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BRIEF COMMUNICATION

Clinical Comparison of Two Confrontation Naming Measures in Spanish-Speaking People with Epilepsy

Willa P. Vo[1], K. Chase Bailey[2], Virginia Zuverza-Chavarria[3], Marielle Nagele[1] and Jason A. D. Smith[1,4]

[1]Department of Physical Medicine and Rehabilitation, University of Texas Southwestern Medical Center, Dallas, TX, USA
[2]Department of Psychiatry, University of Texas Southwestern Medical Center, Dallas, TX, USA
[3]Department of Psychology, Rancho Los Amigos National Rehabilitation Center, Downey, CA, USA
[4]Neurorestoration Center, University of Southern California, Los Angeles, CA, USA

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Abstract

Objective: Research on the lateralizing value of neuropsychological tests is limited among Latino people with epilepsy (PWE). This study aims to evaluate the utility of two confrontation naming measures in laterality determination. **Method:** Data were collected from 71 Latino PWE who completed the Vocabulario Sobre Dibujos (VSD) and the Pontón-Satz Modified Boston Naming Test (MBNT). Raw and standardized scores were examined to determine diagnostic accuracy for predicting left hemisphere (LH) epilepsy for the full sample and using a sample-specific median split of educational attainment. **Results:** The MBNT demonstrated adequate classification accuracy (65.7%, 77.1%) as did the VSD (54.3%, 74.3%) for predicting LH seizure laterality using raw and standardized scores, respectively. For participants with ≥ 9 years of education (HEdu), receiver operator characteristic curve analyses showed a raw/percentile cutoff of ≤ 26/≤ 5th on the VSD, yielding 53%–58% sensitivity/87%–83% specificity. A raw score cutoff of ≤ 17 on MBNT produced 47% sensitivity/78% specificity for HEdu participants. **Conclusions:** The VSD was found to have greater flexibility in determining cutoff scores using either raw or standardized scores for predicting seizure laterality. This study provides interpretation guidance, emphasizing education as a pertinent variable, to optimize lateralization accuracy for Latino PWE.

Keywords: Seizures, Functional laterality, Hispanic Americans, Neuropsychological tests, Language tests, Sensitivity and specificity

INTRODUCTION

The incidence of epilepsy in Hispanics is double than that of non-Hispanics in the United States (Berg et al., 2003). Interdisciplinary evaluation is a standard protocol for pre-surgical planning for epilepsy, with mesial temporal lobe epilepsy (TLE) being most common (Berg et al., 2010). Neuropsychological evaluation improves lateralization certainty. Neuropsychologists play a crucial role given the high stakes nature of potential cognitive morbidity (Baxendale et al., 2019). While ultimate lateralizing/localizing decisions are complex and informed by a multitude of patient-specific factors, confrontation naming tests have been found to be sensitive to language dominant temporal lobe dysfunction (Lee, 2010). The Boston Naming Test (BNT) is often the confrontation naming test of choice (Vogt et al., 2017). Busch, Frazier, Iampietro, Chapin, and Kubu (2009) found that the BNT, in combination with other moderating variables (i.e., Full Scale IQ [FSIQ], age of onset, and duration of epilepsy), was useful in predicting surgical lateralization and the epileptogenic zone, within English-speaking populations.

Neuropsychological tests for Spanish-speakers in the United States remain somewhat limited. An early modification of the BNT was created, the Pontón-Satz Modified Boston Naming Test (MBNT; Pontón et al., 1992). The MBNT was included in the Neuropsychological Screening Battery for Hispanics (NeSBHIS), developed to address the dearth of neuropsychological measures for Spanish-speakers with neurological conditions (Pontón et al., 1992). The NeSBHIS was created in Los Angeles, CA, and primarily

Correspondence and reprint requests to: Willa P. Vo, Department of Physical Medicine and Rehabilitation, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd., Dallas, TX 75390-9044, USA. E-mail: willa.vo@utsouthwestern.edu

composed of an immigrant population with Mexico and Central American countries as the prominent nations of origins (Pontón & León-Carrión, 2001; Smith et al., 2020).

