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The Relationship of Balance and Walking Speed with Fall Risk among Elderly People at the Sudiang Community Health Center, Makassar

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Abstract

Aims: This study aimed to examine the relationship between balance and walking speed, as well as between balance and fall risk, among older adults registered at the Sudiang Community Health Center, Makassar.

Methods: This cross-sectional study involved 82 participants aged ≥ 60 years selected using purposive sampling. Balance was measured with the Activities-specific Balance Confidence (ABC) Scale, walking speed with the 4-Meter Walk Test (4MWT), and fall risk with the Falls Efficacy Scale-International (FES-I). Data were analyzed using Spearman's correlation with a significance level of $p < 0.05$.

Results: Most participants had good balance (92.7%). Overall, 70.8% of participants demonstrated acceptable walking speed when combining the "good" (41.5%) and "normal" (29.3%) categories, although 43.9% exhibited moderate to high fall risk. A statistically significant, moderate negative correlation was found between balance and walking speed ($p= 0.003$; $r= -0.326$), indicating that lower balance confidence is associated with slower walking speed. Similarly, a significant, moderate-to-strong negative correlation was observed between balance and fall risk ($p < 0.001$; $r= -0.466$), showing that lower balance confidence is linked to a higher risk of falling.

Conclusion: Balance is significantly associated with walking speed and fall risk among older adults. The findings support the potential role of balance and mobility interventions in fall prevention among older adults.

Keywords: Accidental falls; Aged; Postural balance; Walking speed

Introduction

The aging process is an inevitable stage of the human life cycle, from infancy to old age, each accompanied by biopsychosocial developmental tasks. Increasing life expectancy in Indonesia has led to a growing elderly population, placing the country into an ageing population phase. According to recent national statistics from Statistics Indonesia (Badan Pusat Statistik/BPS) [1], the number of older adults reached 30.73 million (11.75% of the total population), with projections estimating this proportion to reach approximately 20% by 2045. Women outnumber men due to

higher female life expectancy (52.28% vs 47.72%). Old age is generally associated with declines in physical condition and cognitive function [2].

Physiological changes in the musculoskeletal and neurosensory systems contribute to balance disorders and reduced walking speed. These conditions increase body instability, slow gait, and elevate fall risk.[3,4] Walking speed is a key indicator of functional capacity and is strongly linked to disability, hospitalization, and mortality.[3] Falls among older adults are a major cause of serious injury, loss of independence, and even death, thus negatively affecting quality of life.

Although balance, walking speed, and fall risk are interrelated in determining functional status, existing literature primarily focuses on these variables in isolated pairs or hospital settings. What remains unknown is how balance simultaneously interacts with walking speed and fall risk among community-dwelling older adults within primary health care settings, particularly in regional Indonesian populations with unique socioeconomic profiles. Previous research indicates that impaired balance is associated with slower walking speed and a higher risk of falls.[4] However, comprehensive evaluations integrating these specific clinical indicators into routine primary care screening remain limited.

Preliminary observations at the Sudiang Community Health Center in Makassar noted instances of reduced walking speed and postural instability among several attending older adults, serving as an initial rationale for further empirical investigation. Therefore, this study aimed to examine the relationship between balance and walking speed, as well as between balance and fall risk, among older adults at the Sudiang Community Health Center in Makassar, providing a scientific basis for preventive and promotive strategies in primary health care.

Methods

This quantitative observational cross-sectional study was conducted at the Sudiang Community Health Center in Makassar City to evaluate the statistical associations between balance confidence, walking speed, and fall risk in the elderly, noting that this design inherently assesses correlations rather than causal relationships. From a target population of 108 registered individuals aged 60 years or older, 82 participants were selected using purposive sampling based on their willingness to participate, ability to walk independently, and absence of severe neurological or musculoskeletal disorders that could affect balance. Primary data were gathered through direct observation and standardized physical measurements. Subjective balance confidence, representing balance self-efficacy rather than objective physical balance performance, was evaluated using the Activities-specific Balance Confidence (ABC) Scale. Walking speed was measured using the 4-Meter Walk Test along a 6-meter course comprising a 1-meter acceleration zone, a 4-meter timed walking zone, and a 1-meter deceleration zone, where the average speed in meters per second across two recorded trials at a normal pace was calculated for analysis. Concern about falling, which represented fall risk, was assessed using the Falls Efficacy Scale-International. All instruments were administered by trained personnel using validated Indonesian translations. Data were processed in SPSS version 24, where normality testing determined the use of descriptive statistics and Spearman's rank correlation to examine the relationships between balance confidence and walking speed as well as balance confidence and fall risk at a significance level of $p < 0.05$. Ethical clearance for this research was

officially granted by the Health Research Ethics Committee of the Faculty of Nursing at Hasanuddin University under approval number 362/UN4.18.3/TP.01.02/2025 on May 19, 2025.

