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Diagnostic validity of a neuropsychological test battery for Hispanic patients with epilepsy

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ABSTRACT

The Neuropsychological Screening Battery for Hispanics (NeSBHIS) was developed to address the growing need for linguistically appropriate Spanish-language assessment measures. Despite the potential benefits to clinical practice, no prior study has assessed its diagnostic validity in populations with epilepsy. One hundred and fifteen patients with confirmed epilepsy were evaluated via the NeSBHIS; these data were standardized according to age- and education-based norms. Performance decrements were observed in more than 40% of participants on measures of processing speed and naming. Deficits in verbal and visual recall were also exhibited by 29 and 26% of the sample, respectively. No significant differences in test performance emerged between patients with VEEG evidence of left ($N = 48$) versus right ($N = 24$) temporal lobe epilepsy. Although the NeSBHIS is sensitive to the cognitive impairments commonly observed in populations with epilepsy, there are limitations to its ability to identify lateralized neuropsychological impairment in patients with temporal lobe epilepsy.

1. Introduction

Neuropsychology's role in comprehensive epilepsy centers has evolved in recent decades because of changes in the characteristics and numbers of patients undergoing surgical intervention as a treatment for medically refractory seizures [1–3]. Test batteries used for neuropsychological assessment of surgical candidates typically include measures of global intellectual functioning, as well as tests of other more specific neuropsychological domains including language and memory [4]. Much is now known about the psychometric properties and diagnostic utility of neuropsychological tests administered to English-speaking individuals, particularly those evaluated in North America. However, very little information exists on neuropsychological testing of patients with epilepsy from other cultural and linguistic backgrounds.

The paucity of culturally and linguistically appropriate neuropsychological test measures is of particular concern to the Hispanic immigrant community in the United States, as this population represents the most rapidly growing segment of the country's population. There are indications that Hispanic immigrants are now presenting for treatment at U.S. epilepsy centers with increasing regularity. With this comes an increased need for linguistically and culturally relevant neuropsychological assessment tools, including those appropriate for presurgical contexts. Experience has shown that the solution to this problem is not to simply translate existing test materials into Spanish; test developers must ensure that the assessment materials are culturally and linguistically appropriate for the population in question [5,6]. One must also determine whether the normative data used to interpret the tests are drawn from a group that is ethnically and demographically similar to the clinical sample.

The Neuropsychological Screening Battery for Hispanics (NeSBHIS) was developed by researchers at UCLA in the 1990s to address the fundamental lack of resources available to Spanish-speaking Hispanic individuals [7]. Modeled after a battery first used by the World Health Organization [8], the NeSBHIS was designed to assess multiple cognitive domains. One of the primary advantages of the battery is that it has been among the few to provide data on its psychometric characteristics in addition to test norms stratified by age, gender, and education using a moderately large ($N = 300$) Spanish-speaking sample [9].

Although the NeSBHIS represents a significant advancement in Spanish-language neuropsychological assessment, concerns exist regarding the generalizability of this instrument to a more medically heterogeneous sample [10]. Although preliminary investigation suggests adequate clinical utility in some patient groups, its

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construct validity and diagnostic utility in patients with epilepsy are unknown. The present study aims to examine the diagnostic validity of the NeSBHIS in identifying relevant cognitive impairments in Spanish-speaking Hispanic patients with epilepsy and in predicting seizure lateralization in surgical candidates.

2. Methods

2.1. Subjects

Test data were acquired from a consecutive series of 136 Hispanic patients with epilepsy who had completed neuropsychological evaluations at the New York University Comprehensive Epilepsy Center between 2000 and 2006. All participants described themselves as "Hispanic", emigrated from Spanish-speaking countries, and opted for Spanish-language assessment. A diagnosis of epilepsy was confirmed in each case through results of continuous video/EEG (VEEG) monitoring. Data from 21 patients were excluded from analysis because the VEEG results demonstrated no epileptiform abnormality ($N = 10$) or the presence of nonepileptic seizures with no accompanying EEG changes ($N = 11$).

Demographic characteristics of the final study sample of 115 patients are provided in Table 1. VEEG findings indicated that the majority of the sample demonstrated electrophysiological evidence of partial epilepsy. Fifteen participants exhibited generalized VEEG findings. Results from imaging studies using magnetic resonance imaging (MRI) were available for 95 subjects. Nearly half (47%) had normal MRI scans or findings limited to the presence of mesial temporal sclerosis (MTS). Thirty percent of the patients showed evidence of lesions including benign tumors, vascular malformations, and cortical malformations.

