Published in final edited form as:

Appl Neuropsychol. 2011 January ; 18(1): 11–17. doi:10.1080/09084282.2010.523354.

The RBANS Effort Index: Base rates in geriatric samples

Kevin Duff¹, Cynthia C. Spering², Sid E. O'Bryant³, Leigh J. Beglinger⁴, David J. Moser⁴, John D. Bayless⁴, Kenneth R. Culp⁵, James W. Mold⁶, Russell L. Adams⁷, and James G. Scott⁷

¹ University of Utah, Department of Neurology, Salt Lake City, UT

² Texas Tech University, Department of Psychology, Lubbock, TX

³ Texas Tech University Health Sciences Center, F. Marie Hall Institute for Rural & Community Health, Department of Neurology, Lubbock, TX

⁴ University of Iowa, Department of Psychiatry, Iowa City, IA

⁵ University of Iowa, College of Nursing, Iowa City, IA University of Oklahoma Health Sciences Center

⁶ University of Oklahoma Health Sciences Center, Department of Family and Preventative Medicine

⁷ University of Oklahoma Health Sciences Center, Department of Psychiatry & Behavioral Sciences

Abstract

The Effort Index (EI) of the RBANS was developed to assist clinicians in discriminating patients who demonstrate good effort from those with poor effort. However, there are concerns that older adults might be unfairly penalized by this index, which uses uncorrected raw scores. Using five independent samples of geriatric patients with a broad range of cognitive functioning (e.g., cognitively intact, nursing home residents, probable Alzheimer's disease), base rates of failure on the EI were calculated. In cognitively intact and mildly impaired samples, few older individuals were classified as demonstrating poor effort (e.g., 3% in cognitively intact). However, in the more severely impaired geriatric patients, over one third had EI scores that fell above suggested cut-off scores (e.g., 37% in nursing home residents, 33% in probable Alzheimer's disease). In the cognitively intact sample, older and less educated patients were more likely to have scores suggestive of poor effort. Education effects were observed in 3 of the 4 clinical samples. Overall cognitive functioning was significantly correlated with EI scores, with poorer cognition being associated with greater suspicion of low effort. The current results suggest that age, education, and level of cognitive functioning should be taken into consideration when interpreting EI results and that significant caution is warranted when examining EI scores in elders suspected of having dementia.

Keywords

symptom validity testing; RBANS; geriatric assessment

Silverberg and colleagues (2007) observed that unusually low scores on two subtests of the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) (Randolph, 1998) were quite rare in an outpatient clinical sample. Based on this observation, they created an embedded Effort Index (EI) for the RBANS using inversely weighted scores from these two subtests (Digit Span and List Recognition), with higher EI scores reflecting poorer effort. Using various cutoffs (>0 , >3), the EI yielded good discrimination between actual cases of traumatic brain injury and three “malingering” groups (86 – 96% classification accuracy). From these findings, the authors concluded that the RBANS EI is a sensitive marker for suspect effort though further validation was warranted. The sample used to develop the EI was predominantly comprised of individuals with traumatic brain injury, psychiatric illnesses, and other neurological diseases (e.g., cerebrovascular accident, epilepsy, multiple sclerosis). Although some individuals with dementia were included in this sample, cases with advanced disease that required 24-hour supervision were excluded.

One concern with the EI is that it utilizes raw scores from these two subtests, which might inflate the level of “suspect” effort in older adults, who tend to get lower raw scores than younger adults. Indeed, elevated levels of “suspect” effort, based on RBANS EI scores, were observed in a small sample of medically ill geriatric patients (Hook, Marquine, & Hoelzle, 2009). In that study, 31% of the sample was identified as having questionable effort using the recommended EI cutoffs (Silverberg, Wertheimer, & Fichtenberg, 2007). As cognitive impairment increased, so did the concerns about poor effort using this index. In this small sample, no relationships were found between EI scores and age or education. However, there were only 44 patients in this geriatric clinic sample, and additional validation of these findings is needed.