In the context of epilepsy, the clinical utility of the NeSBHIS has been explored. The NeSBHIS construct validity was documented in Latino people with epilepsy (PWE; Bender et al., 2009). Few studies, however, have investigated the lateralizing value of the NeSBHIS, including the MBNT, among Spanish-speakers in the United States. One study established the diagnostic validity of the NeSBHIS for identifying cognitive impairment in a subgroup of Latinos with TLE; however, seizure lateralization was limited when using the MBNT (Barr et al., 2009). Lancman, Vazquez-Casals, Perrine, Feoli, and Myers (2012) evaluated the lateralizing merits of the core NeSBHIS battery and select subtests of the Batería III Woodcock-Muñoz (Muñoz-Sandoval, Woodcock, McGrew, & Mather, 2005) in a sample of 39 Latino PWE. Findings were such that confrontation naming emerged from their battery as clinically useful in lateralization, with 80% sensitivity and 67% specificity for predicting left hemisphere (LH) seizure onset (Lancman et al., 2012). The mixed results from these investigations render it difficult to apply findings to current clinical practice. Adding to the interpretive complexity of these studies is that other confrontation naming tests, such as the Vocabulario Sobre Dibujos (VSD) of the Batería III Woodcock-Muñoz, have not been directly compared to the MBNT in the same study. Doing so would allow for better control of regional and educational differences, as the respective cohort represents different nations of origin from those of the original NeSBHIS sample (Smith et al., 2020). Along these same lines, educational opportunities for Latinos exist, such as access to education, quality of education, and level of compulsory education (Smith et al., 2020).

This study aims to provide neuropsychologists with additional data on the lateralizing value of two confrontation naming tests, the MBNT and the VSD, with Spanish-speaking PWE. Given the dearth of extant research focusing on both dominant and nondominant TLE lateralizing value, this study is poised to assess the predictive value in accurately classifying LH seizure onset. Furthermore, we examined the comparative efficacy of raw scores and educationally adjusted scores in promoting accuracy in laterality determination.

MATERIALS AND METHODS

This study was completed in accordance with the Declaration of Helsinki and IRB approval from the Rancho Research Institute.

Participants

Participants in this study were primarily immigrant, Hispanic patients from a county-funded, comprehensive epilepsy treatment center in Los Angeles, CA. One hundred sixty-nine Latino PWE referred for outpatient neuropsychological assessment services as part of their comprehensive epilepsy workup completed a battery of Spanish measures. Of these, 114 were lateralized to the right hemisphere (RH) or LH, operationally defined by consensus at interdisciplinary epilepsy conference, which encompasses clinical information gathered from inpatient surface video-EEG, neuropsychological data, and brain imaging (i.e., MRI, PET, SPECT). Of these, 71 had data for the MBNT and VSD. Seizure laterality for this subsample was 36 RH and 35 LH. Demographic and clinical characteristics are provided in Table 1. No significant differences were found between RH and LH participants across demographic and clinical characteristics.

Measures

Pontón-Satz Modified Boston Naming Test (MBNT)

This subtest requires examinees to denominate 30 line drawn objects, presented in the order of increasing difficulty. If the examinee is unable to provide a correct answer spontaneously within 20 seconds or misperceives the stimuli, a semantic cue is provided. If the examinee is unable to provide the correct response with a semantic cue, the examiner provides a phonemic cue. One point is given for each correct spontaneous response or a correct response provided after a semantic cue for a total of 30 possible points. Comparatively to the items in the BNT, the MBNT removes culturally inappropriate items (e.g., igloo), leaving a total of 30 items as opposed to 60 items. Normative data stratified by age and gender exist (Ponton et al., 1996), though to circumvent the small cell sizes in the data set and to extend the work of Smith et al. (2020), education-stratified norms were utilized (Ponton & Leon, 2001).

Vocabulario Sobre Dibujos (VSD)

This subtest was designed to assess oral language and lexical knowledge (i.e., expressive language) through identification (i.e., naming) of detailed, color illustrated objects. Item difficulty increases through gradual presentation of less common objects. All examinees start at item 1 and progress through item 46 or until meeting the discontinuation rule of six consecutive incorrect responses. Raw score transformations can be adjusted for either age or education. For the current study, education-corrected norms were utilized (Muñoz-Sandoval et al., 2005).

