Working Memory, Processing Speed and the Spanish WAIS-III, Puerto Rico

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Abstract

The translation and normalization of the WAIS-III for use with Puerto Rican populations was completed in 2007. The new test, named Escala de Inteligencia Wechsler para Adultos-III (EIWA-III), retained the factor structure of the original WAIS-III version, including the Working Memory Index (WMI) and the Processing Speed Index (PSI). One of the validity studies of the EIWA-III compared the performance on the WMI and PSI of five clinical groups with matched controlled groups (MCG). The clinical groups included in the study are: Schizophrenia (SZ), Intellectual Disability (ID, formerly MR), Multiple Sclerosis (MS), Epilepsy (EP) and Depression (DP). Statistically significant differences were obtained for the CD and SZ groups according to neuropsychological theory.

Introduction

The role of Working Memory (WM) and Processing Speed (PS) in adaptive functioning has been increasingly understood and appreciated (Baddley, 2003; Barkley, 2006). This awareness, with its empirical support, has impacted the design of the recent versions of the Wechsler intelligence scales (Tulsky, Saklofske, & Zhu, 2003). Assessing these cognitive processes has become a common practice within clinical neuropsychology (Hawkins & Tulsky, 2003; Lezak, 1995).

Until November of 2008 Puerto Rican adolescents and adults with suspected neurocognitive conditions were assessed with the Spanish WAIS (EIWA) (Wechsler, 1968), standardized in the 1960's. As expected according to the hypothesized *Flynn Effect* (Flynn, 1987), the EIWA overestimates IQ scores by at least 12 points. As a consequence, many Latino Patients assessed with the EIWA did not obtain realistic recommendations for rehabilitative, academic or vocational services. Some of these individuals might have not received the financial compensation for which they might be entitled due to the psychometric deficiencies of the old EIWA.

Method

The translation, cultural adaptation and normalization of the EIWA-III was completed in 2008 in collaboration with The Psychological Corporation (now Pearson). The pilot study provided information on the cultural appropriateness and psychometric characteristics of the test. From 2004 to 2007 norms were developed with a sample of subjects matching the sociodemographic characteristics of the island. The demographic characteristics of the five clinical samples assessed for the present study are as follows:

Table I. Demographic characteristics of the clinical samples

	ID	MS	EP	DP	EZ
N	50	23	30	30	22
AGE					
Average	36.72	40.22	40.53	44.90	43.23
SD	13.12	8.58	13.79	11.83	13.13
GENDER					
Female	48.0	87.0	50.0	60.0	50.0
Male	52.0	13.0	50.0	40.0	50.0
EDUCATION					
≤ 8	98.0	—	16.7	10.0	31.8
9–11	2.0	—	26.7	10.0	50.0
12	—	4	23.3	26.7	4.6
13–15	—	48	33.3	23.3	13.6
≥ 16	—	48	—	30.0	—

Multiple validity and reliability studies were conducted to determine the psychometric properties of the EIWA-III. These included comparisons of the performance of selected samples of participants on the EIWA-III with their performance on the WISC R-PR and the Raven, and a predictive validity study with performance on SAT.

The Temporal Stability of the test was evaluated and the reliability coefficients obtained were good to excellent; VIQ = .92, PIQ = .84, FSQ = .90. The levels of Internal Consistency of the EIWA-III are also excellent; VIQ = .97, PIQ = .95, FSIQ = .98. Confirmatory Factor Analysis (CFA) revealed that the EIWA-III retained the same factor structure of the WAIS-III.

Table II. Goodness-of-Fit statistics of five models for Confirmatory Factor Analysis

Model	Goodness of Fit Indexes					Improvement			
	x^2	df	x^2/df	AGFI	RMSR	Δx^2	Δdf	MTLI*	TLI
Null Model	2776.	78	35.59						
One Factor	410.	65	6.31	.73	.127	2366.	13		.85
Two Factors	317.	64	4.97	.78	.110	92.	1	.25	.89
Three Factors	208.	62	3.37	.87	.085	109.	2	.55	.93
Four Factors	112.	59	1.92	.92	.053	95.	3	.83	.97

N = 330. * Modified version of the TLI in which Model 1 is the base line and not the null model..