Results

Table 1. Characteristics of respondents

		Frequency	Percentage (%)
Age	Elderly (60-74 years)	72	87.8
	Old (75-90 years)	10	12.2
	Total	82	100
Gender	Male	32	39.0
	Female	50	61.0
	Total	82	100
Occupation	Retiree	28	34.1
	Housewife	34	41.5
	Entrepreneur	20	24.4
	Total	82	100
		Mean ± SD	
Study Variables (Scores)	Balance Score	2.91 ± 0.32	3.00 (0.00)
	Walking Speed Score	2.18 ± 1.06	2.00 (2.00)
	Fall Risk Score	1.59 ± 0.74	1.00 (1.00)

Source: Primary Data (2025)

Table 1 presents the characteristics of respondents by age, gender, and occupation. Most respondents were in the 60–74 years age group (87.8%). By gender, females accounted for a higher proportion than males (61.0%). Regarding occupation, the largest group was housewives (34; 41.5%). Overall, the majority of respondents were women in the younger elderly category who were not engaged in formal employment.

Table 2. Balance Distribution

Characteristics	Category	Variable			Total N (%)
		Good N (%)	Moderate N (%)	Poor N (%)	
Respondents	-	76 (92.7%)	5 (6.1%)	1 (1.2%)	82 (100%)
Gender	Male	31 (37.8%)	1 (1.2%)	0 (0.0%)	32 (39.0%)
	Female	45 (54.9)	4 (4.9%)	1 (1.2%)	50 (61.0%)
Total N (%)		76 (92.7%)	5 (6.1%)	1 (1.2%)	82 (100%)
Age	Elderly (60-74)	69 (84.1%)	3 (3.7%)	0 (0.0%)	72 (87.8%)
	Old (75-90)	7 (8.5%)	2 (2.4%)	1 (1.2%)	10 (12.2%)
Total N (%)		76 (92.7%)	5 (6.1%)	1 (1.2%)	82 (100%)
Occupation	Retired	26 (31.7%)	2 (2.4%)	0 (0.0%)	28 (34.1%)
	Housewife	32 (39.0%)	2 (2.4%)	0 (0.0%)	34 (41.5%)
	Entrepreneur	18 (22.0%)	1 (1.2%)	1 (1.2%)	20 (24.4%)
Total N (%)		76 (92.7%)	5 (6.1%)	1 (1.2%)	82 (100%)

Source: Primary Data (2025)

Table 2 shows that most elderly respondents at the Sudiang Community Health Center were in the good balance category (92.7%). By gender, females accounted for a higher proportion (45; 54.9%). By age, the 60–74 years group dominated with 69 respondents (84.1%). By occupation, housewives were the largest group with good balance (32; 39%). Overall, body balance tended

to be better among younger elderly, females, and those not engaged in formal employment, particularly housewives.

Table 3. Distribution of Fall Risk

Characteristics	Category	Variable			Total N (%)
		Low N (%)	Medium N (%)	High N (%)	
Respondents	-	46 (56.1%)	24 (29.3%)	12 (14.6%)	82 (100%)
Gender	Male	25 (30.5%)	5 (6.1%)	2 (2.4%)	32 (39.0%)
	Female	21 (25.6%)	19 (23.2%)	10 (12.2%)	50 (61.0%)
Total N (%)		46 (56.1%)	24 (29.3%)	12 (14.6%)	82 (100%)
Age	Elderly (60-74)	41 (50.0%)	22 (26.8%)	9 (11.0%)	72 (87.8%)
	Old (75-90)	5 (6.1%)	2 (2.4%)	3 (3.7%)	10 (12.2%)
Total N (%)		46 (56.1%)	24 (29.3%)	12 (14.6%)	82 (100%)
Occupation	Retired	19 (23.2%)	6 (7.3%)	3 (3.7%)	28 (34.1%)
	Housewife	15 (18.3%)	13 (15.9%)	6 (7.3%)	34 (41.5%)
	Entrepreneur	12 (14.6%)	5 (6.1%)	3 (3.7%)	20 (24.4%)
Total N (%)		46 (56.1%)	24 (29.3%)	12 (14.6%)	82 (100%)

