (WHO) definition, a fall was defined as "an event where the participant unintentionally came to rest on the ground or a lower level" [14]. If the answer was yes, the participant was asked how many times they had a fall.

Fear of Falling (FoF): FoF was assessed using the Turkish version of the Falls Efficacy Scale-International (FES-I). It contains 16 items, and higher scores indicate a greater FoF. The FES-I has good measurement properties (Cronbach's a of the Turkish FES-I was 0.94, intraclass correlation coefficient: 0.97 to 0.99) in older adults [15].

Self-Reported Dual-Task Difficulties: The Dual-task Questionnaire (DTQ) is a 10-item self-report measure of dual-task difficulties in daily life. Individuals rate the difficulty they experience in dual-task activities from 0 (never) to 4 (very often). Higher scores indicate greater dual-task difficulties. The Turkish version of DTQ is a valid and reliable measure in older adults [16].

Self-Reported Cognitive Functions: The Cognitive Failure Questionnaire (CFQ) is a self-report questionnaire designed to assess deficits in perception, memory and motor function [17]. It contains 25 items, with participants rating each item on a five-point scale from 'never' to 'always'. Higher scores reflect a greater tendency towards cognitive decline. The CFQ is a valid and reliable tool in the Turkish population [18].

Self-Reported Physical Functioning: The physical functioning subscale of the 36-Item Short-Form Health Survey (PFS) was used to assess self-reported physical deficits [19]. The PFS has been employed as a stand-alone instrument for the description of activity limitations in various groups, including older adults and people with neurological conditions, and it has strong measurement properties. It encompasses ten items, and items are rated according to perceived limitations on the activities (1: yes, limited a lot; 2: yes, limited a little; or 3: no, not limited at all). Higher scores show better physical functioning.

Ethical Approval

The Social Research Ethics Board of Izmir Katip Celebi University (date: 20.03.2024, approval number: 2024/04-06). All participants provided written informed consent before inclusion in this study.

Statistical Analysis

IBM SPSS Statistics for Windows was used (Version 25.0. Armonk, NY: IBM Corp.) to analyze data. Evaluation of the histogram and plots was performed to determine the distribution of the data. Descriptive statistics were reported as mean and standard deviation (SD) for normally distributed data and median and interquartile ranges (IQR) for non-normal distributed data. Spearman's rank correlation was used for non-normally distributed variables and Pearson's correlation for normally distributed variables was performed to determine the association between falls, FoF, CFQ, PFS, and DTQ. Correlation coefficients between 0.1 and 0.29 were interpreted to be small, 0.3 to 0.49 to be moderate, and 0.5 to 1.0 to be strong [20]. Hierarchical binary regression models were conducted to explain the relationship between FoF and other self-reported measures. Logistic regression analysis was conducted to analyze relationship between being fallers and self-reported measures. The odds ratios (ORs) with 95% confidence intervals (95% CIs) were calculated using logistic regression for fall risk.

RESULTS

Table 1 summarizes the baseline demographics and descriptives of outcome measures of participants. The median age was 69, with a range from 65 to 85. Fifty-eight percent of the participants were female.

Table 1. Descriptive measures of the participants

	Mean±SD or Median (IQR)	Range (Min-max)
Age	69 (66.5-74.5)	65-85
Sex: Female/Male, n (%)	29 (58%)/21 (42%)	-
Falls: Faller/Non-faller, n (%)	27 (54%)/ 23 (46%)	-
Number of falls	1 (0-1)	0-4
FES-I	29.3±7.83	16-49
PFS	60 (41.3-83.8)	25-95
CFQ	29.7±12.3	2-57
DTQ	10 (6-14)	1-26

IQR: Interquartile ranges; SD: Standard deviation; FES-I: Falls Efficacy Scale-International; PFS: Physical Functioning Subscale of the 36-Item Short-Form Health Survey; CFQ: Cognitive failure Questionnaire; DTQ: Dual-task Questionnaire.

Correlation coefficients among outcome measures are presented in Table 2. Moderate correlations were found between a number of falls and FES-I, CFQ, and PFS (rho=-0.394 to 0.499). However, it was strongly correlated with DTQ (rho=0.553). FES-I was weakly correlated with DTQ (rho=0.287), moderately correlated with a number of falls (rho=0.412), and strongly correlated with PFS (rho=-0.732). There was no correlation between FES-I and CFQ (r=0.243).

Table 2. Correlation coefficients between outcome measures

		FES-I	Number of falls	PFS	CFQ
Number of falls	Correlation coefficient	0.412	-	-	-
	p value	0.003	-	-	-
PFS	Correlation coefficient	-0.732	-0.394	-	-
	p value	< .001	0.005	-	-
CFQ	Correlation coefficient	0.243	0.499	-0.303	-
	p value	0.089	< .001	0.032	-
DTQ	Correlation coefficient	0.287	0.553	-0.395	0.787
	p value	0.043	< .001	0.005	< .001

FES-I: Falls Efficacy Scale-International; PFS: Physical Functioning Subscale of the 36-Item Short-Form Health Survey; CFQ: Cognitive failure Questionnaire; DTQ: Dual-task Questionnaire.

