Usefulness of a 15-Item Version of the Boston Naming Test in Neuropsychological Assessment of Low-Educational Elders With Dementia

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The purpose of this study was to validate a reduced version (15 items) of the Boston Naming Test (BNT) in a sample of 78 low-educational elderly persons with or without dementia, as determined by independent assessment with a battery of cognitive tests. The reduced version was found to be equivalent to the complete BNT, and to have criterion validity with respect to other measures of dementia. We conclude that the reduced version is a useful instrument for assessing patients who require shorter testing methods because of severe cognitive deterioration or their low level of education.

The Boston Naming Test (BNT; Kaplan, Goodglass, & Weintraub, 1978) is the most widely used test of visual confrontation naming. The standard 60-item version has been used to assess language performance in participants with aphasia or dementia (Goodglass, Wingfeld, & Hyde, 1998). Deficits in naming performance frequently appear in the first stages of Alzheimer’s disease and increase with time. For this reason the BNT is one of the tests most frequently used to detect the disease and follow its course (Williams, Mack, & Henderson, 1989).

Many studies have shown that the BNT is useful in discriminating normal elderly persons and those with dementia (LaBarge, Edwards, & Knessel, 1986; Lansing, Innik, Cullum, & Randolph, 1999; Martin & Fedio, 1983; Welch, Doineau, Johnson, & King, 1996). However, the particular characteristics of the latter population, including the limited attention span, together with the need to shorten testing time in daily clinical practice, have led different researchers to suggest the possibility of giving reduced versions of the test. Williams and colleagues (1989) constructed two reduced versions of 30 items each (the even-numbered and the odd-numbered versions), and found that both were equivalent to each other and showed a significant correlation with the complete version both in patients with dementia and in healthy subjects.

In a more recent study the same researchers (Mack, Freed, Williams, & Henderson, 1992) proposed four equivalent forms of 15 items each, obtained by assigning each item consecutively to one of four series. The interseries equivalence analysis showed that all four versions correlated significantly with one another, and each version appeared to discriminate subjects with and without dementia as effectively as did the complete test. However, as the authors discussed, the scores on each version were obtained by dividing up the items in the global analysis of the complete 60-item test. They therefore emphasized the need for independent validation of each version to verify its usefulness for the clinical diagnosis of dementia.

In 1999, Lansing and colleagues validated the four shortened versions proposed by Mack and colleagues (1992), confirming the tests’ discriminative capacity for the detection of anomia in dementia. Like the full version of the BNT, all shortened versions show significant correlations with demographic variables such as age, gender, and education. However, as the authors indicated in their article, the influence of these variables on short-form performance has not been thoroughly investigated.

There have likewise been few studies of the influence of these demographic variables on populations different from those in the original sample (such as the Spanish population), for which the BNT has been adapted. Moreover, the few comparative studies of norms in Spanish and English have concentrated on the American Hispanic population, whose sociocultural and lexical characteristics differ from those of the indigenous population of Spain (Kohnert, Hernández, & Bates, 1998).

As Kohnert and colleagues (1998) indicate, adapted BNTs have been undertaken without taking into account the demographic variables and lexical peculiarities of the population to which the new version is applied. Specifically, for the Spanish adaptation, the same validation criteria were followed as for the English version (Goodglass & Kaplan, 1986). The test was administered to 84 adults between 18 and 59 years old, arranged in two groups according to level of education: one group with 12 or more years of schooling and the other group with 12 years or fewer. The range of this second group is too broad, including both completely illiterate participants and functional illiterates (able to read and write, but not fluently), who have limited access to the lexicon owing to their low level of education. Currently,
these two subgroups raise important issues for the Spanish elderly population (with and without dementia).

Because of sociopolitical circumstances during their childhood and adolescence (Spanish Civil War and postwar period), many members of this generation did not have access to formal schooling, and thus attained only a low level of education. These subjects usually make more mistakes on the BNT than subjects with a moderate to high level of education; the errors are not due to anomic deficits, but rather to their ignorance of the exact name that the test scores as the correct response. Under these conditions, validation of the reduced form of the BNT could be especially relevant. Administering the complete test would prolong the testing period needlessly and would increase the participant’s feelings of failure and frustration, which might in turn affect his or her motivation and performance.

