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Research paper

Evaluation of short cognitive screening tests in 85-year-old men and women

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ABSTRACT

Introduction: The study aimed to investigate different aspects of cognition using the Cognitive Assessment Battery (CAB) in community-dwelling older adults aged 85 years. We also investigated the eventual influence of sex on the results and aimed to identify predictors for further cognitive decline after 1 year.
Methods: CAB consists of 10 subtests covering the cognitive domains of speed and attention, learning and episodic memory, visuospatial abilities, language, and executive functions. Cognitive tests were performed at baseline ($n = 335$) and follow-up after 1 year ($n = 270$).
Results: Univariate statistics revealed that men performed better than women on episodic memory ($P < 0.05$) and on the naming test ($P < 0.001$). However, floor effects in the paragraph memory test were revealed. There was a high rate of abnormal results on Token Test (67%), PaSMO (50%), Clox (48%), and the cube copying (40%) tests in participants with normal cognition. Logistic regression showed that impaired results on the Stroop III test (odds ratio, 2.38; $P < 0.05$) was independently associated with an increased risk of cognitive decline.
Conclusion: Men performed better than women on the memory and on the naming test. However, due to floor effects in the paragraph memory test in 85 year olds, these results can be disputed. The high rate of abnormal results on the Token Test, PaSMO, Clox, and the cube copying tests in cases with normal cognition indicate that these tests are less suitable for screening in the age group. Impaired result on the Stroop test increased the risk more than two-fold for cognitive decline after 1 year.

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1. Introduction

Cognitive impairment and dementia in the older adults is one of the big challenges in the modern society with an increasing proportion of older adults in the population [1,2]. Basic assessment of suspected cognitive impairment is often performed at the primary care level and there is a great need for quick and accurate cognitive screening tests. The Mini-Mental State Examination (MMSE) [3] is often used as a screening tool in the first basic investigation for dementia. However, although the MMSE is widely used, it is memory oriented [4] and insensitive for detecting early deficits in other cognitive domains, such as speed, attention, and executive functions. These domains are impaired early in vascular cognitive disorders [5,6], which are common in the older adults.

Detecting mild cognitive symptoms of vascular origin might open the way for preventive measures, possibly postponing progression into a dementia state. Mild cognitive impairment (MCI) [7] is a heterogeneous concept and has been shown to identify persons at higher risk for dementia. However, the MCI concept is not well described in those aged 85 years and older, that is, the oldest old [8].

Higher age and low education level have been associated with lower performance on MMSE in community-based studies [9–11]. Besides age and education, sex also influences the results [11]; the effect of sex was responsible for the greater part of the differences observed [12]. One study, specifically on 85-year-olds, showed that women outperformed men at cognitive speed and memory, even when controlled for education level [13]; other data revealed that women performed worse than men on the computation and visuospatial items of MMSE but better than men on the language items [12]. These findings reinforce the suggestion that different biological mechanisms affect cognitive functioning in aged women and men [13].

The Cognitive Assessment Battery (CAB) is a new set of tests that has been suggested as a supplement to MMSE in the diagnosis of MCI and dementia at the specialist clinic [4]. Subtests in CAB were performed to evaluate the cognitive domains speed and attention, learning and episodic memory, visuospatial functions, language, and executive functions [4].

In the present study of 85-year-old community-dwelling women and men, with 1-year follow-up, the aims were to describe different aspects of cognition in the older adults using the CAB and to investigate any eventual influence of sex on cognitive functioning. We also aimed to identify predictors for further cognitive decline after 1 year.

2. Material and methods

2.1. Participants

The data originates from the ELSA 85 study (The Elderly in Linköping Screening Assessment), a longitudinal population-based study of 85-year-old residents in Linköping municipality in south east Sweden [14]. The present data were taken from the baseline cross-sectional part of the study with data collection between March 2007 and March 2008 and follow-up after 1 year. All residents born in 1922 ($n = 650$) were invited to participate in the study; 496 individuals were included in the first part of the study, which consisted of a postal questionnaire on background information and lifestyle factors. This was followed by a home visit from an occupational therapist or a research nurse and a baseline open-clinic visit to the Department of Geriatric Medicine, at Linköping University hospital. Three hundred thirty-eight individuals (52% of 650, or 68% of those who participated in the study) followed the protocol and attended the open-clinic visit. Testing with the Mini-Mental State Examination (MMSE) [3] was performed at the home visit.

