Component structure of the Repeatable Battery for the Assessment of Neuropsychological Status in dementia

Carolina Garcia [a], Brian Leahy [b,*], Karina Corradi [c], Concetta Forchetti [b]

[a] *Illinois Institute of Technology, Chicago, IL, United States*
[b] *Alexian Neurosciences Institute, Eberle Building Suite 610, 800 Biesterfield Road, Elk Gove Village, IL 60007, United States*
[c] *DePaul University, Chicago, IL, United States*

Abstract

The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) has been studied relatively extensively in normal samples, and its theoretically derived index scores have been demonstrated to be useful in the assessment of a variety of clinical conditions. However, examinations of the empirical relationships between individual subtests are limited. The intent of the present study was to explore the component structure of the instrument in a sample of 351 individuals with a diagnosed memory disorder, to examine the impact of demographic factors on these empirically derived components, and to explore differences in performance between diagnostic groups. Findings suggested a three-component solution (Memory, Visuomotor Processing, and Verbal Processing). Demographic variables had relatively small, but significant relationships with various component scores. Significant differences were observed between probable Alzheimer's disease and non-Alzheimer's type dementia groups on the memory component score, but not on other component scores or on RBANS index scores.
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1. Introduction

The Repeatable Battery for the Assessment of Neuropsychological Status (RBANS; Randolph, 1998) is a commonly used screening instrument in the assessment of neuropsychological functioning. Clinical validity has been investigated in a variety of populations including individuals with multiple sclerosis (Aupperle, Beatty, Shelton, & Gontkovsky, 2002; Beatty, 2004) and schizophrenia (Dickerson et al., 2004; Gold, Queern, Iannone, & Buchanan, 1999). However, the instrument was designed to address some of the difficulties inherent in the assessment of older adults. In this respect, it has the advantage of being brief and more tolerable than extensive neuropsychological batteries, while providing more detailed clinical information than brief screening measures such as the Mini-Mental Status Examination or the Dementia Rating Scale (Randolph, 1998).

Normative data from the original RBANS incorporated corrections for age, but subsequent research has suggested that other demographic factors may influence performance on the test. Extensive data in community dwelling older

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* Corresponding author. Tel.: +1 847 981 3648; fax: +1 847 981 3633.
  E-mail address: brian.leahy@abbhh.net (B. Leahy).

adults that supplements the original RBANS normative sample have been provided through the Oklahoma Longitudinal Assessment of Health Outcomes in Mature Adults (OKLAHOMA) studies. For example, Duff et al. (2003) provided normative data from a sample of 718 older adults. The authors noted the significant influence of education on RBANS scores, and provided age and educational corrections for both index scores and individual subtests that were not incorporated in the original RBANS scoring procedures. More specifically, Gontkovsky, Mold, and Beatty (2002) found that among a sample of older adults, age was associated with scores on the Visuospatial/Constructional, Attention, Delayed Memory, and Total Index scores, and education was found to have a significant association with all index scores. In the same sample, Beatty, Mold, and Gontovsky (2003) also observed modest but significant effects of gender in older adults, with males performing better on the Visuospatial/Constructional Index and females performing better on Immediate Memory, Delayed Memory, and Language Indexes.

Validation studies in clinical populations of older adults have supported the use of the RBANS in a variety of diagnostic groups, though the data in clinical samples is substantially less extensive than the OKLAHOMA normative samples. Randolph, Tierney, Mohr, and Chase (1998) examined performance of individuals with Alzheimer's disease and Huntington's disease, and found distinct profiles, with the former group evidencing the most prominent impairment on the Language and Delayed Memory Indexes, and the latter demonstrating relatively prominent impairment on Attention and Visuospatial/Constructional Index scores. Beatty, Ryder, et al. (2003) studied a sample of patients with Alzheimer's disease and Parkinson's disease (with and without dementia). Their results supported the use of an algorithm proposed in previous research by Randolph et al. (1998) in distinguishing between Alzheimer's disease and Huntington's disease. Larson, Kirschner, Bode, Heinemann, and Goodman (2005) examined the predictive validity of the RBANS for clinical outcomes in stroke patients. Results suggested that the RBANS Total score and all indexes were related to Functional Independence Measures cognitive ratings at 12-month follow up assessment.

Construct validity of the index scores has also been explored. In the original normative sample, Randolph (1998) noted, in general, that index scores correlated significantly with established neuropsychological measures in corresponding cognitive domains. Larson et al. (2005) examined convergent and divergent validity of the index scores with other measures in a sample of individuals with stroke. Findings supported the convergent validity for the Immediate Memory, Language, Visuospatial/Constructional, and Delayed Memory Indexes, but partial correlations (controlling for vocabulary knowledge) between the Attention Index and other measures of attention including the Trail Making Test and a Line Cancellation task were not significant.

Although the clinical usefulness of the RBANS index scores and to some degree their construct validity has been supported, the subtests that comprise these scores were determined on a theoretical basis, rather than through empirical investigation. As a result, though they provide useful clinical data, they may not reflect the underlying structure of the test. To date, two factor analytic studies of the RBANS subtests have been published. In a sample of 824 community dwelling older adults, Duff et al. (2006) found a two-factor solution. The first consisted of all immediate and delayed verbal memory subtests and the second of all tests involving visual processing (including visual memory subtests). Their final solution reflected the exclusion of three subtests. Specifically, Digit Span and Semantic Fluency subtests were eliminated due to limited correlation with other measures, and Object Naming was eliminated due to skewness of its distribution in this sample. Overall, it was concluded that the results of confirmatory factor analysis in this study did not support the Total RBANS score or the five index scores.

Wilde (2006) applied principle components analysis with orthogonal (varimax) rotation to the RBANS subtests in a sample of 210 acute stroke inpatients. This analysis revealed a two-component solution with all verbally based subtests on one component and visually based subtests on another. Although the structure noted by Wilde (2006) was generally consistent with that found by Duff et al. (2006), both authors acknowledged that factor solutions are highly dependent on characteristics of the sample. This point is addressed directly by Delis, Jacobson, Bondi, Hamilton, and Salmon (2003) who contend that sample characteristics can serve to obscure important concepts when factor analysis is used to identify underlying constructs measured by a particular test. Nevertheless, although findings may be limited to the particular group being studied, such analyses can enhance our understanding and improve interpretation of brief test batteries such as the RBANS by examining empirical relationships among test variables to complement the theoretical foundation from which the index scores were derived.

The purpose of the present study is to empirically investigate relationships among the 12 subtests of the RBANS through principle component analysis in a clinical sample of older adults with diagnosed memory disorders. The effects of demographic factors on performance in these domains will also be investigated, as well as differences in