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Validity of the WISC–IV Spanish for a Clinically Referred Sample of Hispanic Children

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The Wechsler Intelligence Scale for Children (WISC) is the most commonly used intelligence test for children. Five years ago, a Spanish version of the WISC–IV was published (WISC-IV Spanish; Wechsler, 2005), but a limited amount of published information is available regarding its utility when assessing clinical samples. The current study included 107 children who were Spanish speaking and of Puerto Rican descent that had been administered the WISC–IV Spanish. They were subdivided into a clinical sample of 35 children with diagnoses of various forms of brain dysfunction (primarily learning disability, attention-deficit/hyperactivity disorder, and epilepsy) and a comparison group made up of 72 normal children who were part of the WISC–IV Spanish version standardization sample. Comparisons between these groups and the standardization sample were performed for the WISC–IV Spanish index and subtest scores. Results indicated that the clinical sample performed worse than the comparison samples on the Working Memory and Processing Speed Indexes, although findings varied to some extent depending on whether the clinical group was compared with the normal comparison group or the standardization sample. These findings provide support for the criterion validity of the WISC–IV Spanish when it is used to assess a clinically referred sample with brain dysfunction.

Keywords: WISC–IV Spanish, Hispanic children, learning disabilities, ADHD, Puerto Rican children

The Wechsler Intelligence Scales for Children (Wechsler, 1974, 1991, 2003) have been extensively used in research and clinical applications to identify patterns of cognitive performance unique to neurodevelopmental disorders, such as attention-deficit disorders (Mayes & Calhoun, 2006; Solanto et al., 2008) and autism (Goldstein et al., 2008; Siegel, Minshew, & Goldstein, 1996), as well as to acquired conditions such as traumatic brain injury (TBI; Allen, Thaler, Donohue, & Mayfield, 2010; Donders, 1997; Donders & Janke, 2008; Kinsella, Prior, Sawyer, & Murtagh, 1995; Tremont, Mittenberg, & Miller, 1999). Five years ago, a Spanish version of the Wechsler Intelligence Scale for Children—Fourth Edition (WISC–IV) was released (Wechsler, 2005), which was designed for use in the United States and Puerto Rico with Spanish-speaking children ages 6 years to 16 years 11 months. Development of the WISC–IV Spanish is in keeping with the Joint Committee on Standards for Educational and Psychological Tests (American Educational Research Organization, American Psychological Association, & National Council on Measurement in Education, 1999), which indicates the importance of correctly testing linguistic diversity. However, to date and to our knowledge, no other information is available regarding the clinical utility of the WISC–IV Spanish in clinical populations of Spanish-speaking children except for preliminary data reported in the test manual for children with mental retardation. This is not unusual in that the scientific literature remains critically lacking in research examining minority issues. Furthermore, with regard to the current state of professional psychological test usage, few tests commonly used by neuropsychologists are available in Spanish (Camara, Nathan, & Puente, 2000) and these have a number of limitations (Puente & Salazar, 1998). Efforts to examine potential effects of cultural and linguistic variables in the assessment of primarily Spanish-speaking individuals (e.g., Ardila, Rosselli, & Puente, 1992) have focused primarily on neuropsychology and have not completely migrated to intellectual assessment of Spanish speakers. To begin to address these issues, the WISC–IV Spanish was adapted using experienced Hispanic reviewers from various Spanish-speaking countries and a Spanish-speaking standardization sample from

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Normal comparison data were from the Puerto Rican group of the Wechsler Intelligence Scale for Children—Fourth Edition (WISC–IV) Spanish standardization sample. The sample data were from D. Wechsler, *Wechsler Intelligence Scale for Children—Fourth Edition—Spanish*, 2005, San Antonio, Texas. Copyright 2005 by NCS Pearson, Inc. Used with permission. All rights reserved. We thank the WISC–IV Spanish Edition publisher for allowing access to the standardization data. Also, we thank the Clinical Research Center–National Institutes of Health–Research Centers for Minority Institutions at the University of Puerto Rico Medical School Sciences Campus for providing guidance on this project.

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various Hispanic/Latino ethnic groups, as well as information available from earlier Spanish versions of the Wechsler scales. However, from a clinical standpoint, the degree to which the validity of WISC index scores and performance profiles (as derived from English-language versions) are preserved in the Spanish adaptation remains to be seen.