Source: Primary Data (2025)

Table 3 shows that most elderly respondents at the Sudiang Community Health Center were in the low fall risk category (46; 56.1%). By gender, males accounted for the largest proportion (25; 30.5%). By age, the 60–74 years group dominated with 41 respondents (50.0%). By occupation, retirees had the highest proportion of low fall risk (19; 23.2%). These findings suggest that fall risk tends to be lower among younger elderly and those no longer engaged in formal employment, such as retirees.

Table 4. Distribution of walking speed

Characteristics	Category	Variable				Total N (%)
		Normal N (%)	Good N (%)	Moderate N (%)	Poor N (%)	
Respondents	-	24(29.3)	34(41.5)	11(11.0)	15(18.3)	82(100)
Gender	Male	15(18.3)	12(14.6)	4(4.9)	1(1.2)	32(39.0)
	Female	9(11.0)	22(26.8)	5(6.1)	14(17.1)	50(61.0)
Total N (%)		24(29.3)	34(41.5)	9(11.0)	15(18.3)	82(100)
Age	Elderly (60-74)	22(26.8)	29(35.4)	9(11.0)	12(14.6)	72(87.8)
	Old (75-90)	2(2.4)	5(6.1)	0(0.0)	3(3.7)	10(12.2)
Total N (%)		24(29.3)	34(41.5)	9(11.0)	15(18.3)	82(100)
Occupation	Retired	9(11.0)	13(15.9)	3(3.7)	3(3.7)	28(34.1)
	Housewife	6(7.3)	14(17.1)	4(4.9)	10(12.2)	34(41.5)
	Entrepreneur	9(11.0)	7(8.5)	2(2.4)	2(2.4)	20(24.4)
Total N (%)		24(29.3)	34(41.5)	9(11.0)	15(18.3)	82(100)

Source: Primary Data (2025)

Table 4 shows that most elderly respondents at the Sudiang Community Health Center were in the good walking speed category (34; 41.5%). By gender, females accounted for the largest share (22; 26.8%). By age, the 60–74 years group dominated with 29 respondents (35.4%). By

occupation, both retirees and housewives had the same number in the good walking speed category (14; 17.1% each). Overall, good walking speed was more common among younger elderly, females, and those not engaged in formal employment, particularly housewives.

Table 5. Results of Spearman's rho test of balance index with walking speed in elderly

	Walking Speed		
Balance	Frequency (n)	Significance (p)	Correlation coefficient (r)
	82	0.003	-0.326

Source: Primary Data (2025)

Table 5 shows a statistically significant relationship between balance and walking speed in the elderly ($p = 0.003$; $p < 0.01$). The Spearman correlation coefficient ($r = –0.326$) indicates a negative association of moderate strength. This suggests that lower balance is associated with slower walking speed, reflecting reduced physical function and an increased risk of falls among older adults.

Table 6. Results of Spearman's rho test for balance index with risk of falling in the elderly

	Risk of Falling		
Balance	Frequency (n)	Significance (p)	Correlation coefficient (r)
	82	0.000	-0.466

Source: Primary Data (2025)

Table 6 shows a statistically significant relationship between balance confidence and fall risk in the elderly ($r = -0.466$, $p < 0.001$). Based on standard interpretation guidelines for correlation coefficients (where r = 0.20–0.39 indicates a weak correlation, 0.40–0.59 moderate, and 0.60–0.79 strong), the Spearman correlation coefficient reflects a moderate negative association. Lower balance confidence scores corresponded with higher concern regarding fall risk.