Figure I. Factor intercorrelations and loadings for the EIWA III
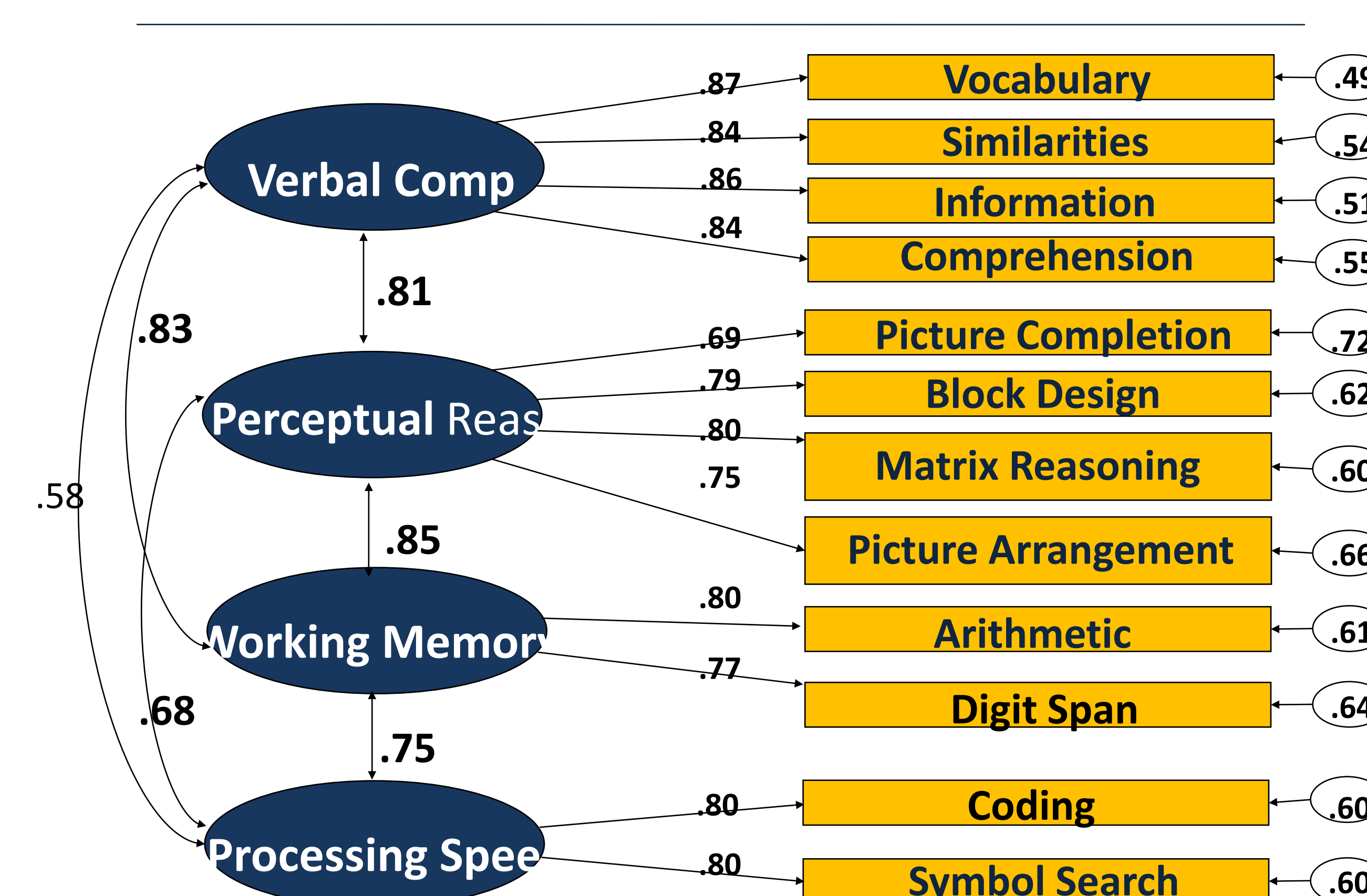
Results