On the basis of these considerations, the purpose of this study was to examine the criterion validity of the WISC–IV Spanish version's subtest and index scores in a clinically referred sample of 35 bilingual but dominantly Spanish-speaking children primarily with diagnoses of learning disabilities (LD) and attention-deficit/hyperactivity disorder (ADHD). This clinical sample was compared with a control group of Puerto Rican children selected from the standardization sample and with the entire standardization sample. The major hypothesis was that the clinical sample would perform significantly worse than the other samples on WISC–IV index and subtest scores that assess processing abilities that facilitate fluid reasoning, learning, and problem solving (Raiford, Weiss, Rolfhus, & Coalson, 2008; Weiss & Gabel, 2008; Weiss, Saklofske, Prifitera, & Holdnack, 2006), with the poorest performance on those index and subtest scores that have consistently been reported to be sensitive to brain dysfunction including Digit Symbol Coding and the Processing Speed Index (Allen et al., 2010; Donders & Janke, 2008).

Method

The study included 107 children and adolescents between the ages of 6.0 and 16.7 years. Of these, 35 had clinical diagnoses (CLIN group), and the other 72 were selected from the WISC–IV Spanish standardization sample (STAN group) as a normal comparison group (NC group). Demographic data for each of the groups are presented in Table 1. The NC group consisted of all 72 Spanish-speaking individuals from the standardization sample for the WISC–IV Spanish who were of Puerto Rican origin. These children were reported to speak and understand Spanish better than English (Wechsler, 2005, p. 56). Participants in the CLIN group were selected from a consecutive series of 50 cases that were referred for neuropsychological assessment to a neuropsychology consultation service at the Neurology Section of the University of Puerto Rico Medical School. They were included in the current study if they spoke Spanish as their primary language, had a diagnosis of either a neurodevelopmental or an acquired brain disorder, and had completed the WISC–IV as a part of their neuropsychological evaluation. In the CLIN group, seven participants had ADHD, eight had various types of LD, 11 had ADHD and LD, eight had epilepsy (partial complex), and one had sustained a closed head injury. Clinical diagnoses were established by a neurology resident with an attending board-certified neurologist, on the basis of a comprehensive neurological evaluation using neuroimaging, laboratory services, related studies, and *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; American Psychiatric Association, 2000) criteria as appropriate. With regard to ethnicity, all participants in the CLIN group were born and lived in Puerto Rico and reported Spanish as their dominant language in expression, comprehension, and writing skills. There were no significant differences between the CLIN and NC groups on age, $F(1, 106) = 0.14$, $p = .71$, although there was a significant difference for sex, $\chi^2(1) = 4.32$, $p = .04$, in that the NC group had more girls than did the CLIN group. Also, the average amount of parental education was higher for the CLIN group.

Table 1
Demographic Data for the Clinical Group (CLIN) and Normal Comparison Group (NC)

Demographic	CLIN ($n = 35$)	NC ($n = 72$)
Age (years)		
M	10.3	10.5
SD	3.0	2.6
Sex (% female)	29.7	52.8
Parental education (%)		
0–8 years	0.0	4.7
9–11 years	0.0	6.6
12 years	32.4	30.2
13–15 years	2.9	20.8
16+ years	64.7	37.7

Note. NC data was derived from the Puerto Rican group of the Wechsler Intelligence Scale for Children—Fourth Edition Spanish standardization sample. Data are from D. Wechsler, *Wechsler Intelligence Scale for Children—Fourth Edition—Spanish*, 2005, San Antonio, Texas. Copyright 2005 by NCS Pearson, Inc. Used with permission. All rights reserved.

The WISC–IV Spanish edition was standardized on a nationally stratified sample of 851 children who were selected on the basis of the 2000 U.S. census data to represent the United States Hispanic population in age, sex, gender, parental education, parental race/ethnicity, geographic area, and disability status. The WISC–IV Spanish norms were developed on the basis of 500 of these individuals and were obtained from the four major geographic regions identified in the 2000 U.S. census (Northeast, South, Midwest, and West). Puerto Rico was included in the South region. The WISC–IV Spanish retains the Full-Scale IQ and the four index scores. Reports in the WISC–IV Spanish test manual indicate internal consistencies, test–retest and interrater stability, and standard errors of measurement comparable to the English version (Braden & Iribarren, 2007). More information regarding test development, reliability, and validity of the WISC–IV Spanish is available in the test manual (Wechsler, 2005).