The purpose of the current study was to further validate this RBANS EI in multiple samples of geriatric patients. This was accomplished in several ways. First, using a large cohort of community-dwelling primary care patients and four clinical samples, base rates of failure on the EI were calculated. Second, relationships between the EI and demographic variables (e.g., age, education, gender) were examined in these samples. Finally, we examined relationships between EI scores and overall level of cognitive functioning in the five samples. Based on the limited existing literature, it was hypothesized that very few cognitively intact older adults would “fail” the EI, but that these rates would likely be higher in clinical samples. Given the pervasive effect of demographic variables on most cognitive tests, it was also expected that increasing age and decreasing education would be related to higher EI scores (i.e., more suspect effort). Gender effects on the EI were not expected. Finally, it was expected that current levels of cognitive functioning would be inversely related to EI scores, especially for the clinical samples.

Methods

Participants

Data from five separate and independent samples were analyzed. These samples have all been previously described in other publications, but will be briefly reviewed. Demographic information on these samples is presented in Table 1.

1. The sample of cognitively intact older adults consisted of 796 community-dwelling elderly primary care patients that were participating in a longitudinal study of health outcomes. Recruitment and additional study details are described elsewhere (Duff et al., 2003). This cohort was used to provide age- and education-corrected normative data for the RBANS, so this sample is viewed as a healthy and cognitively intact group.

2. The sample of nursing home residents consisted of 229 elderly residents of nursing homes that were participating in a study examining the incidence of delirium in this setting. Recruitment and additional study details are described elsewhere (Culp et al., 2004).
3. The sample of clinic referrals to a Neuropsychology Service consisted of 156 elderly patients referred for a neuropsychological evaluation. These patients were primarily inpatients (68%), and carried diagnoses of psychiatric conditions (33%) and dementia (31%). Additional details about this sample are described elsewhere (Schoenberg et al., 2008).
4. The sample of amnesic Mild Cognitive Impairment consisted of 72 older adults classified with this condition based on existing criteria (Petersen et al., 1999) who were participating in a longitudinal study of cognitive progression. Recruitment and additional study details are described elsewhere (Duff, Beglinger et al., 2008).
5. The sample of probable Alzheimer's disease consisted of 126 patients referred to a memory disorders clinic and diagnosed with Alzheimer's disease by a consensus panel of neurologists and neuropsychologists using NINCDS-ADRDA criteria (McKhann et al., 1984). Recruitment and additional study details are described elsewhere (Duff, Humphreys Clark et al., 2008).

All procedures were approved by local institutional review boards before data collection commenced. Informed consent/assent was obtained from all participants, with the exception of the Neuropsychology clinic sample. In this case, the university associated with that data approved retrospective analysis of the deidentified clinical data.

Measures

The RBANS (Randolph, 1998) is a brief, individually administered test battery measuring several cognitive domains. It consists of twelve subtests, which yield five Index scores (Immediate Memory, Visuospatial/Constructional, Language, Attention, and Delayed Memory) and a Total Scale score. Although normative data from the test's manual ranges from 20–89 years old, supplemental age- and education-corrected normative data for older adults (Duff et al., 2003) were used in the current study. Test-retest reliability for the RBANS is adequate in geriatric samples (Duff et al., 2005). Although initially developed as a screening measure for dementia, the validity of the RBANS has been demonstrated in a variety of neuropsychological disorders (e.g., dementia, stroke, Parkinson's disease, multiple sclerosis, Huntington's disease, traumatic brain injury, depression) (Beatty, 2004; Beatty et al., 2003; Beglinger et al., 2009; Dickerson et al., 2004; Duff, Beglinger, Theriault, Allison, & Paulsen, 2009; Hobson, Hall, Humphreys-Clark, Schrimsher, & O'Bryant, 2009; Pachet, 2007; Paradiso, Duff, Vaidya, Hoth, & Mold, 2009; Wilde, 2006).

As noted earlier, Silverberg et al. (2007) developed an EI that was embedded within the RBANS. This index converts raw scores of the Digit Span and List Recognition subtests to weighted scores. These weighted scores are inverses, such that lower raw scores are converted to higher "effort scores" that are suggestive of poorer effort. The two weighted scores are summed to yield the EI, which ranges from 0 – 12, with higher scores suggesting poorer effort. Silverberg et al. proposed two different cutoffs for the EI (>3 and >0) to serve as indicators of suspect effort.