Additional analyses were conducted on a subgroup of 83 participants evaluated as surgical candidates who were found to have VEEG results demonstrating the presence of a temporal lobe seizure focus. A total of 48 subjects were determined to have seizures emanating from the left temporal lobe (LTL), and 24 had seizures localized to the right (RTL). The remaining 11 subjects demonstrated bilateral EEG findings or results that were inconclusive based on the surface recordings. The demographic and MRI characteristics of the subjects with temporal lobe seizures were similar to those seen in the larger sample. No significant differences in demographic or seizure variables were observed between LTL and RTL subjects. Wada test results were available for half of the sample, with the majority (86%) demonstrating language localization in the left cerebral hemisphere.

Table 1
Sample characteristics for 115 Spanish-speaking patients undergoing neuropsychological testing.

Age	37.0 (12.4)[a]
Sex	
Male	41
Female	74
Years of education	11.9 (4.0)[a]
Handedness	
Right	100
Left	15
Land of origin	
Puerto Rico	52
Central America	30
South America	9
Dominican Republic	12
Other Caribbean	2
Age at epilepsy onset	15.9 (13.0)[a]
VEEG results	
Temporal	83
Frontal	8
Other focal	9
Generalized	15
MRI findings ($N = 95$)	
Normal	29
Mesial temporal sclerosis only	16
Atrophy	18
Lesion	30
Other	2

[a] Mean (SD).

2.2. Procedures

The present study was performed according to the policies of the institutional review board of New York University School of Medicine. Participants were tested individually in one or two sessions totaling approximately 90 minutes. All tests were administered and scored by bilingual examiners who had completed advanced graduate-school training in neuropsychological assessment.

The NeSBHIS was designed as a battery of 10 subtests chosen to evaluate the domains of mental control (i.e., attention and concentration), language, memory, visuospatial functions, and psychomotor speed (see Pontón et al. [7,10] for a more comprehensive review). Most measures of this battery were adapted from subtests used internationally by the World Health Organization [8,11]. The majority of subtests constituting the NeSBHIS are already used extensively in some form by North American neuropsychologists working in comprehensive epilepsy centers.

The NeSBHIS was administered for this study in conjunction with other neuropsychological tests. The battery is described as follows:

1. *Raven Standard Progressive Matrices* (RSPM) [12]: This test was used to assess the ability to perceive relationships and to reason by analogy, independent of language and education. This measure is considered one of the most widely administered measures of nonverbal reasoning and intelligence.
2. *Digit Span Subtest—Escala de Inteligencia Wechsler para Adultos* (EIWA) [13]: The Digit Span subtest from the EIWA was administered as a measure of attention and working memory. This subtest is identical in content to the Wechsler Adult Intelligence Scale—Revised (WAIS-R) [14] but involves different scoring parameters.
3. *Digit Symbol Subtest—EIWA*: This test was included as a measure of attention and processing speed. Unlike its English-language counterpart, the EIWA Digit Symbol task has six target symbols and the total number of possible responses is 110 (as compared with 93 on the WAIS-R/Wechsler Adult Intelligence Scale III) [14].
4. *Color Trails Test, Forms 1 and 2* (CTT) [15]: The CTT was administered as a measure of sustained tracking and set shifting. Both forms consist of colored circles numbered 1–25; odd numbers are pink and even numbers are yellow. On Trails 1, examinees were instructed to connect the circles in sequential order as quickly as possible. On Trails 2, examinees were asked to connect the circles in sequential order (while maintaining numerical sequence) and simultaneously alternate colors.
5. *Pontón–Satz Boston Naming Test* (P–S BNT) [16]: The P–S BNT is the 30-item Spanish-language equivalent of the 60-item English-language Boston Naming Test (BNT) [17] and was used as a measure of confrontation naming abilities. Culturally loaded items (e.g., "pretzel" and "beaver") are also excluded from this measure to ensure cultural relevance and appropriateness for Spanish-speaking populations.
6. *Controlled Oral Word Association Test* (FAS) [18]: COWAT is a popular measure of verbal fluency that has been adapted for both English- and Spanish-speaking individuals. On this task, participants are given 1 minute to generate as many words as possible beginning with a target letter (in this case, 'F', 'A', and 'S').