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Research paper

Validation of the Comprehensive Frailty Assessment Instrument against the Tilburg Frailty Indicator

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ABSTRACT

Purpose: Assessing the validity of the Comprehensive Frailty Assessment Instrument (CFAI) in comparison with the Tilburg Frailty Indicator (TFI).
Background: When ageing, most individuals prefer to age in place even if they are frail. Detecting frail older persons in the community becomes a challenge for professionals and policymakers. Most international frailty instruments emphasize physical factors. The CFAI was developed from a multidimensional perspective, measuring a physical, a psychological, a social and an environmental domain and showed good validity and reliability. The novelty of the CFAI is the environmental domain, which is important because older people will highly depend on their environment when ageing in place. In this study, the CFAI is validated against the TFI.
Design: Scale validation study.
Methods: One hundred and seventy-eight respondents aged 60 and over participated in this study. Internal consistency and explained variance of the CFAI and the subscales was assessed. Next, the correlation between the two scales was evaluated. Convergent and divergent validity between the subscales of the CFAI and TFI was assessed.
Results: The internal consistency of the CFAI was 0.759. The correlation between the CFAI and TFI was 0.590. Correlations between the physical, psychological and social domains of both scales was good and the environmental domain showed weak correlations with all other domains, pointing to convergent and divergent validity.
Conclusion: The CFAI is found to be valid in comparison with the TFI and can be used by health care professionals for the detection of frail older people living in the community.
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1. Introduction

Population ageing is affecting all Western societies [1]. In order to cope with the challenges of an ageing population, governments are changing their policy on care for elderly people. Older people are motivated to "age in place" [2] and institutionalisation is restricted to severely dependent elderly. Staying as long as possible in their own homes is also most preferred by older people themselves [3,4] and is less expensive than institutionalisation.

This changed governmental policy creates new challenges. First, growing numbers of frail older people living at home can be expected. Second, in order to remain in their own house, these older people have to rely on both their environment (e.g. quality of housing) and social resources [5]. As a consequence, empowering older people to age in place and the detection of frailty have become very relevant governmental issues. In practice, considerable differences between the definitions of frailty can be found [6]. Frailty can be defined as a dynamic state affecting an individual who experiences losses in one or more domains of human functioning (physical, psychological and social) [7].

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Although different instruments are used to detect frail older people, some needs are still undetected. It was shown that 6.4% of the older people living at home in Belgium report care shortages [8], which points to undetected needs. As a consequence, a new approach in frailty assessment is needed. This necessity is also documented in literature [6,9–11].

In response to this, the Comprehensive Frailty Assessment Instrument (CFAI), capturing four domains of frailty (physical, psychological, social and environmental) was developed [12].

The CFAI was validated among 33,629 older adults using a second-order confirmatory factor analysis and showed good construct validity [12]. Next to confirmatory factor analysis, convergent and divergent validity is another way to asses construct validity [13]. In the light of the further development of the instrument, this study evaluates the construct validity of the CFAI by assessing convergent and divergent validity against a validated instrument, the Tilburg Frailty Indicator (TFI) [14]. This instrument is chosen because both instruments are based on the same integral conceptual model and because the TFI has shown to be potentially suitable for detecting frailty in primary care setting [15,16]. Moreover, the TFI is based on an integral view on human functioning by including physical, social and psychological components in the instrument and excluding disability and diseases. The novelty of the CFAI is the environmental domain, which is important because older people will highly depend on their environment when ageing in place [17].

2. Methods

2.1. Study population and data collection

For this study, convenience sampling was used. Nursing students ($n = 193$) enrolled in the first year of the nursing bachelor programme at University College Ghent, Faculty of Education, Health and Social Work, selected a respondent of at least 60-years-old and living in the community. We asked the students to let their respondents complete a self-administer questionnaire containing the CFAI, the TFI and demographic variables (age and gender). Prior to data collection, students were notified about the self-administered character of the questionnaire. The study was conducted according to the ethical guidelines laid down in the Declaration of Helsinki. As no experiments on humans were conducted and the actual burden of the questionnaire was very low, ethical approval was not necessary.