Statistical analyses

For each participant in each sample, the EI of the RBANS was calculated according to procedures described in Silverberg et al. (2007). For each sample, cumulative frequency distributions were generated of the EI and compared to existing cutoffs (e.g., >3, >0).

Additionally, the EI score was examined for effects of age (via Spearman's rho correlation), education (via Spearman's rho correlation), gender (via Phi coefficients), and overall cognitive functioning (i.e., age- and education-corrected Total Scale score on the RBANS; via Spearman's rho correlation). Nonparametric statistics were utilized because it was expected that scores on the EI would violate many assumptions of the central limit theorem due to non-normally distributed scores (i.e., high mean and limited standard deviation of Digit Span and List Recognition subtests) in a heterogeneous population. A p-value of 0.05 was used throughout.

Results

RBANS Total Scale scores and EI scores for each sample are presented in Table 1. Base rates of various cutoff scores on the EI are presented in Table 2 for each sample. Table 3 provides the relationships between the EI and demographic variables (age, education, gender) and overall cognitive functioning (i.e., age- and education-corrected Total Scale score that does not include the Digit Span and List Recognition scores).

Discussion

The EI of the RBANS (Silverberg et al., 2007) has been shown to adequately discriminate between actual cases of traumatic brain injury and "malingering" groups. However, results of a small study (Hook et al., 2009) suggest that older adults might be disproportionately identified as giving suspect effort due to age-related cognitive changes. The current findings continue to raise caution about the use of this EI in geriatric samples. Across five separate and independent samples of older adults, base rates of "failing" the EI ranged from 0 – 36.9% for the most conservative cutoff (>3) to 21.5 – 76.5% for the most liberal cutoff (>0). Furthermore, in a sample of cognitively intact community-dwelling elders, both age and education were significantly associated with the EI, such that older participants and less educated participants were more likely to be suspected of poor effort. In four clinical samples, age appeared to be less of a factor, but education was strongly associated with EI scores. Gender was not related to EI scores in any of the samples. Finally, as has been noted previously, increased cognitive impairment was associated with the indication of poorer effort on the RBANS in all five samples examined.

Since multiple samples were used in the current analyses, differential rates of performance on the EI can be observed in Table 2. In the cognitively intact sample, the most conservative cutoff (>3) identified only 2.9% of 796 individuals as having low effort. When this same cutoff was applied to individuals classified as having amnesic Mild Cognitive Impairment, no participants (i.e., 0%) were identified as failing this indicator of effort. In these intact and mildly impaired older adults, the EI appears to perform as intended. However, as we shift to the more cognitively impaired samples, the base rates of EI failure dramatically increases, which is consistent with the few other studies in this area (Dean, Victor, Boone, Philpott, & Hess, 2009; Merten, Bossink, & Schmand, 2007; Teichner & Wagner, 2004). Suspicious scores on the EI were observed in one third of a heterogeneous sample of geriatric patients that were referred to a neuropsychology service (32.5%), diagnosed with probable Alzheimer's disease (32.9%), or reside in a nursing home (36.9%). Of course, we cannot know the actual rate of poor effort in any of these samples, and no concurrent measures of symptom validity testing were administered to any of these participants. (And this is a significant limitation of the current findings.) However, it is reasonable to assume that the motivation to purposefully feign impairments was low in all of the samples. In the 1,379 participants in these analyses, 79% were solely participating in a research study (i.e., not receiving clinical services), which seems to reduce the likelihood of suspect effort, as it is traditionally viewed (i.e., malingering).

