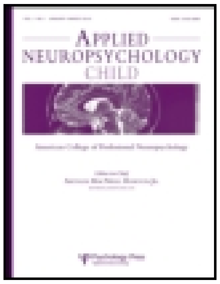

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The Neurocognitive Assessment of Hispanic English-Language Learners With Reading Failure

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This study examined the performance of referred Hispanic English-language learners ($N = 40$) on the English and Spanish versions of the *Cognitive Assessment System* (CAS; Naglieri & Das, 1997). The CAS measures basic neuropsychological processes based on the Planning, Attention, Simultaneous, and Successive (PASS) theory (Naglieri & Das, 1997; Naglieri & Otero, 2011c). Full Scale (FS) scores as well as PASS processing scale scores were compared, and no significant differences were found in FS scores or in any of the PASS processes. The CAS FS scores on the English ($M = 86.4$, $SD = 8.73$) and Spanish ($M = 87.1$, $SD = 7.94$) versions correlated .94 (uncorrected) and .99 (corrected for range restriction). Students earned their lowest scores in Successive processing regardless of the language in which the test was administered. PASS cognitive profiles were similar on English and Spanish versions of the PASS scales. These findings suggest that students scored similarly on both versions of the CAS and that the CAS may be a useful measure of these four abilities for Hispanic children with underdeveloped English-language proficiency.

Key words: *bilingual assessment, Cognitive Assessment System, intelligence, nonbiased assessment, PASS theory*

Pediatric neuropsychology has become a field that can offer an important perspective for understanding and treating developmental, psychiatric, psychosocial, and learning disorders. By addressing both brain functions and environmental factors intrinsic in complex behaviors, such as thinking, reasoning, planning, and the variety of executive capacities, pediatric neuropsychologists are able to offer needed services to children with a variety of learning, psychiatric, and developmental disorders. These clinicians investigate brain–behavior relationships by interpreting several aspects of an individual's cognitive, language, emotional, social, and motor behavior. Standardized instruments can be used to collect information and inferences about brain–behavior relationships (Naglieri & Otero, 2011b).

In spite of many advances in imaging techniques, neuropsychological tests continue to play an important role in identifying the cognitive processes, or abilities, necessary for effective thinking, learning, and behaving, while also allowing for judgments regarding the integrity of the brain (Riccio, Sullivan, & Cohen, 2010). There is,

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however, a paucity of instruments useful for assessing the neurocognitive processes of Hispanic English-language learners (Hispanic ELL), and this presents a challenge to the clinician (Llorente, 2008). Although it is not possible to completely eliminate either the language or the cultural influences embedded in the tests, there are researchers studying ways of assessing minorities, especially the Hispanic population in the United States.

Hispanics are the fastest-growing ethnic minority group in the United States, and they accounted for half the nation's population growth between 2000 and 2006. By 2050, they are expected to represent one fourth of the total U.S. population (National Center for Education Statistics, 2003). By 2008, one in five public school students was Hispanic, and it is projected that Hispanic students, compared with other groups, will be the largest school-age population by 2050 (Fry & Gonzales, 2008). As of 2006, 45% of Hispanic students were ELL students, and native Spanish speakers made up 79% of the ELL student population in the United States (Kohler & Lazarin, 2007). This population has a high poverty rate (23%) as compared with the national rate of 12.5% (U.S. Census Bureau, 2009). Learning English as a second language involves several factors including motivation, exposure to meaningful language, and opportunity to facilitate language development (Espinosa, 2005). Valdes and Figueroa (1989) described ELL individuals as having two language systems that overlap and are relied upon in different ways, depending on demands in one's environment. It is further suggested that there may be a difference in the neurological processing and storing of verbal information in the mind of a person who is an ELL (Valdez & Figueroa). With the increase in Hispanic ELL students, there is a vital need for appropriate assessment of a linguistically and culturally diverse population.

