

Frailty Reveals Domain-specific Cognitive Patterns Beyond Global Cognition In Older Adults: Evidence From An Aging Cohort In Thailand

Rapas Samalapa^{1,2} | Kanyanut Kasiansin³ | Chonnikarn Weng³ | Tanatat Bangpensiri³ | Thanyaporn Hengpongthorn^{1,3} | Bhorn-ake Manasvanich^{1,3} | AisawanPetchlorlian^{1,2} | Natthaphon Ubonsutvanich^{1,2}

1 | Background

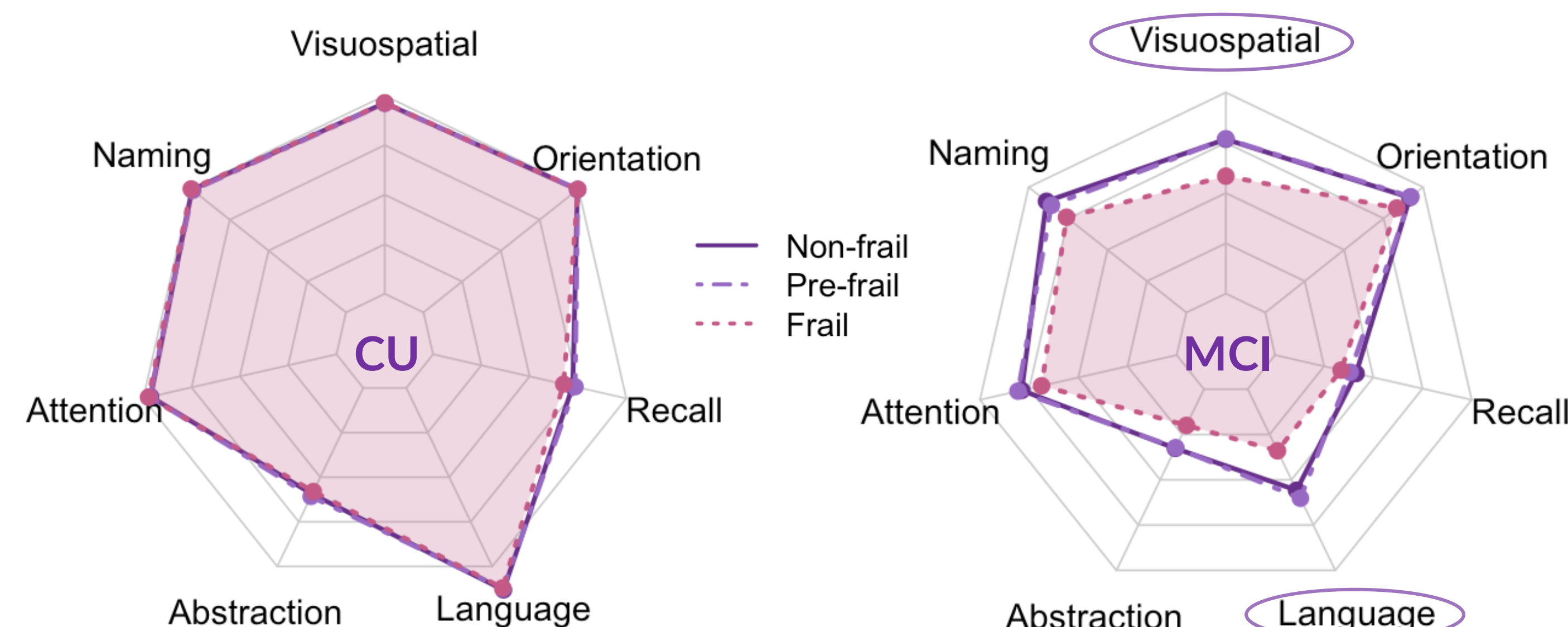
Physical frailty and cognitive impairment frequently coexist in older adults and are increasingly recognized as interconnected geriatric syndromes. Emerging evidence suggests that frailty may be associated with selective vulnerability in specific cognitive domains rather than uniform cognitive decline. However, whether frailty exerts similar cognitive effects across the cognitive continuum remains unclear. Data on domain-specific cognitive patterns associated with frailty are limited in Asian populations, where the prevalence of frailty and mild cognitive impairment (MCI) is high.

2 | Method

We conducted a cross-sectional analysis of older adults from an aging cohort in Thailand. Participants with dementia were excluded. Cognitive function was assessed using the Montreal Cognitive Assessment (MoCA), including total and domain-specific scores. Participants were classified as cognitively unimpaired (CU; MoCA ≥ 25) or mild cognitive impairment (MCI; MoCA < 25). Frailty status was defined using the Fried frailty phenotype and categorized as non-frail, pre-frail, or frail. Cognitive performance across frailty groups was compared using Kruskal-Wallis tests, with post-hoc Dunn tests for significant domains.

Frailty is linked to domain-specific—not generalized—cognitive impairment, particularly in visuospatial/executive and language domains, among older adults with MCI.

