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Original Study

Association Between Frailty and Cognitive Impairment: Cross-Sectional Data From Toulouse Frailty Day Hospital

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A B S T R A C T

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Background: A consensus panel, based on epidemiologic evidence, argued that physical frailty is often associated with cognitive impairment, possibly because of common underlying pathophysiological mechanisms. The concepts of cognitive frailty and motoric cognitive risk were recently proposed in literature and may represent a prodromal stage for neurodegenerative diseases. The purpose of this study was to analyze the relationship between cognition and the components of the physical phenotype of frailty.

Methods: Participants admitted to the Toulouse frailty day hospital aged 65 years or older were included in this cross-sectional study. Cognitive impairment was identified using the Mini-Mental State Examination (MMSE) and the Clinical Dementia Rating (CDR). Frailty was assessed using the physical phenotype as defined by Fried's criteria. We divided the participants into 2 groups: participants with normal cognition (CDR = 0) and participants who had cognitive impairment (CDR = 0.5). Participants with CDR >0.5 were excluded.

Results: Data from 1620 participants, mean age 82 years and 63% of women were analyzed. Cognitive impairment was identified in 52.5% of the participants. Frailty was identified in 44.7% of the sample. There were more frail subjects in the impaired group than the normal cognitive group (51% vs 38%, $P < .001$). In logistic regression analyses, elevated odds for frailty were observed in patients with cognitive impairment [adjusted odds ratio (OR) 1.66, 95% confidence interval (CI) 1.12–2.46]. Subsequent analysis showed that the association between cognitive impairment and frailty was only observed considering one of the 5 frailty criteria: gait speed (adjusted OR 1.89, 95% CI 1.55–2.32).

Conclusion: Physical frailty and in particular slow gait speed were associated with cognitive impairment. Future research including longitudinal studies should exploit the association between cognitive impairment and frailty.

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Frailty is a pathologic aging process that is partly reversible and occurs at an intermediate stage between age-related diseases and a poor prognosis, such as disability or death.^{1–4} This syndrome is triggering considerable attention not only in clinics and research but also among public health authorities.¹ Most of the available definitions have privileged the physical dimension of the frailty syndrome, mostly relying on symptoms and signs like weight loss, muscle weakness,

slow gait speed, and sedentary behavior.⁵ The place of cognitive impairment in a definition of frailty has been widely debated. Fried's model describes a wasting syndrome, with weight loss and negative energy balance as important elements⁵ and does not include cognitive function in its definition, whereas Rockwood's model allows poor cognition to be included as one of the possible deficits.^{6–8}

In 2013, a consensus on the definition of cognitive frailty was reached by an international consensus group (the International Academy on Nutrition and Aging and the International Association of Gerontology and Geriatrics).⁹ The panel defined cognitive frailty as a syndrome in older adults with evidence of both physical frailty and cognitive impairment without a clinical diagnosis of Alzheimer disease (AD) or another dementia [Clinical Dementia Rating

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(CDR) = 0.5].⁹ As a consequence, secondary prevention targeting frailty could be an effective way of slowing down cognitive decline.

This definition also suggests physical frailty and cognition to be associated. However, the causal links between physical frailty and cognitive impairment as common pathophysiological mechanisms remain unclear. Cognitive frailty was suggested to be a fundamental determinant of the individual's vulnerability and resilience to stressors.¹⁰ Several authors have also supported the idea that individuals who manifest both cognitive and motor deficits might have a greater burden of a shared underlying pathology. Therefore, the motoric concept of cognitive risk (MCR) syndrome^{11–13} has emerged, in line with the cognitive frailty.

The primary objective of this article was to explore the association between the concepts of cognitive impairment and frailty. The secondary objective is to find the Fried criteria, which is the most strongly associated with cognitive impairment.

Methods

Participants

Community-dwelling participants aged 70 years or older who visited the Toulouse frailty day hospital during 2 years between 2015 and 2016 were included in this analysis. Each patient was referred by a general practitioner who had reported signs or symptoms of frailty using the Gérontopôle Frailty Screening Tool.¹⁴ Among these patients, those who underwent the assessment of physical frailty and cognition were assessed for eligibility ($n = 2486$). Patients were excluded from the analyses in the following cases: the patients did not agree to undergo the assessments [Fried ($n = 89$) or CDR ($n = 488$)] or the patients had dementia [Mini-Mental State Examination (MMSE)¹⁵ score $<24/30$ ($n = 246$) or CDR¹⁶ >0.5 ($n = 330$)]. A total of 866 subjects were excluded, and 1620 subjects were enrolled into the final analyses (Figure 1).