There are few tests commonly used by neuropsychologists, clinically and in the school setting, that 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. The majority of schools in the United States rely on traditional cognitive tests as part of a student's assessment. Of the various cognitive tests used in the United States to assess children and adolescents, the Wechsler Intelligence Scale for Children (WISC) is the one most commonly used (San Miguel Montes, Puente, Allen, Puente, & Neblina, 2010). There is a paucity of information regarding the utility of using the WISC-Fourth Edition (WISC-IV) Spanish with clinical samples. San Miguel Montes et al. studied a heterogeneous referred sample of children of Puerto Rican descent living on the island and compared WISC-IV results with those of children from the WISC-IV Spanish version standardization sample. 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 to 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. Limitations of the study are related to the sample with heterogeneous clinical diagnoses; thus, the authors could not determine the criterion validity of the WISC-IV Spanish to specific disorders. Because the sample was selected from a series of consecutive cases referred to a neuropsychology consult service in a hospital-based setting, generalizability of their findings may have its limits. Finally, differences were present between the clinical and normal control group with respect to parental education.

Traditional cognitive tests, such as the Wechsler and Binet scales, measure general ability using tests with verbal, nonverbal, and quantitative content (Naglieri, 2008). Verbal measures of general ability have been criticized because individuals with limited English-language skills are likely to perform poorly due to poor language skills (Ford, 1998; Naglieri, 2008). Hispanic ELL students typically perform worse on verbal measures of intelligence as compared with nonverbal measures because of subtests that presuppose English-language mastery (Figueroa, 1990).

It is particularly important that the role of verbal knowledge and skills be recognized when neurocognitive tests are given to diverse populations. One way to assess neurocognitive abilities without the confounding variables of language and knowledge is to use tests of cognitive processes (Kranzler, Flores, & Coady, 2010) that do not contain tests of vocabulary and word analogies, for example. These tests may provide a way to assess individuals from diverse linguistic groups, especially those who have limited language skills, as well as children with language and other impairments (Naglieri & Otero, 2011a).

A conceptualization of human neurocognitive functioning like the one described by Alexander Luria (1980) can guide the development of neuropsychological assessment tools that not only evaluate the underlying processes necessary for efficient thinking and behavior but also provide for the development of effective interventions and address the question of prognosis. Luria's theoretical account of dynamic brain function is perhaps one of the most complete (Lewandowski & Scott, 2008). Luria (1973) conceptualized four interconnected levels of brain–behavior relationships and neurocognitive disorders that the clinician needs to know: the structure of the brain, the functional organization based on structure, syndromes and impairments arising in brain disorders, and clinical methods of assessment (Korkman, 1999). Luria viewed the brain as a functional mosaic, the parts of which interact in different combinations to subserve cognitive processing (Luria, 1973). There is no area of the brain that functions without input from other areas; thus, integration is a key principle of brain function within the Lurian framework (Luria, 1973).

From the Lurian framework, neurocognitive functions, such as attention, executive functions, language, sensory perception, motor function, visuospatial facilities, and learning and memory, are complex capacities. They are composed of flexible and interactive subcomponents that are mediated by equally flexible, interactive, neural networks (Luria, 1980). These cognitive functions could be conceptualized as three separate but connected "functional units" that provide four basic psychological processes. The three brain systems are referred to as "functional" units because the neuropsychological mechanisms work in separate but interrelated systems (see Naglieri & Otero, 2011b, for a detailed discussion).

Cognition and behavior, then, result from an interaction of complex brain activity across various areas. Luria's (1973, 1980) research on the functional aspects of brain structures formed the basis for the development of the Planning, Attention, Simultaneous, Successive (PASS) processing theory, initially described by Das, Naglieri, and Kirby (1994) and operationalized in the *Cognitive Assessment System* (CAS; Naglieri & Das, 1997). The CAS, based on the PASS theory, was created in an effort to augment traditional general ability tests, and more explicitly, to measure the four neurocognitive domains. The four processes in the PASS theory represent a fusion of cognitive and neuropsychological constructs including executive function (Planning); selective, sustained, and shifting attention (Attention); visual–spatial tasks (Simultaneous); and serial features of language and memory (Successive; Naglieri & Das, 2005).

Planning is associated with the prefrontal cortex and represents one of the predominate capacities that differentiate humans from other primates. The prefrontal cortex plays a central role in forming goals and objectives and then in devising plans of action required to attain these goals. The cognitive processes required to implement strategies, coordinate these activities, and apply them in a correct order are subserved by the prefrontal cortex. Finally, the prefrontal cortex is responsible for "evaluating our actions as success or failure relative to our intentions" (Goldberg, 2009, p. 23).