Data Analyses

Descriptive statistics were used to preliminarily determine the relative performance differences on the two measures of interest across lateralization groups. Independent *t* tests compared group differences on medical and demographic variables. Binary logistic regressions were computed for raw and standardized scores for the two confrontation naming measures. Receiver operating characteristic (ROC) curve analyses were computed to assess the diagnostic accuracy and sensitivity/specificity for predicting LH epilepsy for the full sample as

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Table 1. Demographic and descriptive data between right and left hemisphere groups

Variable	Right hemisphere ($n = 36$) M (SD)	Left hemisphere ($n = 35$) M (SD)	Group comparison
Age	36.8 (9.4)	36.6 (10.3)	$t(69) = .06$, $p = .95$
Education	8.4 (4.1)	8.4 (3.0)	$t(69) = -.08$, $p = .94$
Sex			X^2 (1, $N = 71$) = .364, $p = .55$
Male	18	15	
Female	18	20	
Nationality			X^2 (5, $N = 71$) = 5.60, $p = .35$
Mexico	26	22	
El Salvador	6	7	
Guatemala	3	2	
Peru	1	–	
USA	–	3	
Nicaragua	–	1	
Language			X^2 (1, $N = 71$) = .053, $p = .81$
Spanish-only	28	28	
Bilingual	8	7	
Raven's Progressive Matrices Performance			
Impaired	5	4	
Borderline	5	4	X^2 (4, $N = 71$) = 2.76, $p = .59$
Low Average	13	10	
Average	9	15	
High Average	4	2	
Seizure Location ($n = 45$)			X^2 (5, $N = 44$) = 5.80, $p = .33$
Mesial Temporal	19	16	
Frontal	3	1	
Parietal	–	1	
Occipital	1	1	
Multi-lobe	–	1	
Lateral Temporal	1	1	
Age of Onset	12.7 (10.6)	12.8 (12.1)	$t(69) = .05$, $p = .96$
Years with Seizures	23.9 (10.3)	23.8 (10.9)	$t(69) = .04$, $p = .97$
Number AEDs	2.7 (.8)	2.7 (.8)	$t(69) = .19$, $p = .85$
Number of Failed AEDs	1.9 (1.4)	1.5 (1.2)	$t(53) = 1.25$, $p = .22$
MBNT Raw	18.3 (4.3)	16.4 (3.3)	$t(69) = 2.04$, $p = .04$*
MBNT %ile	17.7 (22.4)	11.6 (18.4)	$t(69) = 1.26$, $p = .21$
VSD Raw	27.3 (4.6)	25.1 (3.4)	$t(69) = 2.26$, $p = .03$*
VSD %ile	18.8 (17.9)	13.3 (16.9)	$t(69) = 1.34$, $p = .18$

MBNT = Pontón-Satz Modified Boston Naming Test; VSD = Vocabulario Sobre Dibujos. *$p < .05$.

well as using a sample-specific median split of educational attainment. A median split was used to explore lateralizing utility in the participants with low education (LEdu; <9 years) and high education (HEdu; ≥9 years), consistent with the previously posited position that Spanish-speaking participants with LEdu did not have NeSBHIS scores that lateralized compared to those with HEdu (Shaw, Campelo Smith, Chavarria, Kolberg, & Smith, 2012; Smith et al., 2020).

RESULTS

Independent *t* tests indicated that, using raw scores, LH onset groups performed worse than RH onset groups on both naming tests (see Table 1). Classification accuracy of left temporal lobe seizure laterality using raw scores on the MBNT was 65.7% ($p = .05$) and 54.3% ($p = .03$) using the VSD. Raw scores on both measures were statistically significant, but this finding was not concordant when education-corrected scores were examined. Because percentiles produced better classification accuracy (77.1% for the MBNT and 74.3% for the VSD), all four models were further examined with the hypothesis that years of education was interacting with the model. Pearson correlations showed that the level of education is significantly correlated with raw scores of both MBNT ($r = .327$, $p = .005$) and the VSD ($r = .409$, $p < .001$). Given this finding, ROC analyses were run with and without a median split of 9 years of education.