Assessment of Cognitive Function

Cognitive assessment was performed using the MMSE and the CDR. All the evaluations were done by geriatricians with expertise in memory disorders. The CDR¹⁵ allows more reliable staging of dementia than MMSE and is based on caregiver accounts of problems in

daily functional and cognitive tasks. The CDR was scored for each subject on the basis of a detailed history and clinical examination by a physician who was certified in administering the test. Scoring of the CDR requires integration of the informant report. The CDR has 6 domains (memory, orientation, judgment and problem-solving, home and hobbies, community affairs, and personal care). Each domain is scored as follows: 0 = no impairment, 0.5 = questionable impairment; 1 = mild impairment; 2 = moderate impairment; and 3 = severe impairment. Motoric cognitive risk syndrome builds on mild cognitive impairment criteria¹⁶ and is defined as presence of cognitive complaints and slow gait in older individuals without dementia or mobility disability.¹⁷ In our study, mild cognitive impairment was defined by a CDR score equal to 0.5.

Physical Frailty Assessment

Physical frailty was defined according to the definition proposed by Fried and colleagues based on the 5 criteria of unintentional weight loss, self-reported exhaustion, weakness, slow walking speed, and low physical activity.⁵ From the original criteria, physical activity was the only adapted criterion, as the Minnesota Leisure time Questionnaire was not feasible in clinical practice. Instead a questionnaire from the InCHIANTI study based on regular physical activity was used.¹⁸ In detail,

- **Weight loss.** Weight loss was defined as the unintentional loss of >4.5 kg in the past year.
- **Exhaustion.** If the participant answered often or most of the time for the question "How often in the last week did you feel that everything you did was an effort?" included in the Center for Epidemiologic Studies–Depression scale,¹⁹ the exhaustion criterion was considered present.
- **Low physical activity.** Participants who performed no physical activity, spent most of the time sitting, or rarely had a short walk (or other nondemanding physical activity) in the past year were considered physically inactive.
- **Slow walking speed.** The original sex-specific cut points proposed by Fried were used based on walking speed (over a 4-m course, at usual pace) and height.
- **Weakness (grip strength).** Hand grip strength was measured by a handheld dynamometer (Jamar, Irvington, NY). The participants were asked to perform the task twice with each hand. The average of the best results obtained for each side was used for the present analyses. The original sex-specific cut points by Fried were used, based on grip strength and BMI.

Depending on the numbers of criteria met, participants were ranked as frail (3-5 criteria), prefrail (1 or 2 criteria), or robust (0 criteria).

Covariates

As part of the usual care in the Frailty Day Hospital, sociodemographic, anthropometric, and clinical data were recorded. Functional performances were tested with the measurement of usual gait speed assessment over 4 m; grip strength was measured using a handheld dynamometer. The Short Physical Performance Battery was performed by trained nurses or physical activity specialists. Disability was evaluated using the basic Activities of Daily Living index,²⁰ and nutritional status using the Mini Nutritional Assessment.

Statistical Analyses

The cross-sectional data were analyzed with Stata, v11 (Stata, College Station, TX). Variables were compared according to cognitive

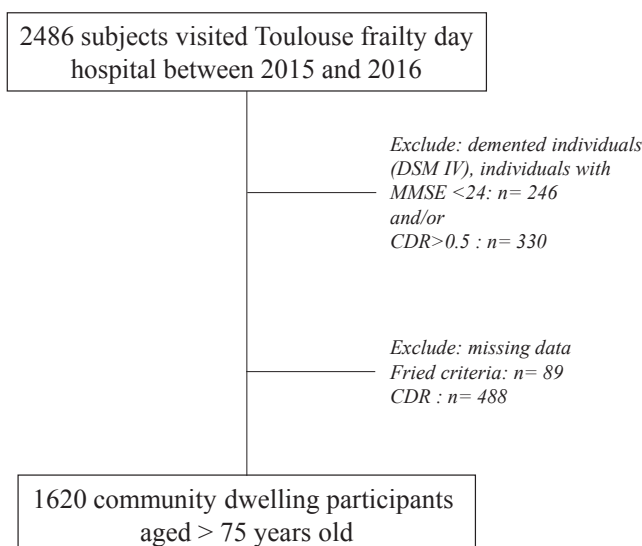


Fig. 1. The study subject selection process. DSM, Diagnostic and Statistical Manual of Mental Disorders.

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