MoCA Domain by Frailty Status in CU and MCI group



3 | Result

A total of 2,414 participants were included (1,745 CU and 669 MCI). Participants with MCI were older and showed lower performance across all MoCA domains than CU participants; frailty prevalence was slightly higher in the MCI group. In the MCI group, frailty was associated with lower global cognitive performance, with differences in MoCA total score across frailty groups ($p=0.001$). Domain-level analyses showed significant differences in visuospatial/executive function ($p=0.036$), naming ($p=0.034$), and language ($p=0.015$), while attention, abstraction, recall, and orientation did not differ. Post-hoc analyses indicated worse performance among frail participants in MoCA total score and visuospatial/executive function, and worse language performance compared with pre-frail participants. In contrast, among CU participants, neither MoCA total score nor domain-specific scores differed across frailty groups.

4 | Conclusion

Frailty is associated with selective domain-specific cognitive deficits beyond global cognition among older adults with MCI, particularly in visuospatial/executive and language domains, but not among cognitively unimpaired individuals. These findings suggest that frailty modifies the expression of cognitive impairment. Integrating frailty assessment with domain-level cognitive evaluation may improve risk stratification and guide targeted interventions in aging populations.

Baseline Characteristic by Frailty Status

Characteristic	Total n = 5694 (100%)	Robust n = 3169 (55.65%)	Pre-frailty n = 2442 (42.89%)	Frailty n = 83 (1.46%)
Age (years), mean $\pm$ SD	67.48 (5.15)	67.41 (5.13)	67.61 (5.23)	66.22 (4.69)
Female, n (%)	4243 (74.5)	2354 (74.3)	1829 (74.9)	60 (72.3)
Fall, n (%)	1007 (17.7)	605 (19.1)	389 (15.9)	13 (15.7)
Recurrent fall, n (%)	233 (4.1)	139 (5.1)	93 (4.3)	1 (1.4)
Unsteadiness, n (%)	981 (17.2)	548 (17.3)	424 (17.4)	9 (10.8)
Fear of falling, n (%)	1475 (25.9)	821 (25.9)	637 (26.1)	17 (20.5)
Polypharmacy, n (%)	2363 (41.5)	1321 (41.7)	1017 (41.6)	25 (30.1)
Sedative drug use, n (%)	546 (9.6)	290 (9.2)	252 (10.3)	4 (4.8)
Exercise < 150 min/week, n (%)	2079 (36.5)	1172 (43.0)	877 (42.0)	30 (42.9)
Urinary incontinence, n (%)	1428 (25.1)	798 (25.2)	607 (24.9)	23 (27.7)
Low muscle mass, n (%)	2382 (41.8)	1300 (41.0)	1055 (43.2)	27 (32.5)
Sarcopenia, n (%)	777 (13.6)	438 (13.8)	332 (13.6)	7 (8.4)
Gait speed (m/s), mean $\pm$ SD	1.46 (0.20)	1.46 (0.20)	1.46 (0.21)	1.48 (0.18)
TUG (s), mean $\pm$ SD	9.23 (1.80)	9.21 (1.85)	9.29 (1.90)	9.05 (1.33)
MoCA score, mean $\pm$ SD	26.01 (2.85)	26.01 (2.80)	25.94 (2.86)	26.36 (2.94)

Baseline Characteristic by Cognitive Status

Characteristic	CU (MoCA ≥ 25) n = 1,745	MCI (MoCA < 25) n = 669
Age (years), mean $\pm$ SD	66.91 $\pm$ 4.85	69.25 $\pm$ 5.60
Female, %	75.1	78.2
Living alone, %	11.6	12.0
Obesity	66.9	74.0
Slow gait speed, %	3.5	5.8
Frailty status		
Robust (Fried = 0), %	47.2	44.1
Pre-frail (Fried = 1–2), %	49.9	52.2
Frail (Fried ≥ 3), %	2.9	3.7
MoCA assessment (mean $\pm$ SD)		
MoCA total score	27.23 $\pm$ 1.50	20.74 $\pm$ 5.63
Visuospatial/Executive	4.81 $\pm$ 0.46	3.81 $\pm$ 1.37
Naming	2.97 $\pm$ 0.17	2.60 $\pm$ 0.84
Attention	5.79 $\pm$ 0.49	4.76 $\pm$ 1.53
Abstraction	1.80 $\pm$ 0.45	0.96 $\pm$ 0.82
Language	2.26 $\pm$ 0.80	1.14 $\pm$ 0.92
Delayed Recall	3.64 $\pm$ 1.15	1.97 $\pm$ 1.54
Orientation	5.97 $\pm$ 0.17	5.50 $\pm$ 1.45
Verbal Fluency	0.95 $\pm$ 0.21	0.75 $\pm$ 0.43



Division of Geriatric Medicine,
Department of Medicine,
Faculty of Medicine,
Chulalongkorn University



ISTAART
ALZHEIMER'S ASSOCIATION

Affiliations

¹Geriatric Excellence Center, King Chulalongkorn Memorial Hospital, Bangkok, Thailand,
²Division of Geriatric Medicine, Department of Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand,
³Department of Family Medicine, Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand.

Contact

Rapas Samalapa, MD
Geriatric Excellence Center, King Chulalongkorn Memorial Hospital
The Thai Red Cross Society
1873 Rama IV Road, Pathumwan, Bangkok, Thailand 10330
Email: rapas.s@chula.ac.th