Not only is our finding of inflated rates of suspect effort consistent with that of Hook et al. (2009), but it is also consistent with a growing body of literature on the uses (and perhaps misuses) of symptom validity testing in older and cognitively impaired adults. For example, inflated rates of “failure” on the Test of Memory Malingering were observed in patients diagnosed with dementia, but not in cognitively intact or cognitively impaired but not demented elders (Teichner & Wagner, 2004). In another study, most effort indices tested in a sample of patients with a broad range of dementia severity demonstrated high false positive rates (Dean et al., 2009). In two other studies examining less impaired elderly patients, depressed and/or anxious subjects performed adequately on three stand-alone symptom validity measures (Rey 15-Item, Rey Dot Counting, Test of Memory Malingering) (Ashendorf, Constantinou, & McCaffrey, 2004; Lee et al., 2000). In another study (Ashendorf, O’Bryant, & McCaffrey, 2003), efforts to detect malingering with embedded measures on the Wisconsin Card Sorting Test and California Verbal Learning Test were examined in older, non-impaired subjects. Although some of these indices showed utility, the lack of any true cognitive impairment in the subjects in these latter three studies brings their generalizability to typical referrals to a neuropsychology service into question. However, all presented data (including our results) seem to support the utility of stand-alone and embedded measures of effort if cognitive impairments are absent or mild.

Using only the cognitively intact sample, small but statistically significant relationships were observed between performance on the EI and age and education. As noted above, older patients and those with less education tend to do more poorly on this measure of effort. In general, this is not a surprising finding, as the two subtests that make up the EI are cognitive tests and many cognitive tests are affected by age and education. In the original paper on the EI (Silverberg et al., 2007), relationships with age and education were not examined. In a subsequent paper on this Index (Hook et al., 2009), no relationships were found. In our four clinical samples, age was only related to EI in the amnesic Mild Cognitive Impairment sample, but not in the other clinical samples. Education, however, was related to EI in 3 of the 4 clinical samples. It is possible that the Hook et al. (2009) study lacked the power to find some of these relatively small effects. Alternatively, in Hook et al.’s (2009) clinical sample, it is possible that any effects of age and education were overshadowed by effects of clinical disorders. It is also possible that the effects of the clinical disorders also overshadowed any moderating effects of age in our patient samples. Regardless, as with most neuropsychological measures, there appears to be the need to consider individual difference factors (e.g., age, education) when interpreting test results, whether they are from measures designed to assess specific cognitive domains or effort. Although a recent policy paper from the National Academy of Neuropsychology on symptom validity testing (Bush et al., 2005) did not mention age or education as a variable to consider in the interpretation of effort, there appears to be growing evidence that this is an important factor.

The Digit Span and List Recognition subtests of the RBANS were chosen for the EI because of their low base rates of low scores in a sample of 103 clinical cases (Silverberg et al., 2007). In the current sample of 796 cognitively intact elders, 94% had Digit Span raw scores and 83% had List Recognition raw scores that would fall into the “adequate” effort range (i.e., would receive a weighted score of 0). These seem quite comparable to the values reported in Table 1 of the original article with their clinical cases (Digit Span = 89% passed the cutoff, List Recognition = 76% passed the cutoff). However, in our clinical samples of geriatric patients, many more individuals fell below these cutoff points. For example, in our nursing home sample, only 65% and 35% passed these same cutoffs on Digit Span and List Recognition, respectively. Only 69% and 43% passed these cutoffs in our Neuropsychology clinic sample, respectively. And only 66% and 21% passed these cutoffs in our probable Alzheimer’s disease sample, respectively. Looking across all samples, it appears that the List Recognition subtest is more heavily weighted in determining low effort in these older

patients. Since the studies that contributed data to these analyses did not include any other measures of effort, we cannot use this data to “build a better mousetrap.” However, we can reiterate the possible concerns associated with uncorrected raw scores in symptom validity tests.