Attention is a cognitive process that is closely connected to the orienting response (Naglieri & Otero, 2011b). Brain structures within Luria's (1976) first functional unit, the reticular formation, allow one to focus selective attention toward a stimulus over a period of time without the loss of attention to other competing stimuli. The longer the attention needed, the more the activity necessitates sustained focus. Intentions and goals mandated by the planning process control attention, whereas knowledge and skills play an integral part in the process as well. The attention work of Schneider, Dumais, and Shiffrin (1984) and the attention selectivity work of Posner and Boies (1971), which relates to deliberate discrimination between stimuli, are similar to the way that the attention process was conceptualized.

The essential dimension of the constructs of Planning and Attention as defined by Naglieri and Das (1997) is very similar to the description of executive function provided by others (see Naglieri, Das, & Goldstein, 2011). For example, O'Shanick and O'Shanick (1994) describe executive functions as the ability to formulate and set goals, assess strengths and weaknesses, plan and/or direct activities, initiate and/or inhibit behavior, monitor current activities, and evaluate results. Executive functions include the ability to formulate a goal, plan and carry out goal-directed behaviors effectively, and monitor and self-correct spontaneously and reliably (Lezak, Howieson, & Loring, 2004). A variety of assessment tools that have been proposed by others to assess executive functions often yield conflicting data given the very broad definition of these functions (e.g., for a review of this issue in the assessment of attention-deficit hyperactivity disorder, see Barkley, 1997). Planning in the PASS theory offers a more finite description that may be characterized as executive function.

Planning processes regulate a variety of other processes, including Attention. Planning processes are subserved by the prefrontal cortex, which is well connected with every distinct functional unit of the brain (Goldberg, 2009). This unit is mostly responsible for output planning and is involved with most behaviors we typically consider as executive functions and, more recently, as executive function capacities (McCloskey, Perkins, & Van Diver, 2009). A growing body of evidence points to a network of connected regions in the adjacent frontal and parietal lobes, which have been implicated in higher-order processing such as attention, decision making, and intelligence (Kolb & Whishaw, 2009).

Simultaneous processing ability is a necessity for sorting information into groups or a coherent whole (Naglieri & Otero, 2012). The ability to recognize patterns as interrelated elements is made possible by the parieto–occipital–temporal brain regions. Because of the substantial spatial characteristics of most simultaneous tasks, there is a visual–spatial dimension to activities that demand this type of process. Conceptually, the examination of simultaneous processing is achieved using tasks that could be described as involving visual–spatial reasoning, found in progressive matrix tests like those developed by Penrose and Raven (1936) and Naglieri (1985, 1997, 2009). Simultaneous processing is not, however, limited to nonverbal content, as demonstrated by the important role it plays in the grammatical components of language and comprehension of word relationships, prepositions, and inflections (Naglieri, 1999). This is most apparent in the inclusion of the Verbal–Spatial Relationship subtest in the CAS (Naglieri & Das, 1997). Typically, however, matrix tests have been included in the so-called nonverbal scales of intelligence tests such as the *Wechsler Nonverbal Scale of Ability* (Wechsler & Naglieri, 2006), the perceptual reasoning portion of the WISC-IV (Wechsler, 2003), the *Stanford-Binet-Fifth Edition* (Roid, 2003), the *Naglieri Nonverbal Ability Test* (Naglieri, 1997, 2009), and the *Kaufman Assessment Battery for Children-Second Edition* (Kaufman & Kaufman, 2004).

Successive processing is the ability to work with or remember stimuli arranged in a specific order (Naglieri & Otero, 2012). Successive processing is typically an integral element involved with the serial organization of sounds, such as learning sounds in sequence and early reading. Furthermore, successive processing has been conceptually and experimentally related to the concept of phonological analysis and reading–decoding disability (Das et al., 1994).