Discussion

The results of this study indicated a statistically significant relationship between perceived balance confidence and walking speed among elderly individuals at the Sudiang Community Health Center in Makassar ($r = -0.326$, $p = 0.003$). This negative correlation suggests that lower perceived balance confidence, which reflects subjective balance self-efficacy rather than objective physical balance capacity, was associated with slower walking speed. Rather than indicating a direct physical constraint alone, this relationship suggests that self-perceived balance insecurity leads older adults to adopt cautious compensatory strategies, such as reducing gait speed or widening their base of support to prevent falls, which directly influences gait parameters. [5,6]

These findings are consistent with the general physiological trends reported by Wijayani,[4] who noted a relationship between dynamic balance and walking speed in older adults. However, while earlier studies often focused on physical performance, the present findings highlight that psychological self-efficacy measured by the ABC Scale acts as a critical cognitive regulator of mobility in community-dwelling seniors. Similarly, Mehdipour et al. [3] emphasized that walking speed serves as a valid functional indicator, often referred to as the "sixth vital sign" in geriatric practice, because of its strong association with disability, morbidity, and mortality. The similarity across these findings stems from the shared focus on community-dwelling older adults who

maintain independent mobility. Discrepancies with other literature typically arise in institutional settings where physical muscle weakness and neurological deficits override subjective confidence in dictating walking speed.

The present study also demonstrated a statistically significant relationship between perceived balance confidence and fall risk ($r = -0.466$, $p < 0.001$), indicating that older adults with lower balance confidence reported higher levels of fall-related concern on the FES-I scale. These findings support previous research by Putri et al. [7] and Nofita et al.,[8] which identified body balance as a key predictive factor for falls and highlighted its modifiability through interventions such as structured physical exercise and preventive therapy. The convergence between our findings and these studies confirms that fear of falling and low balance confidence directly correlate with actual fall risk perceptions.

Physiologically, impaired balance confidence often originates from age-related deterioration of sensory systems, including visual, vestibular, and somatosensory inputs, which reduces the body ability to maintain posture and adapt to environmental changes.[5] Decreased balance confidence has also been associated with reduced mobility,[9] which may exacerbate physical decline through decreased activity levels, muscle disuse, and social isolation. Distinguishing between perceived balance confidence and actual physical balance is essential here, as anxiety about falling can restrict activity even in individuals who retain adequate physical balance ability.

From a practical standpoint, both balance confidence and walking speed assessments should be incorporated into routine screening for older adults, especially in primary care settings. Interventions focusing on balance training, muscle strengthening, and mobility enhancement can serve as effective preventive strategies to reduce fall risk and improve functional capacity.[10] Furthermore, family involvement and education on the importance of physical activity are essential to support intervention success and promote independence in daily living.

In summary, this study confirms that perceived balance confidence is not only related to walking speed but also plays a crucial role in determining fall risk in older adults. Therefore, monitoring both subjective balance confidence and physical mobility should be prioritized in health promotion and preventive programs for the elderly population.

Limitations

Several methodological limitations should be acknowledged in this study. First, the cross-sectional study design precludes establishing causal relationships between perceived balance confidence, walking speed, and fall risk, allowing only statistical associations to be inferred. Second, the study utilized purposive sampling at a single community health center, which may limit the generalizability of the findings to broader older adult populations. Third, the reliance on self-reported questionnaires, specifically the ABC Scale and FES-I, introduces potential recall bias and subjective reporting errors, as some respondents may have experienced undetected mild cognitive impairment or recall difficulties. Fourth, the sample exhibited an imbalance between male and female respondents, which could influence generalizability given physiological differences between genders. Fifth, data collection was conducted sequentially and partly door-to-door, meaning minor variations in environmental conditions during testing might have influenced individual performance. Finally, regarding sample size, N = 82 represents the final, fully analyzed sample size of respondents who successfully completed all research procedures;

non-eligible individuals were excluded prior to analysis, and no missing data were omitted from the reported tables.

Conclusion

This study demonstrates significant associations between balance, walking speed, and fall risk among elderly individuals in Makassar. Declining balance was linked with slower walking speed and higher fall risk. These findings highlight the importance of balance training, strength exercises, and regular monitoring in primary health care to reduce fall-related risks and support independence in older adults.

Author Contribution

All authors have accepted responsibility for the entire content of this manuscript and approved its submission.

Conflict of interest

Authors state no conflict of interest.

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