

Diagnostic Assessment & Prognosis

# Detecting functional decline from normal aging to dementia: Development and validation of a short version of the Amsterdam IADL Questionnaire

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## Abstract

**Introduction:** Detecting functional decline from normal aging to dementia is relevant for diagnostic and prognostic purposes. Therefore, the Amsterdam IADL Questionnaire (A-IADL-Q) was developed: a 70-item proxy-based tool with good psychometric properties. We aimed to design a short version while preserving its psychometric quality.

**Methods:** Study partners of subjects ( $n = 1355$ ), ranging from cognitively normal to dementia subjects, completed the original A-IADL-Q. We selected the short version items using a stepwise procedure combining missing data, Item Response Theory, and input from respondents and experts. We investigated internal consistency of the short version and concordance with the original version. To assess its construct validity, we additionally investigated concordance between the short version and the Mini-Mental State Examination (MMSE) and Disability Assessment for Dementia (DAD). Finally, we investigated differences in instrumental activities of daily living (IADL) scores between diagnostic groups across the dementia spectrum.

**Results:** We selected 30 items covering the entire spectrum of IADL functioning. Internal consistency (0.98) and concordance with the original version (0.97) were very high. Concordance with the MMSE (0.72) and DAD (0.87) scores was high. IADL impairment scores increased across the spectrum from normal cognition to dementia.

**Discussion:** The A-IADL-Q short version (A-IADL-Q-SV) consists of 30 items and has maintained the psychometric quality of the original A-IADL-Q. As such, the A-IADL-Q-SV is a concise measure of functional decline.

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## Keywords:

Alzheimer's disease; Dementia; Instrumental activities of daily living; Item Response Theory; Functional decline; Mild cognitive impairment; Subjective cognitive decline

## 1. Introduction

Dementia is a syndrome characterized by progressive cognitive decline and significant interference in daily function [1]. The first observable problems in daily life often concern the instrumental activities of daily living (IADL).

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IADL can be defined as “complex activities for which multiple cognitive processes are necessary,” such as cooking, managing finances, and driving [2]. Detecting functional decline along the continuum from normal aging to dementia is highly relevant for a number of reasons. First of all, subtle IADL problems may already be present in subjects with mild cognitive impairment (MCI) and predict progression to dementia [3–5]. This suggests that assessment of IADL can be used to select MCI subjects at an increased risk for dementia [6]. Once a diagnosis has been established, measuring IADL performance remains essential for the monitoring of clinical progression [7]. Finally, IADL assessment plays a pivotal role in clinical trials, particularly in the evaluation of symptomatic treatment in dementia caused by Alzheimer's disease (AD) [8–10].

IADL performance is often measured using proxy-based questionnaires [11]. Unfortunately, most of these questionnaires suffer from serious limitations. They focus on everyday activities that are outdated and less relevant for patients in the early stages of dementia [12]. Furthermore, psychometric properties such as reliability, validity, and responsiveness are often questionable or overlooked [13]. Recent studies have pointed out that improvements in IADL instruments are necessary, especially for detecting IADL problems in MCI and the early stages of dementia [14–17].

To overcome the aforementioned drawbacks of existing IADL scales, Sikkes et al. developed the Amsterdam IADL Questionnaire (A-IADL-Q). The A-IADL-Q is a 70-item proxy-based tool and was developed with input from clinicians, patients, and caregivers [18]. Previous studies have reported good psychometric properties with respect to reliability, validity, responsiveness, and diagnostic accuracy in dementia [19–21]. One disadvantage of the A-IADL-Q is its length, resulting in an administration time of 20 to 25 minutes. In addition, respondents often report that some items are redundant or unclear. To facilitate its administration and implementation on a wider scale, we aimed to design a short and more concise version of the A-IADL-Q.

The present article describes the development and validation of a short version of the A-IADL-Q (A-IADL-Q-SV). We aimed to select the most informative items, using a combined approach of quantitative and qualitative methods. We expected that the short version would maintain the good psychometric quality of the original A-IADL-Q. In addition, we expected that IADL scores based on the short version would differ between diagnostic groups across the spectrum from normal cognition (NC) to dementia.

## 2. Methods

### 2.1. Subjects

We selected 1355 subjects with different levels of cognitive functioning, ranging from NC to dementia. Their study partner, mainly a spouse, relative, or friend, completed the A-IADL-Q. We included subjects from neurologic memory clinics of the

VU University Medical Center (VUmc) Alzheimer Center, Amsterdam, The Netherlands ( $n = 1117$ ), and the Alzheimer Center Rotterdam, The Netherlands ( $n = 32$ ), and from the geriatric memory clinic of the VUmc, Amsterdam, The Netherlands ( $n = 102$ ). All these subjects underwent a dementia assessment, including clinical history, medical and neurologic examination, screening laboratory tests, a neuropsychological test battery, and brain imaging [22]. During this visit, study partners completed the A-IADL-Q on an iPad. Subjects' diagnoses were made in a multidisciplinary diagnostic meeting, containing at least a neurologist or geriatrician [3,22,23].

We included cognitively normal subjects ( $n = 104$ ) from the Amsterdam site of the preclinAD cohort of the European Medical Information Framework for AD project. Inclusion criteria for this cohort were age  $\geq 60$ , modified telephone interview for cognitive screening  $> 22$ ; Geriatric Depression Scale  $< 11$ ; Consortium to Establish a Registry for AD 10-word list delayed recall  $> -1.5$  standard deviation of age adjusted normative data; and Clinical Dementia Rating score of 0 with a score on the memory subdomain of 0 [24–27]. During the baseline visit, study partners completed the A-IADL-Q on an iPad.

Data were collected between October 2012 and August 2016. All subjects gave written informed consent and all study partners gave oral informed consent. The Medical Ethical Committee of the VUmc approved the study.

### 2.2. The Amsterdam IADL Questionnaire

The original A-IADL-Q is a proxy-based scale with 70 items covering a broad range of cognitive IADL [18]. The items can be divided into eight subcategories: household, administration, work, computer use, leisure time, appliances, transport, and other activities. The A-IADL-Q is computerized and has an adaptive approach as the items are tailored to individual responses (see Fig. 1). This results in a minimum of 47 and a maximum of 70 items for each respondent. Before the start, it is emphasized that the questionnaire addresses day-to-day problems caused by cognitive problems, such as memory, attention, or planning problems. Difficulty in performance is rated on a five-point Likert scale, ranging from “no difficulty in performing this task” to “no longer able to perform this task.” Scoring is based on Item Response Theory (IRT): a paradigm linking responses to a test battery to an underlying construct (or latent trait) [28]. For the A-IADL-Q, the construct underlying the items can be termed “IADL performance,” that is, the latent trait reflects IADL impairment with higher estimated trait levels indicating more impairment.

Linking the probabilities of category-specific item responses to latent trait levels is based on an IRT model [28]. For the A-IADL-Q, the graded response model (GRM) is used: a polytomous IRT model appropriate for items with ordinal response categories [29]. In the GRM, each item is characterized by a discrimination parameter ( $\alpha$ ) and four extremity parameters ( $\beta$ s; the number of response categories minus 1). The discrimination (or slope) parameter indicates how well an item discriminates between individuals with

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