Results

Descriptive statistics for the clinical and control groups on the WISC–IV subtests and index scores are presented in Table 2, as are results of the comparisons between the CLIN and NC groups and the comparisons between the CLIN and STAN groups. Comparisons were made for subtest and index scores, even though this introduced some redundancy into the analyses, because of the limited amount of information that is currently available for the WISC–IV Spanish in clinical populations. As can be seen from Table 2, with regard to the CLIN and NC comparisons, *t* tests indicated significant differences were present for the Working Memory Index (WMI) and for the Coding and Letter–Number Sequencing (LNS) subtests. Despite the lack of significant difference between the Processing Speed Index (PSI) for the CLIN and NC comparison, it is interesting to note that the WMI score for the NC group is slightly higher than the PSI score. As for comparisons between the CLIN and the STAN groups, single-sample *t* tests indicated significant differences for the Verbal Comprehension

Table 2
Descriptive Statistics and Comparisons Between the Clinical Group (CLIN), Normal Comparison Group (NC), and the WISC–IV Spanish Standardization Sample (STAN)

	CLIN (n = 35)		NC (n = 72)		CLIN vs. NC (df = 105)			CLIN vs. STAN (df = 34)		
Scale	*M*	*SD*	*M*	*SD*	*t*	*p*	*d*	*t*	*p*	*d*
Index										
VCI	93.0	12.8	96.1	14.4	1.1	.29	.23	−3.23	.003	.50
PRI	94.6	16.1	96.9	17.9	0.6	.53	.14	−1.98	.06	.35
WMI	89.6	16.2	98.3	14.7	2.8	.007	.56	−3.79	.001	.67
PSI	88.9	13.2	95.1	17.7	1.8	.07	.29	−4.98	.001	.79
FSIQ	90.6	14.6	96.2	17.0	1.7	.10	.17	−3.82	.001	.64
Subtest										
SI	9.5	2.9	9.4	3.0	0.2	.84	.03	−1.04	.31	.17
VC	8.6	2.5	9.4	2.7	−1.4	.17	.31	−3.38	.002	.51
BD	9.1	3.2	8.6	3.2	0.7	.46	.16	−1.64	.11	.29
PS	9.2	3.0	10.5	3.6	−1.8	.08	.39	−1.58	.12	.27
MR	9.1	3.2	9.4	3.4	−0.3	.73	.10	−1.64	.11	.29
PC	8.5	3.0	9.5	3.1	−1.5	.13	.33	−2.88	.007	.50
DS	9.5	2.8	9.9	2.9	−0.6	.56	.14	−1.03	.31	.17
LN	7.4	3.7	9.8	3.0	−3.6	.001	.71	−4.14	.001	.77
CD	7.5	3.1	9.4	3.6	−2.7	.007	.57	−4.93	.001	.82
SS	8.1	3.2	8.8	3.5	−1.0	.33	.21	−3.44	.002	.61

Note. VCI = Verbal Comprehension Index; PRI = Perceptual Reasoning Index; WMI = Working Memory Index; PSI = Processing Speed Index; FSIQ = Full-Scale IQ; SI = Similarities; VC = Vocabulary; BD = Block Design; PS = Picture Concepts; MR = Matrix Reasoning; PC = Picture Completion; DS = Digit Span; LN = Letter–Number Sequencing; CD = Coding; SS = Symbol Search. NC data were derived from the Puerto Rican group of the Wechsler Intelligence Scale for Children—Fourth Edition Spanish (WISC–IV Spanish) standardization sample. Data are from D. Wechsler, *Wechsler Intelligence Scale for Children—Fourth Edition—Spanish*, 2005, San Antonio, Texas. Copyright 2005 by NCS Pearson, Inc. Used with permission. All rights reserved.

Index (VCI), WMI, and PSI, as well as for the Coding, Vocabulary, LNS, Picture Completion, and Symbol Search subtests. Examination of effects sizes indicated uniformly larger effects for comparisons between the CLIN and STAN samples than for the CLIN and NC samples. Differences in results from comparisons with the CLIN, NC, and STAN groups are presented in Figure 1. It is clear from examination of the figures that the NC group performed below the STAN group on most subtests and all index scores, which decreased the differences between the NC and CLIN groups. For example, on the PSI, the NC group performed 4.9 index points lower than the STAN group; therefore, the PSI difference was not significant for the CLIN and NC comparison and resulted in a mean difference between the groups of 6.2 index points, although it was significant for the CLIN and STAN comparison, with a mean difference of 11.1 index points. In contrast, because the NC group's performance on the WMI provided a closer approximation of the STAN mean (a difference of 1.7 index score points), differences were apparent for the WMI when the CLIN group was compared with both the NC group and the STAN. Paired-sample t tests comparing the NC group's index scores with each other indicated that the only significant difference was between the Perceptual Reasoning Index (PRI) and the PSI, $t(34) = 2.07$, $p < .05$, with nonsignificant differences between the PRI and the WMI, $t(34) = 1.93$, $p = .06$, and the VCI and the PSI, $t(34) = 1.80$, $p = .08$.