The PASS theory as operationalized by the CAS has been carefully studied since the publication of the test in 1997. A thorough summary of the validity of this test is beyond the scope of this article, and interested readers should consult Naglieri (1999), Naglieri and Conway (2009), and Naglieri & Otero (2012) for discussion of the English version of the CAS. There have been a few studies of Hispanic children using the English and experimental Spanish versions of the CAS. Naglieri, Rojahn, and Matto (2007) compared PASS scores for Hispanic and White children in the United States and found that the groups differed by 6.1 points using unmatched samples, 5.1 points with samples matched on basic demographic variables, and 4.8 points when demographic differences were statistically controlled. They also reported that the correlations between CAS scores with achievement did not differ significantly for the Hispanic and White samples. Naglieri, Otero, DeLauder, and Matto (2007) compared scores obtained on the CAS when administered in English and Spanish to 55 bilingual children referred for reading difficulties. The children earned similar Full Scale (FS) scores on the English ($M = 84.6$) and Spanish ($M = 87.6$) versions of the CAS, and the scores from the two versions were highly correlated ($r = .96$). These small differences suggest that ability may be more equitably assessed across race and ethnic groups with a neuropsychologically based measure of ability, and at the same time, the PASS scores are strongly related to academic performance. This was the only study reported using the Spanish version of the CAS, and further replication is clearly warranted and was the purpose of this study. Additionally, this study extends previous findings by documenting English-language proficiency scores of the participants.

METHOD

Participants

Participants included 40 bilingual Hispanic students, aged 6 to 15 years old, including 23 males and 17 females. Thirteen participants attended public schools in several suburbs about 45 to 90 minutes west of the downtown Chicago area. All data were obtained from archival records. The district student population as of 2009 consisted of 37.7% Caucasians, 43.8% Hispanics, 8% Asian Americans, 6.8% African Americans, 3.5% Multiracial, and less than 1% Native American. Eleven participants attended school in a second district, 10 attended school in a third district, and 6 attended school in a fourth district. The second, third, and fourth districts were less diverse, with the 2008 student population being less than 30% Hispanic and more than 60% Caucasian.

All participants had been referred for evaluations due to reading difficulties and other learning problems and had been assessed for English-language proficiency within the school using a fluency measure called *Assessing Comprehension and Communication in English State to State for English-Language Learners* (*ACCESS for ELLs,* Wisconsin Center for Education Research [WCER], 2010). *ACCESS for ELLs* scores for this sample range from 1.2 to 4.5. The majority of participants earned English fluency scores of 3.9 or less, indicating an entering, beginning, or developing level of knowledge of the English language. See Table 1 for all fluency ratings.

Instruments

Cognitive assessment system. The PASS processes were assessed with the CAS, an individually administered

TABLE 1
Demographic Characteristics of Bilingual Hispanic Children ($N = 40$)

Demographic Characteristic	*Number*	*Percentage*
Gender		
Male	23	
Female	17	
Age in Years		
5–7	10	25.0
8–17	30	75.0
English Fluency Ratings		
1. Entering	5	12.5
2. Beginning	9	22.5
3. Developing	18	45.0
4. Expanding	6	15.0
5. Bridging	2	5.0

test for children and adolescents ages 5 to 17 years old. Derived from the PASS theory, the CAS is composed of four scales measuring PASS processing. It yields scaled scores for each cognitive process and an overall measure of cognitive functioning—the FS score—all with a mean of 100 and standard deviation of 15. Each subtest scale score has a mean of 10 and a standard deviation of 3 (Naglieri & Das, 1997).

The CAS was standardized on 2,200 children and adolescents ages 5 years, 0 months to 17 years, 11 months and was matched by the 2002 U.S. Census, stratified by gender, race, ethnicity, parental education level, community setting, geographic region, and classroom placement. The CAS may be administered as a standard battery in which each scale is made up of three subtests, or as a basic battery in which each scale consists of two subtests. Thirty-nine of the 40 children assessed were administered the Standard Battery. The average reliabilities for the Standard Battery of the PASS scales are: Planning = .88; Attention = .88; Simultaneous = .93; Successive = .93; FS = .96 (Naglieri & Das, 1997).