Table 3 presents a logistic regression model for assessing the impact of FES-I, PFS, CFQ, and DTQ on the presence of a history of falls. None of the variables was a significant predictor of falls. Nagelkerke R^2 was 0.174

Table 4 presents the multiple linear regression models to show the impact of self-reported outcome measures (i.e., PFS, CFQ, and DTQ) on FoF. PFS was the only significant variable explaining FES-I, and the model explained the 51% variance of the FES-I.

DISCUSSION

The aim of this study was to investigate whether falls and FoF were related to self-reported cognitive and physical functions and dual-task difficulties in older adults. Findings from the present study showed that falls are linked to self-reported physical and cognitive functions, but particularly perceived dual-task difficulties. FoF was related to self-reported physical functions and dual-tasking, and physical functioning was the significant predictor of FoF in community-dwelling older adults.

Lusardi et al. suggest that there is no single measure to predict falls in older adults, given the multifactorial nature of the falls [21]. They recommend the use of the combination of self-report tools and performance-based measures to better identify persons under risk. However, there is lack of evidence on the relationship between self-reported functioning and falls. We found a moderate correlation between a number of falls and FES-I, CFQ, and PFS. Recently, a longitudinal study supported our finding by showing that a decreased self-reported lower extremity function is associated with a risk of incident falls within a year [22]. It is not surprising that falls are associated with physical functioning, as they mostly occur while walking and during transfer [21].

Table 3. Logistic regression analysis

						95% Confidence Interval	
Predictor	**Estimate**	**SE**	**Z**	**p**	**Odds ratio**	**Lower**	**Upper**
PFS	0.0184	0.0213	0.861	0.389	1.019	0.98	1.06
CFQ	-0.0359	0.0433	-0.829	0.407	0.965	0.89	1.05
FES-I	-0.0171	0.0586	-0.292	0.770	0.983	0.88	1.10
DTQ	-0.0147	0.0918	-0.161	0.872	0.985	0.82	1.18

Nagelkerke R^2: 0.174

FES-I: Falls Efficacy Scale-International; PFS: Physical Functioning Subscale of the 36-Item Short-Form Health Survey; CFQ: Cognitive failure Questionnaire; DTQ: Dual-task Questionnaire.

Table 4. Multivariate regression analysis for FES-I

			95% Confidence Interval			
Predictor	**Estimate**	**SE**	**Lower**	**Upper**	**t**	**p**
PFS	-0.2604	0.0387	-0.33	-0.18	-6.724	< .001
CFQ	0.0378	0.1034	-0.17	0.25	0.366	0.716
DTQ	-0.0654	0.2225	-0.51	0.38	-0.294	0.770

R^2 0.538, Adjusted R^2 0.507

FES-I: Falls Efficacy Scale-International; PFS: Physical Functioning Subscale of the 36-Item Short-Form Health Survey; CFQ: Cognitive failure Questionnaire; DTQ: Dual-task Questionnaire.

The role of cognitive functions on motor activity is assessed by dual-task performance assessments. Currently, there is substantial data on performance-based dual-task walking or balance in older adults, showing a significant association between falls and dual-task performance. Additionally, several studies showed that perceived dual-task difficulties are related to FoF and falls [23]. In line with these findings, there was a strong correlation between the number of falls and self-reported dual-task difficulties in our study, and the magnitude of the correlation was higher than self-reported physical functioning and cognitive deficits. These findings may be attributed to the fact that dual-task activities better represent daily-life activities and have a more complex structure than single motor and cognitive tasks. However, in the logistic regression analysis, it was not the predictor of the presence of falls. Overall, although self-reported dual-task difficulty is not a predictor, it is a variable that shows a high correlation with the number of falls. It should be investigated in a larger sample to determine whether it could be a possible screening tool for determining those with fall risk.

The highest correlation was found between FoF assessed by FES-I and self-reported physical functioning. There was a weak correlation with the perceived dual-task difficulties and no significant correlation with

self-reported cognitive failures. This may be related to the fact that FES-I includes items that mainly focus on motor activities. Consequently, a decline in perceived physical functioning may lead to FoF regardless of perceived cognitive functions.

Limitations

The present study has several limitations. Firstly, we collected fall history data retrospectively. Thus, memory problems might affect the reliability of the data. Additionally, a small sample size may lead to nonsignificant results for the regression analysis. Another consideration is that we did not administer the performance-based assessments for walking and cognitive functions. Future research could examine the predictive ability of the self-reported and performance-based measures together. Additionally, further efforts in conducting a longitudinal study design are required to verify the role of self-reported measures for predicting falls and FoF.

CONCLUSION

This study has revealed a significant association between falls and FoF with self-reported cognitive and physical functioning, as well as dual-task difficulties in community-dwelling older adults. Notably, self-reported dual-task difficulties have shown the strongest correlation with falls, indicating the potential to serve as a screening tool for falls. Furthermore, self-reported physical functioning emerged as the determinant of FoF. These findings underscore the promising potential of self-reported outcomes in predicting falls and FoF in older adults, offering hope for the future of geriatric care.