For the full sample, VSD was significant with both raw (AUC = .662; $p = .019$) and education-corrected standardized scores (AUC = .639; $p = .044$), while the MBNT was not significant for raw (AUC = .624; $p = .073$) or education-corrected

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Table 2. Sensitivity and specificity values associated with various VSD and MBNT scores for predicting left hemisphere epilepsy in participants with nine or more years of education (HEdu)

	Raw score cutoff	Sensitivity	Specificity	Percentile cutoff	Sensitivity	Specificity
VSD	≤22	.16	1.00	≤2	.32	.96
	≤23	.26	.96	≤3	.37	.91
	≤24	.32	.96	**≤5**	**.58**	**.83**
	≤25	.42	.96	≤6	.58	.74
	≤26	**.53**	**.87**	≤8	.58	.65
	≤27	.53	.78	≤10	.63	.65
	≤28	.74	.65	≤11	.74	.61
	≤29	.79	.57	≤12	.79	.52
MBNT	≤13	.26	1.00	≤1	.42	.78
	≤14	.32	.96	≤2	.63	.65
	≤15	.37	.96	≤5	.68	.65
	≤16	.42	.83	≤7	.74	.65
	≤17	**.47**	**.78**	≤9	.79	.65
	≤18	.63	.70	≤12	.84	.61
	≤19	.74	.70	≤15	.84	.49
	≤20	.84	.65	≤21	.84	.44
	≤21	.84	.44	≤25	.84	.39
	≤22	.84	.30	≤30	.84	.30
	≤23	.90	.17	≤37	.84	.22

VSD = Vocabulario Sobre Dibujos; MBNT = Pontón-Satz Modified Boston Naming Test; bold notes the optimal values for those with ≥ 9 years of education.

standardized scores (AUC = .594; $p = .171$). The VSD had marginally better overall model quality (.54, .51) compared to the MBNT (.49, .46) for raw and percentile scores, respectively.

For HEdu participants, raw scores on the VSD improved model fit (AUC = .788, $p < .001$) as did percentiles (AUC = .747, $p = .001$), but findings were nonsignificant for LEdu participants ($p = .464$, $p = .812$) for either scores. Similar patterns were observed on the MBNT raw/percentile scores for the HEdu cohort (AUC = .746, $p = .002$, AUC = .682, $p = .03$) improving diagnostic accuracy, with nonsignificant findings in the LEdu cohort (AUC = .353, $p = .175$, AUC = 0.382, $p = .27$). Again, the VSD produced higher models (.63) compared to MBNT (.55) for the HEdu cohort. The diagnostic accuracy for the HEdu group is summarized in Table 2.

DISCUSSION

This study investigated two confrontation naming tests' predictive accuracy in classifying seizure laterality in a primarily immigrant cohort of Spanish-speaking PWE living in the United States. Historically, the BNT served as the primary confrontation naming measure in English-speaking patients. While neuropsychologists understand the importance of controlling for pertinent factors such as age and education, other disciplines (i.e., neurology) may be apt to use raw score cutoffs. As the sociodemographic makeup of people living in the United States expands, the onus of responsibility for cross-validating traditional cognitive measures to populations underrepresented in extant normative data often falls to clinical researchers to reduce risk of incorrect classification of cognitive impairment (Olabarrieta-Landa et al., 2019).

Utilization of raw scores, regardless of confrontation naming measure, yielded statistically significant differences between epilepsy laterality. Previous research has been discordant with respect to the ability of the MBNT to predict side of seizure onset. The current study demonstrates that when pertinent factors are considered, such as similitude between the patient sample and the reference sample, raw scores and education adjusted scores are both able to capture dominant hemisphere deficiencies.

Patient-specific factors, such as years of education, are correlated with rates of low scores (Brooks, Iverson, & White, 2009). Therefore, it seemed most appropriate to utilize a median split for years of education within the present sample to further analyze classification accuracy for raw scores. As demonstrated in Table 2, both measures' cutoffs were able to be raised to maintain adequate sensitivity/specificity balance in the HEdu group. Specifically, a raw score cutoff of ≤26 on the VSD improved sensitivity by 10% and specificity by 9%. The same findings were unable to be replicated with the MBNT, as raising cutoffs to improve specificity resulted in lower sensitivity values. Presumably, a median split approach for percentile scores would not confer additional advantage given that such scores have already taken education into account. This presumption notwithstanding, the current study found that optimal classification accuracy was achieved when using the VSD with a cutoff of ≤5th percentile for the HEdu group, with adequate sensitivity/specificity (58%/83%). The ability to use either raw scores or percentiles with the MBNT was not found. This suggests that, despite the original education adjustment, higher education appears to

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uniquely impact patient performance across the two naming measures. Unfortunately, none of the ROC curve models performed on the sample with the LEdu group were significant.