At the open-clinic visit, the medical history and current medication were reviewed and each participant also underwent a health examination by a physician. Body mass index was also estimated at baseline. The CAB [4] was administered as described later.

Three of the individuals (1 man, 2 women, 2 of whom had an established diagnosis of dementia) declined the MMSE test leaving 335 for analysis (67.5% of those included in the study). After 12 months, a follow-up visit took place at which the MMSE and CAB tests were repeated. Two hundred seventy individuals (42% of invited cases, or 54% of those included at baseline) participated in the follow-up investigations; 46 people declined and 19 people were deceased (Fig. 1). Hence, the baseline data in this study originated from 335 participants and the follow-up data from 270.

Level of education was divided into 2 categories:

- low education for those in formal education for a maximum of 8 years;
- high education for those educated for 9 years or more.

Data on current diseases were provided by the patient and relatives as well as from the patients' medical records, as previously described [14].

2.2. Cognitive tests

The MMSE test was performed during the home visit as previously described [15]. All participants underwent the CAB at the open-clinic visit. The tests were always administered in the following order: immediate recall of a text (learning), Symbol Digit Modalities Test (speed and attention), 30-item naming test from the original Boston naming test (language), Clox and cube copying (visuospatial functions), Token Test short version (language), Stroop color word test (executive function), delayed recall of the text (episodic memory), Trail making A test (speed and attention), Rey Complex Figure test (visuospatial function), and parallel serial mental operations (PaSMO) (executive function). The Paragraph Recall Test consists of a verbally presented short paragraph. The subject is asked to recall the text word-for-word immediately and after a five minute delay [16]. The Symbol Digit Modalities Test represents a task of simple substitution. A reference key is given to pair numbers with geometric figures for a limited time of 90 seconds [17]. The naming test involves 30 objects from the original Boston naming test [18]. In the clock-drawing test Clox, the subject is first asked to draw a round face, to fill in all numbers, and to set the hands to ten past eleven. The second step is to reproduce a drawing of a clock presented to the subject [19]. The cube copying test involves the task to draw a three-dimensional cube [20]. Auditory comprehension is assessed with the short version of the Token Test. Tokens in different shapes and colors are used. The subject point at or move tokens after verbal commands [21]. Stroop color word test is a classical test of executive functions that involves naming of colors of dots, words and color words and the inhibition of reading the words [22]. In Trail making A, the subject is asked to connect 25 numbered dots as fast as possible [23]. In Rey Complex Figure test, the subject is instructed to reproduce a complicated line drawing [24]. Performing the parallel serial mental operations (PaSMO), the subject is instructed to rattle off the alphabet, giving each letter and the number of the letter (A-1-B-2, etc.) [25]. The components of the CAB have been described in detail previously by Nordlund et al. [4].
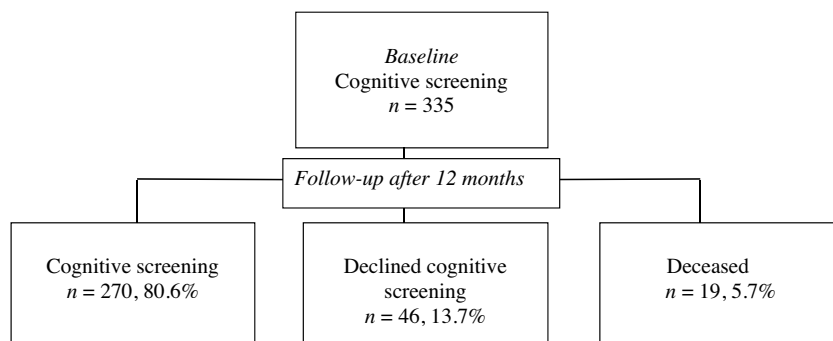

Fig. 1. Flow chart of the data collection process showing the number and percentage of participants at baseline and at follow-up.