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REFERENCES

1. Salari N, Darvishi N, Ahmadipanah M, Shohaimi S, Mohammadi M. Global prevalence of falls in the older adults: a comprehensive systematic review and meta-analysis. J Orthop Surg Res. 2022;17(1):334.
2. Giovannini S, Brau F, Galluzzo V, et al. Falls among older adults: screening, identification, rehabilitation, and management. Appl. Sci. 2022;12(5):7934.
3. Xiong W, Wang D, Ren W, Liu X, Wen R, Luo Y. The global prevalence of and risk factors for fear of falling among older adults: a systematic review and meta-analysis. BMC Geriatr. 2024;24(1):321.
4. Denkinger MD, Lukas A, Nikolaus T, Hauer K. Factors associated with fear of falling and associated activity restriction in community-dwelling older adults: A systematic review. Am J Geriatr Psychiatry. 2015;23(1):72-86.
5. Dwolatzky T, Rashedi V, Copyright fmed, et al. Reviewed by risk factors for falls among community-dwelling older adults: A systematic review and meta-analysis. Front Med (Lausanne). 2023;9:1019094.
6. Shao L, Shi Y, Xie XY, Wang Z, Wang ZA, Zhang JE. Incidence and risk factors of falls among older people in nursing homes: systematic review and meta-analysis. J Am Med Dir Assoc. Elsevier Inc.; 2023;24(11):1708-1717.
7. Liu M, Hou T, Li Y, et al. Fear of falling is as important as multiple previous falls in terms of limiting daily activities: a longitudinal study. BMC Geriatr. 2021;21(1):350.
8. Gazibara T, Kurtagic I, Kisic-Tepavcevic D, et al. Falls, risk factors and fear of falling among persons older than 65 years of age. Psychogeriatrics. 2017;17(4):215-23.
9. Hoang OTT, Jullamate P, Piphatvanitcha N, Rosenberg E. Factors related to fear of falling among community-dwelling older adults. J Clin Nurs. 2017;26(1-2):68-76.
10. Shirooka H, Nishiguchi S, Fukutani N, Tashiro Y, Nozaki Y, Aoyama T. Subjective cognitive decline and fall risk in community-dwelling older adults with or without objective cognitive decline. Aging Clin Exp Res. 2018;30(5):457-62.
11. Muir-Hunter SW, Wittwer JE. Dual-task testing to predict falls in community-dwelling older adults: A systematic review. Physiotherapy. 2016; 102(1):29-40.
12. Delbaere K, Close JCT, Brodaty H, Sachdev P, Lord SR. Determinants of disparities between perceived and physiological risk of falling among elderly people: cohort study. BMJ. 2010;18(341):1-8.
13. Peduzzi P, Concato J, Kemper E, Holford TR, Feinstein AR. A Simulation Study of the Number of Events per Variable in Logistic Regression Analysis. J Clin Epidemiol. 1996;49(12):1373-1379.
14. World Health Organization [Internet]. A global report on falls prevention epidemiology of falls. February 2007. Available from: https://www.who.int/publications/i/item/9789241563536.
15. Ulus Y, Durmus D, Akyol Y, Terzi Y, Bilgici A, Kuru O. Reliability and validity of the Turkish version of the Falls Efficacy Scale International (FES-I) in community-dwelling older persons. Arch Gerontol Geriatr. 2012;54(3):429-433.
16. Sertel M, Abit Kocaman A, Aydoğan Arslan S, Demirci C, Şengül Ayçiçek G. Investigation of the validity and reliability of the Turkish version of the Dual Task questionnaire in older individuals. Adnan Menderes Üniversitesi Sağlık Bilimleri Fakültesi Dergisi. 2021;5(2):304-314.
17. Broadbent DE, Cooper PF, FitzGerald P, Parkes KR. The cognitive failures questionnaire (CFQ) and its correlates. Br J Clin Psychol. 1982;21(1):1-16.
18. Ekici G, Atasavun Uysal S, Altuntaş O. The Validity and Reliability of Cognitive Failures Questionnaıie in University Students. Turk J Physiother Rehabil. 2016;27(2):55-60.
19. Bohannon Richard W, DePasquale Louis. Physical Functioning Scale of the Short-Form (SF) 36: Internal Consistency and Validity With Older Adults. JGPT. 2010;33(1):16-18.
20. Cohen J. Statistical Power Analysis for the Behavioural Science. 2nd edition. New York: Routledge; 1988:100-140.
21. Lusardi MM, Fritz S, Middleton A, et al. Determining Risk of falls in community dwelling older adults: A systematic review and meta-analysis using posttest probability. J Geriatr Phys Ther. 2017;40(1):1-36.
22. Yip W, Ge L, Heng BH, Tan WS. Association between patient-reported functional measures and incident falls. Sci Rep. 2021;11(1):5201.
23. VanNostrand M, Sogoloff B, Giroux C, Bergmans L, Kasser SL. Predicting falls in adults with multiple sclerosis using patient-reported measures: Are perceptions of dual-tasking missing? Mult Scler Relat Disord. 2022;68:104115.