The purpose of our research was threefold:

1. To find out whether one of the reduced versions of the BNT, the Shortened Boston Version-15 (SBV-15) proposed by Mack and colleagues (1992; specifically, Version 2; see Table 1), correlated with the complete 60-item version, and could therefore substitute for the latter in clinical situations in which time limitations, special characteristics of the participant, or both, make use of a shortened version necessary.

2. To find out whether the SBV-15 is useful in detecting dementia in a population with a low educational level, in whom attention is limited by dementia and lexical capacity by low level of education.

3. To analyze the differences between participants with and without dementia in performance on the SBV-15 and the BNT, and to examine the influence of age, education, and gender on performance.

METHODS

Participants

Seventy-eight participants (37 women and 41 men) were included in the study. They ranged in age from 60 to 93 years old, with an average age of 74 years. The participants diagnosed with possible dementia as well as the normal controls were selected from among the residents of retirement centers (67.5%) and the outpatients at a hospital neurology clinic (32.5%). The sample’s demographic and clinical features are summarized in Table 2. Since Spain’s current generation of elderly persons with and without dementia have a low level of education (especially those people who grew up in southern Spain), we created three groups: (a) those who were completely illiterate (Group 1); (b) those who were functionally illiterate, that is, able to read and write, although not fluently (Group 2); and (c) those with primary education, with an average of 6 to 8 years of schooling (Group 3). Other categories of educational level were not used because very few participants in our sample had received education beyond the primary school level.

Instruments

BNT.—Developed by Goodglass and Kaplan (1986). The complete 60-item version consists of figures representing everyday objects arranged in increasing order of difficulty. The subject was asked to name each object correctly within a maximum of 20 s. Semantic or phonemic cues were provided as necessary. According to the standard test criteria, the score was calculated from those items that were correctly named spontaneously plus additional items named correctly after semantic cues.

Reduced 15-Item version of the BNT (SBV-15).—Developed by Mack and colleagues (1992). We used Version 2 of the SBV-15. Each of the 60 items was assigned consecutively to one of four series, and one series of 15 items was used. Five items were easy, five were moderately difficult, and five were difficult. The criteria used to apply and correct the items were the same as for the complete BNT.

Mini-Mental State Examination (MMSE).—Developed by Folstein, Folstein, and McHugh (1975), translated and adapted by Lobo, Escobar, Ezquerra, and Seva Diaz (1979). In the adapted version the maximum score is 35 points. To

<table>
<thead>
<tr>
<th>Table 1. Items in the SBV-15</th>
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<tbody>
<tr>
<td><strong>English</strong></td>
</tr>
<tr>
<td>Tree</td>
</tr>
<tr>
<td>Watch</td>
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<tr>
<td>Broom</td>
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<tr>
<td>Hanger</td>
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<tr>
<td>Mask</td>
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<tr>
<td>Racquet</td>
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<tr>
<td>Wreath</td>
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<tr>
<td>Rhinoceros</td>
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<tr>
<td>Stilts</td>
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<tr>
<td>Escalator</td>
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<tr>
<td>Muzzle</td>
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<tr>
<td>Accordion</td>
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<tr>
<td>Compass</td>
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<tr>
<td>Scroll</td>
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<tr>
<td>Abacus</td>
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</table>

*Note: SBV-15 = Shortened Boston Version-15.*
establish criteria for the presence or absence of dementia we used standards developed by Manubens and colleagues (1997) for the Spanish population.

Rey’s Auditive Verbal Learning Test.—This test consisted of 15 common words presented in five trials (Rey, 1964). Recall was required after each presentation.

Benton’s Visual Retention Test.—This multiple-choice identification task tests short-term visual memory (Benton, 1953).

Luria’s Motor Test.—In this test the participant is asked to learn and reproduce a sequence of movements (fist/edge/palm; Christensen, 1979).

Digit Span and Block Design Subtests.—Taken from the Wechsler Adult Intelligence Scale (Wechsler, 1974).

Verbal Fluency Test.—Tested with semantic (mainly nouns) and phonetic cues (words that begin with the letter p; Goodglass & Kaplan, 1986).

Procedure
The complete battery of tests for neuropsychological assessment was administered in three sessions. Each participant took both versions of the BNT (complete and SBV-15) independently in different sessions, normally one week apart.

