Physical and Psychological Factors Associated With Fall History in Older Adults Attending Daycare Centers

Seong-Gil Kim*
*Dept. of Physical Therapy, Korea National University of Transportation
e-mail: niceguygil@gmail.com

주간보호센터 이용 노인의 낙상 경험과 관련된 신체적·심리적 요인

김성길*
*국립한국교통대학교 물리치료학과

Abstract

This cross-sectional study examined the combined influence of physical and psychological factors on fall history (past 12 months) in 73 older adults (mean age 83.25±6.91 years; 83.6% women) attending community-based adult daycare centers. Knee extension strength (KES), Timed Up and Go (TUG), and Falls Efficacy Scale-International (FES-I) were assessed. Binary logistic regression identified KES (OR=0.73, p=0.009) and TUG (OR=1.26, p=0.005) as significant predictors of fall history. The FES-I approached significance (p=0.055). ROC analysis showed an AUC of 0.83 for the physical model (KES+TUG), increasing to 0.87 when FES-I was included. These results support a multidimensional fall prevention approach integrating physical and psychological components.

1. Introduction

Falls represent a major public health concern among older adults, leading to injury, loss of independence, and reduced quality of life. Lower limb strength, balance, and mobility are well-established physical predictors of falls. However, fear of falling (FoF) — a psychological factor — also plays a critical role by triggering a maladaptive cycle of activity avoidance, muscle deconditioning, and increased fall risk. Despite its importance, relatively few studies have integrated FoF with physical predictors in comprehensive fall models, particularly in older adults attending community-based adult daycare centers. This study aimed to analyze the combined effects of KES, TUG, and FES-I on fall history and test whether adding FES-I improves model discrimination (AUC).

2. Methods

2.1 Study Design and Participants

A cross-sectional observational study was conducted with 73 older adults (mean age 83.25±6.91 years) from four adult daycare centers. Institutional Review Board approval was obtained (Sunmoon University, SM-202409-022-2). STROBE guidelines were followed.

2.2 Measurements

① KES: Handheld dynamometer (MicroFET2) measuring isometric knee extension (mean of 3 trials per leg).

② TUG: Time (seconds) to stand, walk 3 m, return, and sit. ③ FES-I: 16-item, 4-point Likert scale (range 16-64; higher = greater FoF). ④ Fall experience: Self-reported fall in past 12 months (yes/no).

2.3 Statistical Analysis

Multivariable logistic regression (variables with $p<.10$ in univariate analyses entered simultaneously) was performed. Predictive accuracy was assessed via ROC

curve analysis (AUC). All analyses used SPSS 26.0; significance set at $p<.05$.

3. Results

Of 73 participants, 24 (32.9%) reported a fall in the past 12 months. The fall group showed significantly lower KES, longer TUG times, and higher FES-I scores than non-fallers (Table 1).

[Table 1] General characteristics and physical/psychological variables between fallers and non-fallers

Variables	Total (n = 73)	Non-fallers (n = 49)	Fallers (n = 24)	p value
Age (years)	83.25 ± 6.91	82.74 ± 7.02	84.38 ± 6.69	0.462
Sex (Female, %)	83.6	81.6	87.5	0.537
Knee extension strength (kgf)	10.92 ± 4.17	12.06 ± 4.01	8.68 ± 3.72	0.008**
Timed Up and Go (TUG) (s)	13.54 ± 4.28	12.31 ± 3.69	15.94 ± 4.19	0.001**
FES-I (score)	23.34 ± 8.39	20.74 ± 7.45	28.58 ± 8.13	0.002**

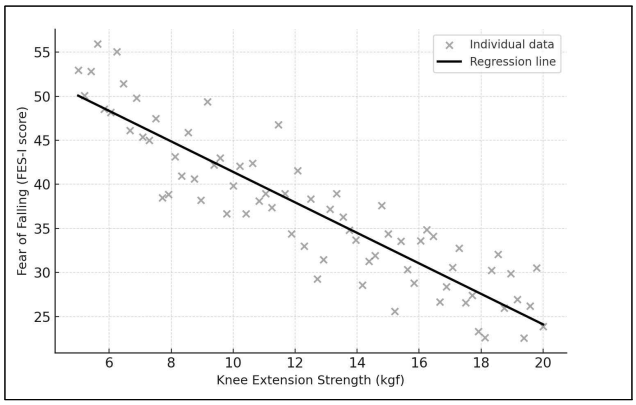
* p < 0.05, ** p < 0.01

[Table 2] Logistic regression analysis for predictors of fall history

Variables	β (SE)	Wald	OR (95% CI)	p value
Knee extension strength	−0.31 (0.12)	6.78	0.73 (0.58 – 0.91)	0.009**
Timed Up and Go (TUG)	0.23 (0.08)	7.85	1.26 (1.08 – 1.53)	0.005**
FES-I	0.06 (0.03)	3.69	1.06 (1.00 – 1.12)	0.055

* p < 0.05, ** p < 0.01

ROC analysis: KES-only AUC=0.78, TUG-only AUC=0.74, KES+TUG AUC=0.83. Adding FES-I increased AUC to 0.87, supporting the added value of psychological assessment.



[Fig. 1] Relationship between Knee Extension Strength and Fear of Falling

4. Discussion and Conclusion

Lower limb strength and mobility were strongly associated with fall history, whereas FoF approached significance and incrementally improved model discrimination. The increase in AUC from 0.83 to 0.87 when FES-I was incorporated supports a multidimensional fall prediction model. Older adults in daycare settings present unique vulnerability through lower physical activity, limited social stimulation, and higher caregiver dependence. Fall prevention programs for this population should combine physical training (strength and mobility) with psychological confidence-building strategies to break the activity restriction-weakness-fall risk cycle.

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