A Broad Cognitive Ability–Bilingual Scale for the *WJ-R Tests of Cognitive Ability* and the *Batería Woodcock-Muñoz: Pruebas de habilidad cognitiva–Revisada*

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A Broad Cognitive Ability–Bilingual Scale for the *WJ-R Tests of Cognitive Ability* and the *Batería Woodcock-Muñoz: Pruebas de habilidad cognitiva–Revisada*

Criselda Guajardo Alvarado

The Broad Cognitive Ability–Bilingual Scale, BCA (Bil), is a cluster of tests designed to measure cognitive ability of bilingual or multilingual individuals from 5 to over 90 years of age. The BCA (Bil) uses a language-reduced test format to measure long-term retrieval, short-term memory, processing speed, auditory processing, visual processing, and fluid reasoning. Additionally, the BCA (Bil) measures four aspects of verbal ability using a bilingual testing format in a combination of English and the student's native language. To administer the BCA (Bil), the examiner uses selected tests from the WJ-R® Tests of Cognitive Ability *or the* Batería Woodcock-Muñoz: Pruebas de habilidad cognitiva–Revisada, *along with the* Bilingual Verbal Ability Tests *(BVAT). This combination of language-reduced tests and bilingual testing of verbal ability allows the examiner more opportunity to explore the capabilities of bilingual and multilingual individuals without some of the limitations inherent in current testing practices.*

The Broad Cognitive Ability–Bilingual Scale, BCA (Bil), is a variation of the Broad Cognitive Ability–Standard Scale, BCA (Std), from the *WJ-R® Tests of Cognitive Ability* (WJ-R COG) (Woodcock & Johnson, 1989) and the *Batería Woodcock-Muñoz: Pruebas de habilidad cognitiva–Revisada* (Batería-R COG) (Woodcock & Muñoz-Sandoval, 1996a). The BCA (Bil) provides an assessment of cognitive ability for individuals ranging in age from 5 to over 90 years who speak two or more languages. The scale provides a method to assess a bilingual individual's cognitive skills in a comprehensive manner, while taking into account the complexities of bilingualism.

The BCA (Bil) includes measures of seven *Gf-Gc* cognitive factors: verbal ability (*Gc*), long-term retrieval (*Glr*), short-term memory (*Gsm*), processing speed (*Gs*), auditory processing (*Ga*), visual processing (*Gv*), and fluid reasoning (*Gf*). Six of the seven cognitive factors are assessed in a language-reduced format using selected tests from either the WJ-R COG or the Batería-R COG. The seventh test, which measures four aspects of verbal ability, is assessed in a bilingual testing format using the *Bilingual Verbal Ability Tests* (BVAT) (Muñoz-Sandoval, Cummins, Alvarado, & Ruef, 1998a). Table 1 indicates the tests utilized in the BCA (Bil) scale.

The BCA (Bil) is especially appropriate for students who are bilingual in English and any of the BVAT languages (Arabic, Chinese, French, German, Haitian Creole, Hindi, Italian, Japanese, Korean, Polish, Portuguese, Russian, Spanish, Turkish, and Vietnamese). The BCA (Bil) provides a fairer estimate of intellectual ability for bilingual individuals than do monolingual and verbally laden cognitive tests. It allows the examiner to explore the multiple intelligences of the bilingual individual.

Bilingual Assessment

Recent major advances in test development have provided professionals with assessment options that previously did not exist. Language, cognitive, academic, and behavioral tests in Spanish are now available. The most recent development in bilingual assessment is the advent of bilingual verbal ability tests. The utilization of tests in other languages requires that the examiner (a) select the most appropriate test for the individual and

Table 1.
Tests Utilized to Obtain the BCA (Bil) Score

Cognitive Factor	WJ-R COG, BCA (Bil)	Batería-R COG, BCA (Bil)
Verbal Ability (*Gc*)	BVAT BVA	BVAT BVA
Long-Term Retrieval (*Glr*)	Test 1: Memory for Names	Prueba 1: Memoria para nombres
Short-Term Memory (*Gsm*)	Test 17: Numbers Reversed	Prueba 17: Inversión de números
Processing Speed (*Gs*)	Test 3: Visual Matching	Prueba 3: Pareo visual
Auditory Processing (*Ga*)	Test 18: Sound Patterns	Prueba 18: Configuración de sonidos
Visual Processing (*Gv*)	Test 12: Picture Recognition	Prueba 12: Reconocimiento de dibujos
Fluid Reasoning (*Gf*)	Test 7: Analysis-Synthesis	Prueba 7: Análisis-Síntesis

assessment objective, (b) accurately administer and score the tests, and (c) interpret the test results in light of the bilingual background of the tested individual.