Before the results were analyzed, we used multiple comparisons between groups of participants recruited from the retirement home or hospital to rule out statistically significant differences in age, gender, or level of education related with the variable setting.

Statistical Analysis
We first classified the participants as having or not having dementia depending on neurological diagnosis and their performance in the battery. We used the methodology commonly used in epidemiological studies (Agrimon & Jiménez Villa, 1991; González de Rivera, Rodríguez Pulido, & Sierra López, 1993; Sackett, 1979) to show that the reduced version of the BNT showed criterion validity with regard to the complete version and the MMSE.

In accordance with these methods, to establish the criterion validity of measurement instruments and diagnostic tests (understood as the ability of a test to identify subjects who have a certain characteristic or diagnostic status and differentiate them from those who do not), we took into account the test’s sensitivity (the proportion of persons with a certain characteristic who are correctly classified) and specificity (the proportion of persons who do not have the given characteristic and are correctly classified), as well as the agreement between the two (criterion agreement).

We then used the SPSS program (SPSS Inc., Chicago, IL) to test the correlation between the shortened version and the 60-item BNT. Correlations between the SBV-15 and the other tests used to detect dementia were calculated with the Pearson Product-Moment Test. We used analysis of variance (ANOVA) to compare the groups with and without dementia by age and sex. If a factor was found to be statistically significant, post-hoc comparisons were done.

RESULTS
The means and standard deviations of the MMSE, SBV-15 version, and the BNT scores are summarized in Table 3. On the basis of these results and in accordance with a previous study estimating the cut-off points of greatest sensitivity and specificity for this population (Calero, Navarro, Robles, & García-Berben, 2000), we used a score of 24 points in the MMSE, 10 items in the SBV-15 version, and 36 items in the BNT as a cut-off to classify the participants as having or not having dementia.

The results of our analysis of criterion validity for the SBV-15 are summarized in Table 4. Specificity (agreement in the identification of dementia between the two versions of the BNT) reached 1, positive predictive value was 1, and complete agreement between the two versions was 0.855. The MMSE yielded a higher positive predictive value for the identification of participants without dementia (0.913), although complete diagnostic agreement was slightly lower (0.835).

As shown in Table 5, there was a highly significant correlation between the complete and the reduced versions of the BNT ($r = .83, p < .001$). The correlation between the MMSE and each version of the BNT was also significant ($r = .68, p < .001$ for the BNT; $r = .65, p < .001$ for the SBV-15).

Table 5 also shows the correlations between the SBV-15 and some of the other tests traditionally included in the battery of instruments used to detect dementia. In all cases the correlations were highly significant.

ANOVA between the groups with and without dementia depending on their MMSE scores (above or below 24 points) revealed significant differences in performance on...
both versions of the BNT ($F(1, 77) = 32.95, p < .001$ for the SBV-15, and $F(1, 77) = 54.13, p < .001$ for the BNT).

Multivariate analysis to test the influence of age, level of education, and gender revealed significant differences only for the variable age ($F(2, 76) = 7.22, p < .001$ for the SBV-15, and $F(2, 76) = 3.98, p < .05$ for the BNT) and the Age × Diagnosis interaction ($F(2, 76) = 6.24, p < .001$ for the SBV-15, and $F(2, 76) = 4.55, p < .05$ for the BNT). Post-hoc analyses showed that these differences were mainly due to the oldest age subgroup, which also had the highest prevalence of dementia.

**Discussion**

In spite of the fact that the BNT, whether in its full version or the versions reduced to 30 or 15 items, is one of the most widely used clinical tests to detect the presence of anoma in dementia, few studies have considered the influence of lexical characteristics and demographic variables (age, gender, and education) in non-English-speaking populations subjected to adaptations of the test. Specifically, the Spanish version of the BNT normally used is a literal translation of the original test, validated in a population with an upper age limit of 59, which falls well short of the average age of the population with dementia. Classification of subjects according to education level also follows the standards of the original version, with two overly broad groups (12 or more years of schooling as opposed to fewer than 12 years). These groups present great variability in performance depending on their lexical knowledge, which means that in many cases the final scores need to be corrected in order to avoid a diagnosis of anoma for what in reality is lexical ignorance of the evaluated item.