Although the RBANS allows for the assessment of patients across the adult age range, it was originally developed as a dementia screening battery, and some may wonder why symptom validity testing is needed in cases of suspected dementia. The RBANS EI, as proposed by Silverberg et al. (2007), assesses “effort,” not malingering. Although these two terms are often used interchangeably, they may reflect overlapping, but not identical, concepts. Whereas malingering has a generally agreed upon definition of the intentional production of false or exaggerated symptoms for external incentives (Bush et al., 2005), effort might be more vague, as it may reflect a more general phenomenon. Effort may include more benign factors, such as fatigue, apathy, or a misunderstanding of the expectations of the patient in the evaluation. Effort may also include aspects of clinical presentation, such as depression, delirium, or actual brain impairment. When an individual scores poorly on an effort index (whether embedded or stand-alone), it is incumbent on the clinician to determine which of these factors led to the poor effort score. It is worthwhile to state that any “indicator” score should not be applied dogmatically. Measures of effort, like all cognitive measures, must be interpreted in the context of history and clinical presentation. Ultimately, reliable and objective measures of effort should be used to foster clinical judgment, but not replace it.

Despite the large samples sizes, there are some notable limitations of the current set of analyses. First and foremost, none of the datasets used in these analyses were designed to examine poor effort, and no concurrent measures of effort were administered to any of the participants. Therefore, we do not know the actual rate of poor effort. However, as noted above, it is reasonable to assume that any true instances of feigned impairment would be very low in large groups of primarily research volunteers. Ideally designed studies of suspect effort would include multiple measures of this phenomenon, including ones considered to be “gold standards.” However, as noted above, many measures of effort fail to correct for important demographic and clinical variables and their utility in older, less educated, and impaired samples is unknown. Second, although the current set of analyses sought to examine aging effects on this effort measure, the participants in these samples were all 60+ years old, and a broader age range (e.g., 20 – 90 years old) might have identified additional effects. Third, due to data collection procedures in the cognitively intact sample, the education levels for all samples were coded ordinally, rather than continuously. It is possible that this coding method could have altered the relationship between education and the EI. Lastly, the lack of gender effects could have been affected by our relatively high proportion of females in these samples. Despite these limitations, the current set of analyses raises caution when using the EI of the RBANS in older adults, especially those with more severe cognitive impairments.

Acknowledgments

The project described was supported research grants (K23 AG028417-01A2) from the National Institutes On Aging. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institute On Aging or the National Institutes of Health.

References

- Ashendorf L, Constantinou M, McCaffrey RJ. The effect of depression and anxiety on the TOMM in community-dwelling older adults. *Arch Clin Neuropsychol*. 2004; 19(1):125–130. [PubMed: 14670385]

