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Dimensions of physical frailty and cognitive function in older adults with amnesic mild cognitive impairment

Dimensions de la fragilité physique et fonctions cognitives chez la personne âgée présentant un trouble cognitif léger de type amnésique

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Abstract

Objective. – The objective of this study was to examine relationships between dimensions of physical frailty and severity of cognitive impairment in older adults with amnesic mild cognitive impairment (aMCI).

Patients and methods. – The prevalence of physical frailty dimensions including slow gait speed, low physical activity, and low grip strength was examined among 201 sedentary older adults with aMCI. Associations between dimensions of physical frailty and severity of cognitive impairment, as measured with the Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog) and individual dimensions of cognitive function were examined using multiple linear regression models.

Results. – Greater than 50% of participants met physical frailty criteria on dimensions of slow gait speed, low physical activity and low grip strength. Slower gait speed was associated with elevated severity of cognitive impairment. Both gait speed and physical activity were associated with individual dimensions cognitive function.

Conclusions. – Dimensions of physical frailty, particularly gait speed, were associated with severity of cognitive impairment, after adjusting for age, sex and age-related factors. Further studies are needed to investigate mechanisms and early intervention strategies that assist older adults with aMCI to maintain function and independence.

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Keywords: Mild cognitive impairment; Physical frailty; Cognitive impairment; Gait speed

Résumé

Objectif. – L'objectif de cette étude était d'examiner les relations entre les différentes dimensions de la fragilité physique et la sévérité des troubles cognitifs chez la personne âgée souffrant d'un trouble cognitif léger de type amnésique (aMCI)

Patients et méthodes. – Nous avons étudié la prévalence des dimensions de la fragilité physique, c'est-à-dire marche lente et diminuée, faible niveau d'activité physique et faible force de préhension, chez 201 personnes âgées sédentaires présentant un aMCI. Les associations entre dimensions de la fragilité physique et sévérité des troubles cognitifs ont été mesurées à l'aide de l'échelle Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog) et les dimensions individuelles des fonctions cognitives furent analysées à l'aide des modèles de régression linéaire.

Résultats. – Plus de 50 % des participants remplissent les critères de fragilité physiques dans les domaines d'une marche lente et diminuée, faible niveau d'activité physique et faible force de préhension. Une marche lente était corrélée à la sévérité du trouble cognitif. La vitesse de marche et le faible niveau d'activité étaient tous deux associés aux dimensions individuelles des fonctions cognitives.

Conclusions. – Les dimensions de la fragilité physique, tout particulièrement la vitesse de marche étaient corrélées à la sévérité du déficit cognitif, après corrections en fonction de l'âge, du sexe et des facteurs liés à l'âge. Des études complémentaires sont nécessaires pour étudier les

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mécanismes et stratégies d'intervention précoce pour permettre à la personne âgée aMCI de maintenir son indépendance et un état fonctionnel satisfaisant.

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Mots clés : Handicap cognitif modéré ; Fragilité ; Troubles cognitifs ; Vitesse de marche

1. English version

1.1. Introduction

Older adults with both cognitive and physical impairments are at elevated risk for falls, disability, and institutionalization [56]. Mild cognitive impairment (MCI) is a transitional state less severe than dementia but beyond that of typical age-related cognitive changes [40]. There are two major sub-classifications of MCI, amnesic MCI (aMCI) and non-amnesic MCI (naMCI) [39]. aMCI involves impairment of cognitive dimensions specific to memory and attention, while naMCI is characterized by reduced function in cognitive domains other than memory [39,41]. Older adults with aMCI are at highest risk for developing Alzheimer's disease (AD) [23]. A temporal relationship exists between declining cognitive function and declining physical function in older adults with AD [13]. Reduced physical function is evident prior to the onset of dementia [1,29,30,35], contributing to accelerated global decline and disability.

Older adults with MCI (amnesic and non-amnesic) demonstrate declining physical function including slower walking, reduced balance reactions and elevated risk for falling [32,34,38]. Physical frailty, a convergence of cumulative stress from multiple physiological systems, is also associated with increased incident falls, activities of daily living (ADL) dependence, hospitalization and disability [10,18,21,37,60]. Identification of physical frailty associated with severity of cognitive impairment is needed to develop early intervention and rehabilitation strategies aimed at assisting older adults in maintaining their health and independence.

A frailty index derived from the Cardiovascular Health Study includes the clinical presentation of three of five criteria: slow gait, low grip strength, low physical activity (PA), low energy, and unintentional weight loss [21]. More broadly defined, slowness, low PA, low strength, exhaustion, and body composition represent dimensions of physical frailty [5]. Of these dimensions slow gait speed, low PA and low grip strength have been reported to be predictive of cognitive impairment and incident disability in community-dwelling older adults [3,31,43,55,62]. Concurrent presentation of slow gait speed and cognitive impairment has been reported to be more strongly associated with the onset of dementia than either slow gait speed alone or cognitive impairment alone [57].

Although a relationship between physical frailty and cognitive function have been reported, severity of cognitive impairment has not been studied in relation to key aspects of physical frailty. The Alzheimer's Disease Assessment Scale-Cognitive Subscale (ADAS-Cog) is associated with the rate of disease progression in older adults with mild to moderate AD [27,65], and has been shown to discriminate between very mild

to mild dementia in addition to more advanced stages of AD [66], therefore, it may also be sensitive to reduced global cognitive function in individuals with aMCI.

In persons with aMCI, pathological mechanisms involved in AD may manifest as physical decline prior to the onset of dementia through alterations in memory, attention and executive function networks [12,15,16,54]. Alternatively, age and age-related conditions may contribute to concurrent decline of physiological systems via underlying mechanisms such as inflammation [19] and energetic pathways [49]. Early identification of relationships between physical frailty and severity of cognitive impairment are important for timely interventions aimed at slowing or reversing functional decline and disability in persons with aMCI.

The purpose of this study was two-fold, first, to describe the prevalence of three dimensions of physical frailty in older adults with aMCI, and, second, to examine whether aspects of physical frailty are associated with severity of cognitive impairment. We hypothesized that dimensions of physical frailty would be associated with severity of cognitive impairment and dimensions of cognitive function after adjusting for sex, age, and age-related conditions.

1.2. Method

This study involved analysis of baseline data from the Resources and Activities for Life-Long Independence (RALLI) study, a randomized controlled trial of psychosocial and exercise interventions for sedentary older adults with aMCI, who were enrolled between July 2007 and October 2009. Participants were volunteers living in independent retirement residences who reported mild memory problems. Participants enrolled in the study were age 70 and older, sedentary, and classified as having aMCI based on screening interviews and a consensus meeting of an expert panel. Study recruitment and screening consisted of:

- a phone screening;
- an in-home screening with a semi-structured interview and neuropsychological tests;
- an expert consensus panel of clinical psychologists.

Petersen criteria [39,40], using a combination of cognitive test scores, screening interview data, and consensus case review, were applied to identify persons with memory problems consistent with a clinical subtype of aMCI (single or multiple domain). Petersen criteria included:

- memory complaint;
- impaired memory for age and education;

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