This situation is especially common in subjects with a low educational level, who currently constitute the average population with dementia, particularly in southern Spain. Owing to the sociocultural characteristics prevailing during their childhood and adolescence, this population presents a high index of total illiteracy (neither reading nor writing) or of functional illiteracy (reading and writing without fluency). There can be no doubt that such subjects have significant lexical limitations affecting the results of the BNT.

Research into adapting the BNT and its shortened versions to the characteristics of this group could therefore improve diagnoses of dementia for this population.

The results we obtained show a high degree of equivalence between the complete version of the BNT and the reduced version of only 15 items in subjects with a low education level. Criterion validity for the SBV-15, diagnostic agreement with the MMSE, and the significant correlations between the results of the reduced version and other tests traditionally used to detect and follow dementia, all suggest that the SBV-15 can be used instead of the BNT to assess dementia in situations in which time limitations or the special characteristics of the patient so require.

Our analyses revealed significant differences between the complete and the reduced versions of the BNT with regard to the results for the MMSE and all other battery tests in participants with and without dementia. This is further confirmation of the usefulness of the reduced version and its equivalence to the complete form of the test.

Lansing and colleagues (1999) demonstrated the influence of age, education, and gender variables on all versions of the BNT published to date. Because our participants were generally homogeneous with regard to their low educational level, we found that this variable was not associated with significant differences in performance in either version of the BNT. The gender variable was not significant either. It could have become highly relevant if groups with a higher educational level had been introduced, because within the present generation of patients with dementia in Spain, men had greater opportunity of access to education than women did. Regarding the age variable, not surprisingly an Age × Diagnosis interaction was detected: The greatest number of cases of Alzheimer’s disease was found in the oldest age subgroup.

In conclusion, even considering possible limitations due to the reduced number of participants in the sample or to sample characteristics, our study reveals that the SBV-15 shows high criterion validity and can thus be considered an assessment instrument equivalent to the complete BNT for certain patients. The validation of other reduced forms as alternatives to the BNT, as well as shortening the overall neuropsychological battery, may facilitate follow-up of the course of patients with anoma, with or without dementia, by obviating possible learning effects after the same test has been given in repeated measures.

In the future, there is a need for a fuller validation of the Spanish adaptation of the BNT and its shortened versions, which should also include a frequency analysis of the items selected, to investigate their correspondence with the particular lexical characteristics of the Spanish population. These are probably different from those of the Hispanic population, on which such studies have normally been based (Kohnert et al., 1998).

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**Table 5. Bivariate Correlations Between the SBV-15, the BNT, and Cognitive Tests Used to Assess the Degree of Cognitive Deterioration**

<table>
<thead>
<tr>
<th>Test</th>
<th>MMSE</th>
<th>SBV-15</th>
<th>BNT</th>
</tr>
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<tbody>
<tr>
<td>Benton Visual Retention</td>
<td>0.597**</td>
<td>0.597**</td>
<td>0.660**</td>
</tr>
<tr>
<td>BNT</td>
<td>0.685**</td>
<td>0.834**</td>
<td>1.000</td>
</tr>
<tr>
<td>Block Design</td>
<td>0.657**</td>
<td>0.658**</td>
<td>0.729**</td>
</tr>
<tr>
<td>Digit Span</td>
<td>0.503**</td>
<td>0.420**</td>
<td>0.420**</td>
</tr>
<tr>
<td>Age</td>
<td>−0.383**</td>
<td>−0.389**</td>
<td>−0.341**</td>
</tr>
<tr>
<td>Education</td>
<td>0.369**</td>
<td>0.361**</td>
<td>0.199</td>
</tr>
<tr>
<td>Verbal Fluency</td>
<td>0.358*</td>
<td>0.283**</td>
<td>0.420**</td>
</tr>
<tr>
<td>MMSE</td>
<td>1.000</td>
<td>0.651**</td>
<td>0.685**</td>
</tr>
<tr>
<td>Luria Motor</td>
<td>0.528**</td>
<td>0.441**</td>
<td>0.577**</td>
</tr>
<tr>
<td>REY Verbal Learning</td>
<td>0.534**</td>
<td>0.350**</td>
<td>0.525**</td>
</tr>
</tbody>
</table>

**Notes:** MMSE = Mini-Mental State Examination; SBV-15 = Shortened Boston Version-15; BNT = Boston Naming Test.

*p < .05; **p < .01.
REFERENCES