Discussion

The results of the current study provide initial support for the criterion validity of the Spanish version of the WISC–IV when it is used to evaluate intellectual abilities in a clinically referred sample of children and adolescents with various forms of brain dysfunction. To our knowledge, the current study is the first to examine the criterion validity of the Spanish version of the WISC–IV in children with neurological disorders outside of the special group with mental retardation reported in the test manual. As in prior studies, the CLIN sample performed significantly worse that the NC and STAN samples on a number of key indexes and subtests. The few reports published regarding the English version of the WISC–IV suggest some differences may be present between the WISC–IV and its predecessors. The two published studies of the WISC–IV English version that examined children with TBI (Allen et al., 2010; Donders & Janke, 2008) indicate that although the Perceptual Organization Index was sensitive to TBI in prior versions of the WISC, its revision into the Perceptual Reasoning Index for the WISC–IV has decreased its sensitivity to the TBI. Also, LNS, which is sensitive to TBI in the adult version of the Wechsler scales, does not appear sensitive to TBI in children on the English version of the WISC–IV (Allen et al., 2010; Donders & Janke, 2008). This difference may indicate that the LNS measures a different cognitive construct in children than in adults, making it less sensitive to brain injury in children (Donders & Janke, 2008).

With regard to the current results, we too did not find that the PRI was uniquely sensitive to brain dysfunction in our clinical sample; although lower than the STAN mean, it was the highest of the index scores in our CLIN group and on par with the VCI, which is composed of subtests that have been traditionally identified as hold tests that are not as susceptible to decline in the

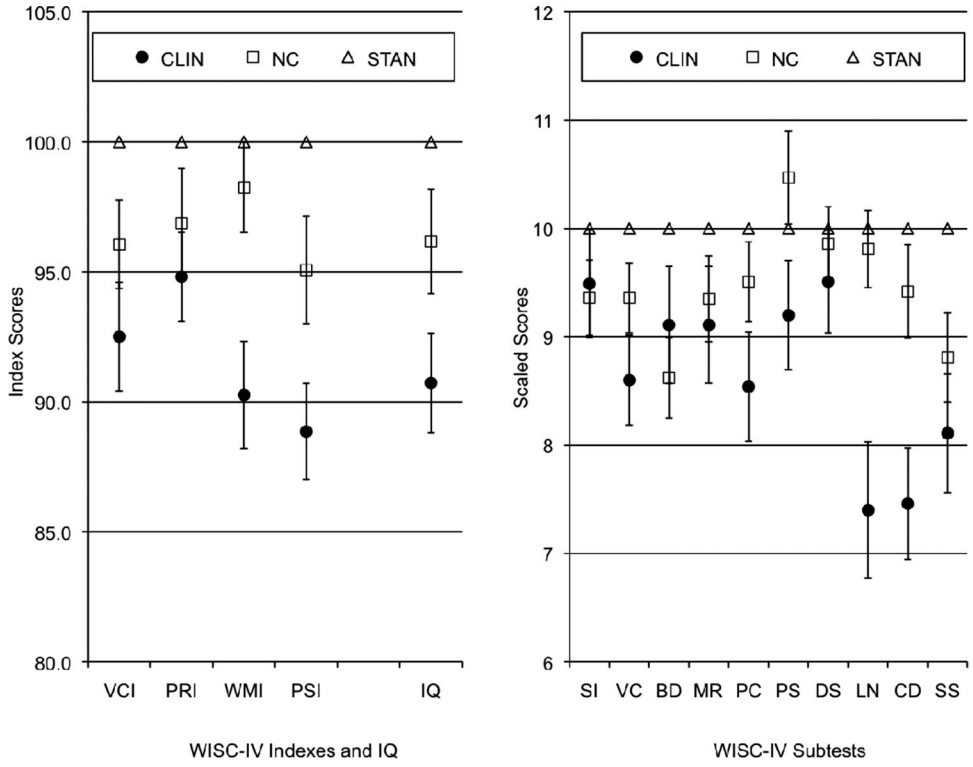

Figure 1. WISC–IV Index, IQ, and subtest profile in children from the clinical group (CLIN), normal comparison group (NC), and WISC–IV Spanish standardization sample (STAN). VCI = Verbal Comprehension Index; PRI = Perceptual Reasoning Index; WMI = Working Memory Index; PSI = Processing Speed Index; IQ = Full-Scale IQ; SI = Similarities; VC = Vocabulary; BD = Block Design; MR = Matrix Reasoning; PC = Picture Completion; PS = Picture Concepts; DS = Digit Span; LN = Letter–Number Sequencing; CD = Coding; SS = Symbol Search; WISC–IV = Wechsler Intelligence Scale for Children—Fourth Edition.