The Planning scale consists of three paper-and-pencil tasks: Matching Numbers, Planned Codes, and Planned Connections. Each subtest requires the child to consider how to solve each item, create a plan of action, apply the plan, and modify that plan when necessary. During the Planned Codes subtest, the examiner observes the child's behavior for signs of strategies being used. The examiner also asks the child what strategies are utilized to achieve his or her goal for the items presented. The Attention scale, which is composed of Expressive Attention, Number Detection, and Receptive Attention, requires focus of cognitive activity, detection of a specific stimulus, and inhibition of responses to competing stimuli. These subtests include visual information and require the child to scan information quickly while maintaining focus. The Simultaneous scale, which is composed of Nonverbal Matrices, Verbal–Spatial Relations, and Figure Memory, calls for the synthesis of separate elements into an interrelated group or whole through the use of verbal and nonverbal content. Lastly, the Successive scale consists of Word Series, Sentence Repetition, and Speech Rate or Sentence Questions (children ages 5 to 7 years old are administered Speech Rate, whereas children ages 8 through 17 years old are administered Sentence Questions). The Successive subtests require the child to integrate information into a sequential order through repetition and responses to receptive information.

Spanish version of the CAS. The CAS was translated and adapted into Spanish by Wanda C. Rodríguez and her team at the University Center for Psychological Services and Research at the University of Puerto Rico in Río Piedras. The CAS translation followed the conceptual and methodological considerations discussed by Bravo (2003) and Canino and Bravo (1999) regarding cultural adaptation of psychological instruments aimed at assessing the characteristics of ethnic minorities. The back-translation method was used, in which a team of translators translated the CAS into Spanish and then a second team translated that CAS back into English. The original CAS and twice-translated CAS were then compared to evaluate the accuracy of the translated test (Geisinger, 2003). The 12 CAS subtests were divided into two equal groups, and each group was assigned to a pair of translators. Each translator of the team worked independently on 6 subtests, and once the subtests were translated, the two translators on the same team compared their translations. They discussed the disagreements and, when necessary, consulted a translator on the other team. When they reached an agreement in the translation of their 6 subtests, one translator from each team joined to determine the consistency of the vocabulary used in the whole test. Finally, the coherence analysis between the English and the Spanish versions was made by an additional group with considerable experience in test translation and adaptation.

Assessing comprehension and communication in english for english-language learners. *ACCESS for ELLs* is a large-scale language proficiency test administered in school systems to children in kindergarten through 12th grade. This test is a standards-based, criterion-referenced English-language proficiency test designed to measure ELLs' social and academic proficiency in English. It assesses social and instructional English as well as the language associated with language arts, mathematics, science, and social studies within the school context (Illinois State Board of Education, n.d.). It measures four language domains (Listening, Speaking, Reading, and Writing) and utilizes three response modes: multiple choice, oral constructed responses, and written constructed responses (WCER, 2010). ACCESS for ELLs provides levels of English proficiency described as follows:

1. Entering: The student knows and uses words, phrases, or chunks of language to produce minimal social English and minimal language of specific content areas in the classroom. Visual supports are used to represent language pertaining to class work as needed.
2. Beginning: The student knows and uses some social English and general language of the classroom content areas through the production of short sentences and written language but with errors that impede in the overall meaning of the statements.
3. Developing: The student uses social English and some specific language of content areas through expanded sentences produced orally or in written

paragraphs. The student is able to produce oral or written language, although it may contain errors, while much of the overall meaning is still retained.

4. Expanding: The student uses some social English and some technical language of a content area through the production of varied oral sentences or multiple related written sentences. The oral or written language produced contains minimal errors that do not impede overall meaning.
5. Bridging: The student uses specialized language of the classroom content areas and can produce varied sentences, orally and through written language, such as essays or stories.
6. Reaching: The student's receptive and expressive language is comparable to English-speaking peers. The student uses specialized language reflective of content areas and can produce a variety of sentence lengths of varying linguistic complexity, orally and through written language, as required by grade level (WCER, 2010).

Design

The English and Spanish versions of the CAS were administered as part of a psychoeducational assessment in connection with a referral of academic difficulties. Both versions were administered during one test session, and administration order was counterbalanced equally. Each version of the CAS was administered by a school psychologist fluent in both English and Spanish. CAS data were collected between May of 2009 and April of 2010, and ACCESS for ELLs was administered in September of the student's first year of school in the district and every September after (WCER, 2010).

