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# Are frailty components associated with disability in specific activities of daily living in community-dwelling older adults? A multicenter Canadian study



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## ABSTRACT

Current studies show the relevance of geriatric prevention and rehabilitation programs to slow down the development of disability in community-dwelling older adults who are becoming frail. This evidence reveals the importance of improving knowledge on how individual components of frailty and specific disability in basic and instrumental activities of daily living (ADL) are related, to offer early, targeted, and tailored interventions. The objective was to examine the association between each of the five frailty phenotype components (*weakness, slowness, exhaustion, low physical activity, weight loss*) and disability in specific ADL pertaining to physical aspects (*bathing, dressing, cutting toe nails, transportation, shopping, housekeeping, food purchasing, food preparation*) and cognitive aspects (*finances, telephone, medication*). A cross-sectional design involving 1643 community-dwelling older adults (65+) from the longitudinal multi-center FRÉLE study was used. Disability was defined as *needing help or being unable* to perform specific ADL. Multiple logistic regressions were adjusted for socio-demographic characteristics, clinical variables, and for 4 other frailty components. Results showed that *low physical activity* and *slowness* were significantly linked to disability in all physical and cognitive aspects of ADL (OR: 1.71–9.42;  $p < 0.05$ ), except using the *telephone*. Notably, all frailty components except *weight loss* were associated with disability in the physical aspects of instrumental ADL (*transportation, shopping, housekeeping, food purchasing, food preparation*) (OR: 1.73–9.42;  $p < 0.05$ ). This study helped identify the relevant frailty components as targets in community-based prevention and rehabilitation programs. Easily imbedded interventions in daily routines should be promoted earlier in the frailty process to delay or reduce disability.

## 1. Introduction

Prevalence of physical frailty among community-dwelling older adults (65+) in western countries ranges from 4.0% to 17.0% with a weighted average of 9.9% (Fried, Ferrucci, Darer,

Williamson, & Anderson, 2004). Physical frailty is defined as an increased vulnerable physiological state in response to stressors, putting the person at high risk for adverse health-related outcomes such as falls, hospitalization, as well as disability (Fried et al., 2004, 2001). Disability refers to difficulty or inability to perform basic activities of daily living

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(BADL) (e.g., *getting dressed, bathing and eating*) or instrumental (IADL) pertaining to either physical (e.g., *housekeeping and shopping*) or cognitive aspects (e.g., *ability to handle finances and responsibility for own medication*). Previous work showed that disability in at least one BADL is present in approximately 30% of frail community-dwelling older adults (Wong et al., 2010), whereas almost 60% of them reported disability in at least one IADL (Fried et al., 2001). Robust studies show that rehabilitation interventions can slow down the development of disability, particularly in the early stages of frailty, or before (pre-frailty) (Provencher & Demers, 2013; Daniels, van Rossum, de Witte, Kempen, & van den Heuvel, 2008; Theou et al., 2011). It is thus essential to identify ADL that are challenging for this vulnerable subgroup of frail and pre-frail older adults, in order to help design more tailored interventions and to implement them earlier in the frailty process.

Two recent systematic reviews (Vermeulen, Neyens, Van Rossum, Spreuwenberg, & de Witte, 2011; Kojima, 2017) provided strong evidence to the effect that physical frailty can predict disability in community-dwelling older people. However, both recognized that the studies reviewed used different sets of BADL and IADL as an outcome, which may possibly have yielded different disability risk estimates. Despite the likelihood that frail older adults will develop disabilities, few studies have focused on identifying specific ADL that are most affected throughout the frailty process. Theou et al. (Theou, Rockwood, Mitnitski, & Rockwood, 2012) showed that an increase in the level of frailty is often associated with difficulty to perform at least one ADL, particularly bathing, managing medication, and preparing meals. These activities are essential to independent living, especially when compared to others, such as heavy housekeeping, which are frequently compensated through services (Van Rensbergen & Pacolet, 2012). ADL can be hierarchized in difficulty and clinical importance, and should thus not be viewed as a “whole”. Consequently, it is clinically relevant to know if frailty is more strongly associated to *specific* ADL disability.

