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Featured Article

Assessing reliability of short and tick box forms of the ANU-ADRI: Convenient alternatives of a self-report Alzheimer's disease risk assessment

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Abstract

Introduction: To assess the reliability of short versions of the Australian National University Alzheimer's Disease Risk Index (ANU-ADRI).

Methods: A short form of the ANU-ADRI (ANU-ADRI-SF) was developed by assessing risk and protective factors with single questions where possible and with short forms of sub-questionnaires where available. The tick box form of the ANU-ADRI (ANU-ADRI-TB) was developed with unique questions for each risk and protective factor for Alzheimer's disease. The short versions were evaluated in an independent community sample of 504 participants with a mean age of 45.01 (SD = 14.85, range = 18–81).

Results: The short versions demonstrated high reliabilities when compared with the ANU-ADRI. However, the proportion of misclassification was high for some risk factors and particularly for the ANU-ADRI-TB.

Discussion: The ANU-ADRI-SF may be considered if less reliable questions from the ANU-ADRI-SF can be replaced with more reliable questions from the ANU-ADRI for risk/protective factors with high misclassification.

Keywords: Risk assessment; Alzheimer's disease; Short versions; Screening

1. Introduction

At present, there is no cure or effective treatment for dementia [1–3] and existing pharmacological treatments do not modify the course of the disease [4]. Prevention is therefore one of the key objectives of current dementia research [5], and increased attention has been paid to identifying risk and protective factors for dementia. It is also essential that people understand and address their risk profile for dementia as early as possible before the development of the pathologic processes which lead to unrecoverable neurodegeneration. Easily accessible methods of risk assessment are an important tool for facilitating population-level dementia risk awareness.

A questionnaire-based risk assessment tool, the Australian National University Alzheimer's Disease Risk Index (ANU-ADRI), was developed to assess the presence of 11 risk and 4 protective factors for Alzheimer's disease (AD) [6]. These risk and protective factors have reliable scientific evidence and can be measured by self-report. The ANU-ADRI was validated on three independent cohorts [7] against the Cardiovascular Risk Factors, Aging and Dementia index and has been proposed as the key risk assessment tool in large-scale dementia prevention trials. ANU-ADRI has already been used in the first online dementia risk reduction trial in Australia [8,9] and is currently available to the general public through the ANU-ADRI website (http://anuadri.anu.edu.au/). The website has attracted over 11,700 visitors since its launch early 2014.

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The original ANU-ADRI takes approximately 15–20 minutes to complete, although longer time of up to 1 hour has been reported for older adults who were not familiar with the computer or Internet. The length of the ANU-ADRI did not affect the participation of a dementia prevention trial [9] or completion of publicly available ANU-ADRI through the website. However, a shorter version of the ANU-ADRI may have a role on public websites and online applications, enabling the ANU-ADRI to reach wider audiences in more diverse settings and in turn, save time in assessing an individual's risk level. Given that the average general practice (GP) consultation time is 14.6 minutes (95% CI, 14.1–15.0) [10], the length of the time taken to complete the current ANU-ADRI can be considered long. Hence, by providing shorter versions of the ANU-ADRI, health professionals such as GPs for example may be able to assess a client's risk level and provide them with relevant advice in a timely manner. The ANU-ADRI can also be used to screen individuals to identify those at high risk of developing AD who would benefit most from intervention programs. We therefore developed and evaluated two brief alternatives (a short form and a tick box form) to the original longer version of the ANU-ADRI while aiming to preserve its content coverage.

2. Methods

2.1. Participants and procedure

One thousand and seventy three people from the community were approached by Qualtrics, a survey company. Five hundred and four of them completed the original ANU-ADRI as well as one of the short versions to be validated. Sample size calculations were estimated using G*Power (version 3.1.3). To detect a medium difference (0.5) between two independent sample means, with a 5% risk of type I error (α), 95% power, and two equal groups (1:1), 105 persons in each group was required. Our sample size was more than double the required size, and half of the participants (group 1; n = 251) completed the original and the short form of the ANU-ADRI. The other half (group 2; n = 253) completed the original and the tick box form of the ANU-ADRI. Participants were randomly assigned to one of two groups by the Qualtrics survey program. Inclusion criteria were being $\geq$18 years, being proficient in English, having internet access, and having no psychiatric or neurological diagnoses.

2.2. Measures and procedures

2.2.1. Short form

A short form of the ANU-ADRI (ANU-ADRI-SF; see Supplementary A) which included the validated short forms of questionnaires used in the original ANU-ADRI (e.g. International Physical Activity Questionnaire short form [11] and 10 item Community Epidemiological Study-Depression scale (CESD-10) [12]) while keeping single-item questions (e.g., gender, age, and smoking status) was developed. The risk and protective factors covered by more than one item were also simplified into single-item questions by adding questions together. For example, two questions on diabetes "Have you ever been told by a doctor or other health professional that you have diabetes?" and "Have you ever been told by a doctor or other health professional that you have high sugar levels in your blood or urine?" became a single question "Have you ever been told by a doctor or other health professional that you have diabetes or have high sugar levels in your blood or urine?". These single items intended to reduce the number of questions while keeping the contents. These include education, diabetes, cholesterol, traumatic brain injury, cognitive activity, and fish intake. The short form was estimated to take approximately 5 minutes to complete.

2.2.2. Tick box form

The tick box form of the ANU-ADRI (ANU-ADRI-TB; see Supplementary B) was built with single-item questions for each AD risk and protective factors and was estimated to take approximately 2 minutes to complete. The ANU-ADRI-TB was developed with an assumption that a single-item scale may be as sensitive and reliable as multi-item scales. This assumption was supported in previous research such as in depression [13] and physical activity [14]. It was found that a single-item interview for depressed mood provides a reliable and accurate screen that can be used in clinical settings that permit direct patient interview.

One of the short versions followed by original long version of the ANU-ADRI was administered on the same day.

2.3. Analysis

To analyze the reliability of the short versions, intra class correlation coefficients (ICC) were used between the original scores and short versions' scores. The relative measure of risk points attributed to each risk and protective factor assessed in the ANU-ADRI-SF was the same as that used in the original ANU-ADRI which ranged between 0–6 for risk factors and −7 to 0 for protective factors. ANU-ADRI-TB, however, only had binary variables (having risk/protective factors vs not) and was compared against binary variables of the original ANU-ADRI. Although the original ANU-ADRI did not evaluate misclassifications, as the tick box form can only be measured as binary outcomes (having risk/protective factors vs not), we felt it was worth examining misclassification in addition to reliability tests. The number of risk and protective factors misclassified in the short compared to the long form were calculated using binary variables (having risk/protective factors vs not). Percentages of misclassification of each risk and protective factor were also calculated to examine false-positive (being