Data analysis. Standard scores ($M = 100$, $SD = 15$) were used in all the analyses. Pearson correlations of FS, PASS scales, and each subtest were calculated. Because the standard deviations for this sample were less than the normative standard deviation value (15 for PASS scales and 3 for subtests), the following formula, provided by Kaufman (1972), was used to correct for restriction of range.

$$R_{12} = (r_{12} \times (S_1/s_1))/\mathrm{SQRT}(1 - r_{12}^2 + r_{12}^2 (S_1^2/s_1^2)$$

Kaufman's formula was applied sequentially (English than Spanish version of the CAS) to correct the restriction in the two distributions. FS scores and PASS scale scores for each version of the CAS were compared. Means and standard deviations were calculated for each test, and the differences between the English and Spanish means were examined using dependent-sample *t*-tests. A Bonferroni correction was used to achieve a family-wise error of .10. Therefore, the *p*-value needed for significance for each comparison was .002 (.10/5 = .002). Differences between the FS and the PASS scale means on the English and Spanish versions were described in standard deviation units based on the average standard deviation; Cohen's *d* ratio was used as presented:

$$(X_1 - X_2)/\mathrm{SQRT}[(n_1 \times SD_1^2 + n_2 \times SD_2^2)/(n_1 + n_2)]$$

Cohen (1988) described *d* ratio values as small (.20), medium (.50), and large effects (.80). Additionally, cognitive weakness profiles of each student for English and Spanish versions of the CAS were compared. Cognitive weaknesses are defined by a significant weakness relative to the child's mean PASS score that also falls below one standard deviation from the mean (a standard score of less than 85).

RESULTS

Examination of the means for this sample of Hispanic ELLs indicates that the group earned FS scores within the low-average classification. The means for the Planning, Simultaneous, and Attention scales for both the English and Spanish versions of the CAS fell in the average range, while mean Successive scale scores for both versions of the CAS fell in the below-average range of functioning. Means and standard deviations for the English and Spanish versions of the CAS are presented in Table 2. Five paired-samples *t*-tests were conducted to compare FS scores and individual PASS scale scores on the English and Spanish versions of the CAS. There was no significant difference between FS scores on the English ($M = 86.40$, $SD = 8.73$) and Spanish ($M = 87.10$, $SD = 7.94$) versions; $t(39) = 1.437$, $p = .159$. There were also no significant differences in the Planning, $t(39) = -1.282$, $p = .207$, Simultaneous, $t(39) = 1.178$, $p = .246$, Attention, $t(39) = 2.254$, $p = .030$, and Successive, $t(39) = 0.735$, $p = .467$, processing scale scores. *d* ratios were calculated to further examine subtest differences between the two versions of the CAS, and findings indicate a medium effect size on the Word Series subtest ($d = .50$) and a small effect size on the Figure Memory subtest ($d = .22$). All other effect sizes were trivial and less than .17.

Obtained correlations between the two versions of the CAS presented in Table 2 for the CAS subtest scores range from .62 to .98, and corrected correlations range from .66 to .99. Obtained and corrected correlations on the PASS scales range from .89 to .99. The correlation between the mean English and Spanish CAS FS scores is .94, and the corrected correlation is .99. These results indicate a strong relationship between standard scores obtained from the two versions of the CAS.

TABLE 2
Means, Standard Deviations, *d* Ratios, and Correlations Between the English and Spanish Versions of the Cognitive Assessment System ($N = 40$)

	CAS English		CAS Spanish			Correlations	
CAS Subtests and Scales	*M*	*SD*	*M*	*SD*	*d ratio*	*Obtained*	*Corrected*
Subtests							
Matching Numbers	8.78	1.90	9.03	1.85	–0.14	.915	.985
Planned Codes	9.55	1.80	9.53	1.62	0.01	.842	.979
Planned Connections	9.05	1.56	9.08	1.53	–0.02	.906	.992
Nonverbal Matrices	9.35	2.29	9.55	2.16	–0.09	.944	.982
Verbal–Spatial Relations	8.58	2.80	8.68	2.98	–0.04	.631	.659
Figure Memory	8.59	1.45	8.90	1.33	–0.22	.619	.965
Expressive Attention	9.48	1.81	9.45	1.71	0.01	.650	.928
Number Detection	8.48	1.92	8.70	1.64	–0.13	.666	.931
Receptive Attention	9.15	1.79	9.31	1.79	–0.09	.831	.973
Word Series	7.61	2.16	6.55	2.15	0.50	.923	.978
Sentence Repetition	6.43	2.30	6.45	1.95	–0.01	.782	.930
Speech Rate/Sentence Questions	7.10	1.47	6.82	1.92	0.17	.831	.979
Scales							
Planning	94.60	8.78	94.98	8.59	–0.04	.978	.997
Simultaneous	92.58	11.34	93.63	12.06	–0.09	.886	.953
Attention	94.08	8.48	94.78	8.23	–0.08	.973	.997
Successive	78.65	10.29	78.25	10.08	0.04	.943	.987
Full Scale	86.40	8.73	87.10	7.94	–0.08	.936	.993