One of the most well-known conceptions of frailty is the Fried et al. (2001) phenotype model, which emphasizes the importance of five frailty components: *weakness* (grip strength), *slowness* (gait speed), *low physical activity*, *exhaustion*, and *weight loss*. According to this model, an individual presenting at least three of these components is considered to be frail (whereas an individual presenting one or two components is considered as pre-frail). Because the five frailty components are non-specific to the phenotype, not all frail (and pre-frail) older adults show the same “combination” of frailty components (Fried et al., 2001). For example, one frail older adult may show weakness, slowness and exhaustion, while another may present low physical activity, slowness and weight loss. Each frailty components can however be differently linked to ADL. For example, we can hypothesize that older adults, presenting weakness problems, may have difficulty to efficiently perform ADL requiring that they carry heavy objects (e.g., grocery or garbage bags). At the same time, exhaustion may impair the individual’s ability to do his shopping or to prepare meals (Avlund, Damsgaard, Sakari-Rantala, Laukkanen, & Schroll, 2002). Consequently, older adults presenting these specific frailty components are expected to be more prone to developing or worsening the associated ADL disability. Knowing which frailty components are more closely related to ADL disability is useful in identifying older people who might benefit from an intervention that increases functioning in daily life (Vermeulen et al., 2011).

One cross-sectional study (Ávila-Funes et al., 2011) highlighted the link between each of the five frailty components proposed by Fried et al. and overall disability in ADL (Fried et al., 2001). However, their results did not specify which frailty components are related to disability in *specific* ADL. To our knowledge, no previous study has documented how individual components of frailty and specific disability were related. Improving knowledge about this relationship would support the development and implementation of tailored interventions for community-dwelling older adults. Considering the potentially reversible

state of frailty, these interventions could directly target some frailty components in order to better prevent or reduce disability in associated ADL. For example, reducing exhaustion in pre-frail or frail older adults (*specific frailty component*) or targeting older adults presenting this specific frailty component (*exhaustion*) may prevent or reduce disability in preparing meals (*individual ADL*). The participation of older adults in specific ADL most strongly associated with frailty components could also be promoted through rehabilitation programs based an occupation-focused approach (Gray, 1998). For example, training in preparing meals (*individual ADL*) could reduce exhaustion (*specific frailty component*), which may also positively impact on going shopping (*other individual ADL*). Improving the ability of frail and pre-frail older adults to perform ADL is an important element, considering its positive impact on social involvement (Desrosiers, Noreau, & Rochette, 2004), and consequently, on the quality of life (Levasseur, Desrosiers, & St-Cyr Tribble, 2008). The current study aimed to fill a clinically relevant knowledge gap by examining the association between the five frailty components and disability in specific ADL in a large sample of Canadian community-dwelling older adults.

## 2. Methods

### 2.1. Study design and population

This cross-sectional study was conducted using the database from the FRÉLE study (*Frailty: A longitudinal study of its expressions* (Galand, Béland, & Fletcher, 2012). The FRÉLE study was designed to obtain a significant number of men and women in each category of the Fried et al. (2001) frailty phenotype: robust, pre-frail and frail. To approximate the distribution of frailty states, three databases (Béland, Zunzunegui, Alvarado, Otero, & del Ser, 2005; Cornoni-Huntley et al., 1993; Zunzunegui et al., 2004) were used to obtain appropriate sample design factors. Results showed that six strata (men and women in three age groups – 65–74; 75–84; 85 and over), each with 270 respondents, provide a sufficient sample size to identify frailty profiles and to follow frailty trajectories, over time.

The FRÉLE sample was randomly selected from the database of the Régie de l’assurance maladie du Québec (RAMQ – Quebec’s health insurance board). Community-dwelling older adults, aged 65 or older, were recruited from three different areas in the Province of Quebec, Canada: a metropolitan area (Montréal), an urban area (Sherbrooke) and a semi-rural area (Victoriaville). Participants were included if they understood French or English to be able to answer the interview questions, but no cognitive exclusion criterion was applied. Participants were excluded if they (1) were hospitalized or living in a nursing home; (2) presented significant hearing impairments. From the RAMQ list, 4915 persons were identified, of whom 4483 were eligible. The Montreal Jewish General Hospital Research Ethics Committee required that a letter be sent to each participant, asking for their agreement to participate in the study. Of all the eligible persons, 2141 agreed, of which 1643 signed the consent form and completed the baseline questionnaire. The research protocol was approved by the Jewish General Hospital’s Research Ethics Committee (#15-182).

Some of the FRÉLE baseline questions were selected from the Statistics Canada Canadian Communities Health Survey (Statistics Canada, 2010). Comparative figures from the Quebec-based CCHS and an appropriately weighted FRÉLE data set show that FRÉLE reflects some of the characteristics of the elderly population in Quebec. For example, 59.3% of Quebec-based CCHS 65+ respondents were married compared to 57.6% in the FRÉLE sample. The proportion of individuals with an education level greater than high school was 56.5% versus 55.1% respectively; for home ownership: 66.8% versus 70.0%. FRÉLE respondents had higher odds of living in households with earnings of more than \$30,000 CAD (48.4%), compared with CCHS Quebec respondents (42.3%). Self-perceived health status was also higher (82.7% good or excellent) than in their CCHS counterparts (77.5%). However,

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