presence of brain injury. In contrast, the LNS subtest, which for the WISC–IV in English was not sensitive to TBI, was sensitive to brain dysfunction in our clinical sample of Spanish-speaking children, for whom it was the lowest subtest score. This finding is consistent with findings from the Wechsler Adult Intelligence Scale—Third Edition in TBI where LNS has shown sensitivity (Donders, Tulsky, & Zhu, 2001). The conclusions drawn from our finding should be viewed as tentative, but they appear to support the LNS as a sensitive indicator of brain dysfunction on the WISC–IV Spanish, although the reason for this apparent discrepancy from studies of children with TBI using the English version of the WISC–IV could not be determined. In 2008, Renteria, Li, and Pliskin suggested that the LNS of the WAIS–III Spanish version published by TEA Ediciones in Madrid, Spain, may underestimate ability, possibly because of pronunciation differences between Spanish spoken in Spain and Spanish spoken in Latin America. This suggestion does not appear to account for differences in the present study, as the WISC–IV Spanish standardization sample was selected to represent the United States Hispanic population on the basis of the 2000 U.S. census data. Furthermore, this difference observed in LNS was apparent even when the clinical sample was compared with individuals selected from the standardization sample who were of Puerto Rican decent. Expected results were present for the PSI when comparisons were made with the standardization mean, and PSI was the lowest of the index scores. Similarly, Coding and Symbol Search were among the lowest of the subtest scores. Since publication in its earliest versions, the Digit Symbol Coding subtest has shown sensitivity to brain dysfunction, whether due to acquired or neurodevelopmental disorders (Lezak, Howieson, & Loring, 2004; Matarazzo, 1972). Although the subtest and index scores obtained by the CLIN group were not as low as has been observed in children with structural brain damage (Allen et al., 2010; Donders & Janke, 2008), the PSI appears to be useful in identifying children with brain dysfunction on the WISC–IV Spanish.

An important difference between the current study and those that have been already reported is that we used a subsample of normal controls selected from the WISC–IV Spanish standardization sample (NC groups) as a comparison group for our Puerto Rican clinical subjects, as well as compared their scores with the standard scores derived from the entire standardization sample. Matched samples have been used in past studies similar to this one (e.g., Allen, Haderlie, Kazakov, & Mayfield, 2009; Donders & Janke, 2008) and have some advantages. However, because they represent a subset of the standardization sample, they do not tend to be representative of national norms, and their scores often do not fall at published means for the entire standardization sample. This was the case in our study, where the NC group's scores fell below the STAN on all of the index scores as well as on nine of the 10 subtest scores. However, because clinicians rely on the means and

standard deviations from the entire standardization sample when determining performance of individual cases, comparisons to matched control samples may produce results that are inconstant with comparisons to the entire standardization sample. Such an effect was observed in the current study, where, for example, the Symbol Search subtest score for the CLIN group was 8.1, for the NC group was 8.8, and for the STAN was 10.0. Thus, although comparisons between the CLIN and NC groups were not significant ($p = .33$) and produced a mean difference of 0.7, the difference between the CLIN group and the STAN was significant ($p < .01$), producing a mean difference of 1.9. Discrepancies between the two approaches reflect, on the one hand, the need to provide information that is directly applicable to clinical interpretation of WISC–IV profiles, and, on the other hand, the need for experimental control of extraneous variables to characterize various disorders according to patterns of cognitive disturbance and gain insight into the dysfunction of varied underlying neural systems. These issues should be considered when applying findings from research studies in clinical practice.

Limitations of the current study include that we examined a sample with heterogeneous clinical diagnoses, so we could not determine the criterion validity of the WISC–IV Spanish to specific disorders. Also, we did not address whether the supplemental subtests are sensitive to brain dysfunction. Additionally, the sample was selected from a series of consecutive cases referred to a neuropsychology consult service in a hospital-based setting, which may limit the generalizability of our findings. Finally, differences were present between the CLIN group and the NC group in parental education. However, because the CLIN group had higher levels of parental education than did the NC group and standardization sample, educational differences do not appear to account for the poorer performance by the CLIN group on the WISC–IV subtest and index scores. Despite these limitations, the current findings provide initial support for the use of the WISC–IV Spanish to assess Puerto Rican children with neurodevelopmental disorders.

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