Comparisons of the PASS scale variability were also examined by examining the detection of cognitive weakness (Naglieri, 2000) for each student for the English and Spanish versions of the CAS. The results show overall PASS scale agreement of 96%, meaning that when a student had a cognitive weakness on one version of the CAS, it was identified on the other version 96% of the time. More specifically, Planning cognitive weakness profiles were identical for all cases (100% agreement); Simultaneous and Attention scale cognitive weakness profiles were the same 97.5% of the time; and Successive processing scales showed 90% agreement.

DISCUSSION

The purpose of this study was to examine if a test of neurocognitive processes could be useful in the assessment of ELLs. The results suggested that examinees score similarly regardless of whether the English or Spanish version of the CAS was used. A secondary purpose was to replicate and extend previous findings of Naglieri, Otero, et al. (2007) with a sample of ELL students of varying levels of language proficiency. The current findings suggest that the CAS is useful in the assessment of ELL students because of the consistency between the results when administered in English or Spanish. This is consistent with past research that has found small PASS score differences between Hispanics and Whites (Naglieri, Rojahn, et al., 2007) as well as between Blacks and Whites (Naglieri, Rojahn, Matto, & Aquilino, 2005). Results of the English and Spanish CAS suggest that PASS scores could be used as part of a comprehensive evaluation to identify a disorder in one or more of the basic psychological processes, and similar results are likely regardless of which language is used.

Limitations of this study should be considered. Although the area of residence was expanded from the previous study to examine children from more than one school district, the majority of students assessed were from the same geographical region. In addition, the age range of the referred students was restricted so that the majority of participants were between the ages of 8 and 13 years old. Lastly, although English proficiency of the current study was more varied, the majority of students were still categorized in the middle and low-middle ranges of ACCESS for ELLs scores. Nevertheless, it is within these ranges of language proficiency where examiners are often at a loss in deciding how to best evaluate ELL students. Thus, these results suggest the CAS may be a viable instrument to have as part of a comprehensive test battery.

The current findings, in combination with those by Naglieri et al. (2005) and Naglieri, Rojahn, et al. (2007) support assertions by those who have argued (e.g., Das, 2002; Fagan, 2000; Naglieri, 2002) that although general intelligence tests have value, there are additional advantages if ability were conceptualized on the basis of basic psychological processes. Fagan as well as Suzuki and Valencia (1997) suggested that a cognitive processing approach like that used in the CAS would avoid the knowledge base required to answer verbal and quantitative questions found on most traditional IQ tests and would be more appropriate for culturally and linguistically diverse populations. The results of this study support the assertion. Suzuki and Valencia also described the PASS theory of intelligence as measured by the CAS as "an innovative approach to traditional intelligence assessment that assesses a broader spectrum of abilities than has been previously available in IQ testing" (p. 1111). The present findings in combination with previous research (Naglieri, Otero, et al., 2007; Naglieri, Rojahn, et al., 2007) suggest that the multidimensional approach used in the CAS may have utility ELLs particularly because the test yielded similar findings regardless of the language used. The results of this study offering promise for greater utility for diagnosis and treatment planning (see Naglieri & Otero, 2011a, 2011c). These and related issues surrounding the assessment of Hispanic children with varying levels of English-language proficiency require additional examination. We encourage researchers to further study the use of the CAS with Hispanic populations and particularly the value of PASS profiles for diagnosis and treatment planning (see Naglieri, 2012; Naglieri & Pickering, 2010). The relationships between PASS scores and achievement as well as the acquisition of English proficiency and especially the role of cognitive strengths and weakness to response to instruction should be studied. Although there is considerable research evidence on the relationship between PASS scores and instruction (see Naglieri & Conway, 2009), further evidence is needed to clarify the relationships between CAS scores and academic interventions.

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