- Ashendorf L, O'Bryant SE, McCaffrey RJ. Specificity of malingering detection strategies in older adults using the CVLT and WCST. *Clin Neuropsychol*. 2003; 17(2):255–262. [PubMed: 13680433]
- Beatty WW. RBANS analysis of verbal memory in multiple sclerosis. *Arch Clin Neuropsychol*. 2004; 19(6):825–834. [PubMed: 15288335]
- Beatty WW, Ryder KA, Gontkovsky ST, Scott JG, McSwan KL, Bharucha KJ. Analyzing the subcortical dementia syndrome of Parkinson's disease using the RBANS. *Arch Clin Neuropsychol*. 2003; 18(5):509–520. [PubMed: 14591446]
- Beglinger LJ, Duff K, Allison J, Theriault D, O'Rourke JJ, Leserman A, et al. Cognitive change in patients with Huntington disease on the Repeatable Battery for the Assessment of Neuropsychological Status. *J Clin Exp Neuropsychol*. 2009:1–6.
- Bush SS, Ruff RM, Troster AI, Barth JT, Koffler SP, Pliskin NH, et al. Symptom validity assessment: practice issues and medical necessity NAN policy & planning committee. *Arch Clin Neuropsychol*. 2005; 20(4):419–426. [PubMed: 15896556]
- Culp KR, Wakefield B, Dyck MJ, Cacchione PZ, DeCrane S, Decker S. Bioelectrical impedance analysis and other hydration parameters as risk factors for delirium in rural nursing home residents. *J Gerontol A Biol Sci Med Sci*. 2004; 59(8):813–817. [PubMed: 15345731]
- Dean AC, Victor TL, Boone KB, Philpott LM, Hess RA. Dementia and effort test performance. *Clin Neuropsychol*. 2009; 23(1):133–152. [PubMed: 18609332]
- Dickerson F, Boronow JJ, Stallings C, Origoni AE, Cole SK, Yolken RH. Cognitive functioning in schizophrenia and bipolar disorder: comparison of performance on the Repeatable Battery for the Assessment of Neuropsychological Status. *Psychiatry Res*. 2004; 129(1):45–53. [PubMed: 15572184]
- Duff K, Beglinger L, Schoenberg M, Patton D, Mold J, Scott J, et al. Test-retest stability and practice effects of the RBANS in a community dwelling elderly sample. *J Clin Exp Neuropsychol*. 2005; 27(5):565–575. [PubMed: 16019633]
- Duff K, Beglinger L, Theriault D, Allison J, Paulsen J. Cognitive deficits in Huntington's disease on the Repeatable Battery for the Assessment of Neuropsychological Status. *J Clin Exp Neuropsychol*. 2009:1–9.
- Duff K, Beglinger L, Van Der Heiden S, Moser D, Arndt S, Schultz S, et al. Short-term practice effects in amnesic mild cognitive impairment: implications for diagnosis and treatment. *Int Psychogeriatr*. 2008; 20(5):986–999. [PubMed: 18405398]
- Duff K, Humphreys Clark J, O'Bryant S, Mold J, Schiffer R, Sutker P. Utility of the RBANS in detecting cognitive impairment associated with Alzheimer's disease: sensitivity, specificity, and positive and negative predictive powers. *Arch Clin Neuropsychol*. 2008; 23(5):603–612. [PubMed: 18639437]
- Duff K, Patton D, Schoenberg M, Mold J, Scott J, Adams R. Age- and education-corrected independent normative data for the RBANS in a community dwelling elderly sample. *Clin Neuropsychol*. 2003; 17(3):351–366. [PubMed: 14704885]
- Hobson VL, Hall JR, Humphreys-Clark JD, Schrimsher GW, O'Bryant SE. Identifying functional impairment with scores from the repeatable battery for the assessment of neuropsychological status (RBANS). *Int J Geriatr Psychiatry*. 2009
- Hook JN, Marquine MJ, Hoelzle JB. Repeatable battery for the assessment of neuropsychological status effort index performance in a medically ill geriatric sample. *Arch Clin Neuropsychol*. 2009; 24(3):231–235. [PubMed: 19549722]
- Lee A, Boone KB, Lesser I, Wohl M, Wilkins S, Parks C. Performance of older depressed patients on two cognitive malingering tests: false positive rates for the Rey 15-item memorization and dot counting tests. *Clin Neuropsychol*. 2000; 14(3):303–308. [PubMed: 11262705]
- McKhann G, Drachman D, Folstein M, Katzman R, Price D, Stadlan EM. Clinical diagnosis of Alzheimer's disease: report of the NINCDS-ADRDA Work Group under the auspices of Department of Health and Human Services Task Force on Alzheimer's Disease. *Neurology*. 1984; 34(7):939–944. [PubMed: 6610841]
- Merten T, Bossink L, Schmand B. On the limits of effort testing: symptom validity tests and severity of neurocognitive symptoms in nonlitigant patients. *J Clin Exp Neuropsychol*. 2007; 29(3):308–318. [PubMed: 17454351]

- Pachet AK. Construct validity of the Repeatable Battery of Neuropsychological Status (RBANS) with acquired brain injury patients. *Clin Neuropsychol.* 2007; 21(2):286–293. [PubMed: 17455019]
- Paradiso S, Duff K, Vaidya JG, Hoth A, Mold JW. Cognitive and daily functioning in older adults with vegetative symptoms of depression. *Int J Geriatr Psychiatry.* 2009
- Petersen RC, Smith GE, Waring SC, Ivnik RJ, Tangalos EG, Kokmen E. Mild cognitive impairment: clinical characterization and outcome. *Arch Neurol.* 1999; 56(3):303–308. [PubMed: 10190820]
- Randolph, C. Repeatable Battery for the Assessment of Neuropsychological Status. San Antonio, TX: The Psychological Corporation; 1998.
- Schoenberg MR, Duff K, Beglinger LJ, Moser DJ, Bayless JD, Mold J, et al. Retention rates on RBANS memory subtests in elderly adults. *J Geriatr Psychiatry Neurol.* 2008; 21(1):26–33. [PubMed: 18287167]
- Silverberg ND, Wertheimer JC, Fichtenberg NL. An Effort Index for the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS). *Clin Neuropsychol.* 2007; 21(5):841–854. [PubMed: 17676548]
- Teichner G, Wagner MT. The Test of Memory Malingering (TOMM): normative data from cognitively intact, cognitively impaired, and elderly patients with dementia. *Arch Clin Neuropsychol.* 2004; 19(3):455–464. [PubMed: 15033228]
- Wilde MC. The validity of the repeatable battery of neuropsychological status in acute stroke. *Clin Neuropsychol.* 2006; 20(4):702–715. [PubMed: 16980256]