The performance obtained from the clinical groups was compared with Matched Controlled Groups (MCG) selected from the EIWA-III normative sample. The difference between the sample of patients with SZ and its MCG is statistically significant at p =. 01 with an effect size of 1.48. This difference is consonant with the literature in that SZ is usually associated with deficiencies in those cognitive operations most dependent upon executive functions. The sample of persons with a history of depression did not present signs of cognitive impairment. In assessing the mean WMI for the patients with EP and MS, average values are obtained. When these scores are compared statistically with the scores obtained by the corresponding MCG, a significant difference is obtained for the MS group but not for the EP group.

The mean Processing Speed Index (PSI) for the five MCG's ranged from 101.32 for the MR MCG to 106.48 for the MS MCG. The mean PSI for the SZ sample is 71.41 compared with a mean of 101.50 for its MCG. This difference is significant at the p=.01 level with an effect size of 2.62. Likewise, the comparison of the mean PSI between the sample of individuals with CD and its MCG is highly significant (p=.01) with a high effect size of 3.59. The mean PSI for the SZ group is 54.18 and the mean PSI for its MCG is 101.32. Similar to the general trend seen for the WMI, the mean PSI for the EP sample is within normal and not statistically significant. The PSI obtained for the MS and DP samples are within normal, but below those obtained by their corresponding MCG. Such difference is not statistically significant for the DP cohort, but the difference between the MS sample and its MCG is significant at.05 with an effect size of 68.

Table 3. Statistical comparison of the scores obtained on the WMI of the EIWA-III by five clinical samples and their Matched Control Groups

Clinical Group	*M*	*SD*	MCG *M*	*SD*	dif.	T	*p*	Effect size
SZ	81.91	13.40	99.00	9.41	17.09	5.46	<0.01	1.48
EP	101.87	15.62	104.23	10.68	2.37	0.72	0.48	0.18
MS	100.30	12.56	108.30	13.07	8.00	2.16	0.04	0.62
DP	99.23	15.06	99.50	12.72	0.27	0.08	0.94	0.02
ID	60.06	8.30	101.92	14.00	41.86	17.39	<0.01	3.64

Note: Schizophrenia (SZ) n = 22. Epilepsy (EP) n = 30. Multiple Sclerosis (MS) n = 23. Depression (Dep) n = 30. Intellectual Disability (ID n = 50. Effect sizes are Cohen's *d*

Table 4. Statistical comparison of the scores obtained on the PSI of the EIWA-III by five clinical samples and their Matched Control Groups

Clinical Group	*M*	*SD*	MCG *M*	*SD*	dif.	T	*p*	Effect size
SZ	71.41	11.88	101.50	11.04	30.09	9.93	<0.01	2.62
EP	100.27	14.60	103.87	17.51	3.60	1.04	0.31	0.22
MS	97.57	13.90	106.48	12.17	8.91	2.58	0.02	0.68
DP	97.20	16.71	102.27	16.63	5.07	1.32	0.2	0.30
ID	54.18	10.96	101.32	14.98	47.14	17.63	<0.01	3.59

Note: Schizophrenia (SZ) n = 22. Epilepsy (EP) n = 30. Multiple Sclerosis (MS) n = 23. Depression (Dep) n = 30. Intellectual Disability (ID n = 50. Effect sizes are Cohén's *d*

Conclusion

- The samples of adults with CD and with SZ present the most significant differences with the stronger effect size.
- The assessment of processing speed and of working memory of different clinical groups with the EIWA-III, yields results consonant with theoretical expectations and clinical experience, providing further evidence of the test's validity and clinical utility.