In total, 178 older people (67.2% females) completed the questionnaire, resulting in a response rate of 92.2%. The median age was 74 years and 47.5% were aged 75 or older. Compared to the sample used for the validation of the TFI, our sample is younger (74.0 years compared to 80.2 for the TFI validation study) and shows an over-representation of women (67.2% women against 59.0% for the TFI validation study [14]).

2.2. Measures

2.2.1. Description of the Tilburg Frailty Indicator

The TFI was developed and validated with the aim to approach frailty in an integral way [14]. In order to do so, three domains of frailty are assessed (Fig. 1). The physical domain is evaluated by asking questions about physical health, weight loss, walking, balance, hearing, vision, strengths in hands and tiredness. The psychological domain contains memory, feeling down, anxiety or nervousness and coping with problems. The social domain is assessed by living alone, missing people and receiving enough support. The total score of the TFI is calculated by adding all scores of the items, resulting in a total score ranging from 0 to 15. The score of the subscales range from 0 to 8 for the physical domain, from 0 to 4 for the psychological domain and from 0 to 3 for the social domain. The TFI was validated in a sample of community-dwelling older persons aged 75+ [14] and has proven to be a valid instrument in predicting disability, health care utilization and quality of life of older people [18].

2.2.2. Description of the Comprehensive Frailty Assessment Instrument

The CFAI was developed and validated with the aim to approach frailty in a multidimensional way [12]. In contrast with the TFI, the CFAI (Fig. 2) measures four domains of frailty. For the physical domain of frailty, the respondent's general physical health is assessed. The psychological domain is captured by measuring mood-disorders and emotional loneliness. The social domain of frailty is measured twofold, capturing older people's social loneliness, and their social support. Finally, the environmental domain of frailty is assessed by propositions regarding push factors of the respondent's actual housing and environmental conditions. Push factors [19] refer to conditions of physical inadequate environments, threatening the mobility of ageing individuals as to a lack of comfort.

The total score of the CFAI is calculated by summing the scores on each indicator, resulting in a score ranging from 19 to 97. The scores for the subscales are calculated by adding the scores of the specific items. As a consequence, the physical subscale ranges from 4 to 12, the psychological subscale from 4 to 20, the emotional and social subscale from 3 to 15, the environmental subscale from 5 to 25 and the social support subscale from 0 to 10. The CFAI was validated among 33,629 older adults, using a second-order confirmatory factor analysis. Due to the large sample size, only those fit indices which are insensitive to sample size were used. The model showed good model fit indices: Root Mean Square Error of Approximation (RMSEA) = 0.032 (90% interval = 0.032 to 0.033), Comparative Fit Index (CFI) = 0.974 en Tucker-Lewis Index (TLI) = 0.970 and produced factor loadings ranging from 0.32 to 0.80. The CFAI also proved to be internally consistent, with a Cronbach's α of 0.812, explaining 63.6% of the variance in frailty.

2.3. Analytic strategy

The data were coded and entered into IBM SPSS v20.0. First, the internal consistency of the CFAI and the subscales was calculated. Afterwards, the mean scores of both the CFAI and TFI were calculated. Second, the correlation between the two scales was assessed. Third, internal consistency of the subscales of the CFAI was assessed and the sub-scores of the CFAI and TFI calculated. Fourth, convergent and divergent validity was assessed by calculating the Spearman correlation coefficient between the subscales of the TFI and the CFAI. It was expected that the highest correlation coefficients between subscales are found between those measuring the same domain, and the lowest coefficients between measures of other domains. Although no cut-offs are suggested [20], scholars like Reid [21] suggest that different tests of the same construct should have correlation coefficients greater than 0.30.

3. Results

3.1. Validity of the Comprehensive Frailty Assessment Instrument

3.1.1. Internal consistency of the Comprehensive Frailty Assessment Instrument and mean score of the Comprehensive Frailty Assessment Instrument and Tilburg Frailty Indicator

The CFAI showed a Cronbach's α of 0.759 and a mean score of 38.7 (SD = 10.8) (Table 1), the TFI showed a mean score of 3.8

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