Table 1

Demographic and cognitive scores for each sample

	Cognitively Intact	Nursing Home	Neuropsych Clinic	Amnesic MCI	Alzheimer's disease
N	796	229	156	72	126
Age (years)	73.4 (5.9)	85.5 (7.2)	75.9 (6.8)	82.1 (6.9)	76.7 (6.8)
Education (%)					
<9 years	5%	26%	14%	0%	12%
9 – 11 years	11%	10%	12%	3%	14%
12 years	26%	42%	42%	17%	38%
13 – 15 years	30%	13%	18%	23%	10%
>15 years	28%	9%	14%	57%	26%
Gender (% female)	55%	78%	63%	76%	66%
RBANS Total Scale*	95.7 (13.3)	73.1 (11.9)	75.0 (12.2)	92.3 (9.1)	65.9 (5.9)
RBANS Digit Span (raw)	11.5 (2.8) 4 – 16	8.3 (2.4) 0 – 16	8.3 (2.1) 2 – 14	10.0 (1.9) 6 – 16	8.5 (2.4) 1 – 15
RBANS List Recognition (raw)	18.8 (1.7) 10 – 20	15.2 (4.0) 0 – 20	16.0 (3.2) 9 – 20	18.5 (1.7) 13 – 20	14.7 (3.2) 0 – 20
RBANS Effort Index	0.5 (1.1) 0 – 6	3.1 (2.6) 0 – 12	2.6 (2.5) 0 – 11	0.5 (0.9) 0 – 3	3.3 (2.6) 0 – 11

Note.

* This Total Scale score used age- and education-corrected subtest scores (Duff et al., 2003) for all subtests.

Table 2

Base rates of scores on the RBANS Effort Index for each sample

	Cognitively Intact	Nursing Home	Neuropsych Clinic	Amnesic MCI	Alzheimer's disease
RBANS Effort Index					
>3	2.9%	36.9%	32.5%	0%	32.9%
>2	7.4%	54.0%	45.7%	5.6%	48.0%
>1	14.8%	71.1%	58.3%	16.7%	61.8%
>0	21.5%	76.5%	66.2%	23.6%	70.4%

Table 3
Relationships between RBANS Effort Index and demographics and overall cognition for each sample

	Cognitively Intact	Nursing Home	Neuropsych Clinic	Amnesic MCI	Alzheimer's disease
Age (years)	0.19 p<0.001	0.04 p=.60	0.12 p=0.15	0.23 p=0.05	0.02 p=0.82
Education (years coded)*	-0.11 p=0.001	-0.17 p=0.01	-0.28 p=0.001	-0.10 p=0.34	-0.28 p=0.002
Gender**					
>0	p=0.12	p=0.24	p=0.12	p=0.51	p=0.12
>3	p=0.68	p=0.58	p=0.18	p=1.00	p=0.68
RBANS Total Scale***	-0.40 p<0.001	-0.46 p<0.001	-0.50 p<0.001	-0.33 p=0.004	-0.53 p<0.001

Note.

* Education was coded as in Table 1.

** Only p-values are reported for Gender, since none were significant.

*** This Total Scale score used age- and education-corrected subtest scores for all subtests except Digit Span and List Recognition.