Classification accuracy when using the VSD was consistently superior to that of the MBNT, regardless of whether raw scores or percentiles were used. This may be due in part to the superior psychometric rigor present in the Batería III Woodcock-Muñoz (Schrank et al., 2005). In addition to highlighting how education impacts classification accuracy, the present study controlled for sociocultural differences that may have limited the previous studies by simultaneously studying the MBNT and the VSD in a cohort closely matching the demographic makeup of the original NeSBHIS sample.

The results from this study indicate that for both the VSD and MBNT, LH lateralization accuracy was optimized when considering years of education (i.e., ≥9 years) consistent with previous studies (Smith et al., 2020). This poor lateralizing ability on both measures in the LEdu groups may be due to variability in opportunity for and quality of education in various nations and subregions of these nations of origins represented in the present cohort. Reported years of education is not equivalent to quality of education. Saez et al. (2014) studied Latino PWE in New York and reported the importance of sociocultural factors in neuropsychological evaluation of Latinos in the United States, specifically related to country of origin (e.g., US *vs.* Latino country of origin). In particular, the authors recommended that their results be applied with some restriction to populations from the similar country (i.e., Puerto Rico) of origin and linguistic fluency, given the heterogeneity that exists among Latino PWE of different countries of origin.

Overall, the VSD was found to have superior sensitivity and specificity than the MBNT in accurately classifying seizure laterality in Latino PWE, with more flexibility given robust findings when using either raw or standard scores while accounting for educational attainment. The current study adds to the small body of literature investigating naming performance in Spanish-speaking PWE in the United States. It supports the findings of Lancman et al. (2012) with respect to the predictive value of the MBNT and extends those findings into clinical application for both the MBNT and VSD. The literature for English-speaking PWE with respect to naming, and more broadly language functioning, is unequivocally better established. For instance, in English-speakers, many studies fail to find group differences in naming performance between RH and LH seizure onset (Bartha-Doering & Trinka, 2014). This could be due to several factors such as idiosyncrasies of the naming measures utilized, the neuroanatomic complexity of a functioning linguistic system, or underappreciated contributions from other clinical variables. For example, several studies have found that hippocampal pathology is associated with naming dysfunction regardless of seizure laterality in both English and Spanish-speakers (Hermann, Seidenberg, Schoenfeld, Davies, 1997; Oddo et al., 2003). In English-speakers, research with the BNT has shown that predictions about ultimate side of surgery are optimized when considering moderating variables such as FSIQ, age at seizure onset, and duration of epilepsy (Busch et al., 2009). Additionally, previous research has shown that qualitative error analysis (i.e. phonemic paraphasias) can also enhance predictive accuracy of seizure laterality (Fargo, Schefft, Dulay, Privitera, & Yeh, 2005; Ramirez, Schefft, Howe, Hwa-Shain, & Privitera, 2008). To summarize, naming research in English-speakers demonstrates that this area of study is complex, and additional research is required to further characterize how specific Spanish neuropsychological measures interact with both education and disease characteristics to inform clinical decision making. These aspirations aside, the current study contributes meaningfully to the important foundational work of neuropsychology in Spanish-speaking PWE.

Despite the strengths and potential applicability of these findings, there are several limitations. First, without Wada or fMRI data, the study was not able to account for atypical language representation among participants. Additionally, neither measure performed well in the LEdu group. This study provides recommendations for cutoff scores to optimize lateralization accuracy for Latino PWE. Although classification accuracy in determining seizure laterality has improved with the development of neuropsychological tests initially developed and validated in Spanish, it is clear that further development and validation of neuropsychological tests for Spanish-speaking PWE is of high importance given the overrepresented nature of epilepsy in this population compared to other groups living in the United States. Future research may investigate the importance of country of origin in the development of adequate neuropsychological norms.

SUPPLEMENTARY MATERIAL

To view supplementary material for this article, please visit https://doi.org/10.1017/S1355617720001289

CONFLICTS OF INTEREST

The authors declare no conflicts of interest. There are no sources of financial support.

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