The availability of tests in different languages creates new challenges for examiners, school districts, and agencies. Keeping informed of and trained in new tests is a difficult task. Another challenge is that assessment professionals literate in the language of the test may not be available. Best practice calls for the administration of tests in other languages by bilingual examiners who are fluent in the subject's language(s). When qualified bilingual examiners are unavailable, however, it may be necessary to use a primary and ancillary examiner team approach to testing (Woodcock & Muñoz-Sandoval, 1993a, 1993b). An ancillary examiner is a professional or paraprofessional fluent in the target language who has been trained to assist in the administration of the test(s). When using the primary and ancillary examiner team approach, it continues to be the responsibility of the primary examiner to be proficient in all aspects of the administration, scoring, and interpretation.

Second language acquisition is a complex and dynamic process that poses some unique challenges to the interpretation of test results. The nature of bilingual language development and the length of time required to develop peer-appropriate levels of conversational and academic skills have practical relevance for interpretation of test results. The examiner must be knowledgeable about theories of second language acquisition to properly interpret test results.

Limitations of Current Testing Practices

Current testing procedures with culturally and linguistically diverse individuals often yield underestimates of cognitive ability, which in turn result in low participation rates in gifted and talented programs (Saccuzzo, Johnson, & Guerfin, 1994) and high participation rates in special education programs (Ortiz & Yates, 1983; Ortiz, 1991). Many social scientists and educators argue that the use of traditional English language cognitive tests in the assessment of bilingual students is the major culprit underlying this misrepresentation (Bernstein, 1989; Figueroa, 1989).

Assessing cognitive ability in the second language often yields lowered scores because the bilingual individual has not had the same amount of language exposure as the test's norming population. On the other hand, testing in the native language may also yield lowered scores because the bilingual individual may not have had the native language actively maintained or is experiencing the natural phenomenon of language loss. Administering verbally laden tests, regardless of whether they are in the first or second language of the bilingual individual, can yield results not representative of the bilingual individual's cognitive ability.

In addition, monolingual testing neglects the bilingual's total repertoire of verbal concepts (Grosjean, 1985; Figueroa, 1990). Current testing practices usually attempt to measure the verbal ability of a bilingual by testing language skills monolingually, even when testing is conducted in both languages. A bilingual individual is tested as if two monolinguals exist in one body. The fractional view of bilingualism underestimates the overall verbal ability of the bilingual (Grosjean, 1985). A "fractional" assessment focuses on assessing verbal ability, one language at a time. It overlooks knowledge specific to the language not currently being testing. A more equitable practice is to assess the bilingual's total knowledge of verbal concepts or bilingual verbal ability.

The BCA (Bil) scale acknowledges and addresses the limitations of using verbally laden tests and of using monolingual testing of verbal ability for bilingual individuals. The BCA (Bil) cluster of tests measures certain cognitive abilities using a language-reduced format and verbal ability using a bilingual testing format.

Bilingual Testing Using the BCA (Bil) Scale

Obtaining a BCA (Bil) score requires the examiner to administer the BVAT and six tests from either the WJ-R COG or the Batería-R COG. Testing time is approximately one hour or less. Results yield a score for English Language Proficiency (ELP), Bilingual Verbal Ability (BVA), and Broad Cognitive Ability (BCA), as well as scores for the individual subtests.

The BVAT serves as the measure of verbal ability in the BCA (Bil) scale. The BVAT is a set of four verbal ability subtests (Picture Vocabulary, Synonyms, Antonyms, and Analogies) administered in a combination of English and the bilingual individual's native language, thus yielding a better estimate of overall verbal ability.

The language-reduced format of the BCA (Bil) scale measuring the six other cognitive areas allows bilingual individuals to demonstrate their abilities with fewer confounding oral language demands, while at the same time, the BVAT acknowledges the subject's overall verbal ability in a combination of his or her two (or more) languages. Using this battery of language-reduced and bilingual language tests provides a more equitable and appropriate assessment of the intellectual ability of a bilingual individual.

Determining Language Proficiency and Dominance

For bilingual and multilingual individuals, it is important that levels of language proficiency are investigated as fully as possible in both languages, and that domi-

nance is determined. Proficiency and dominance testing is important in test selection decisions and test interpretation. Fortunately, the examiner can select from several available tests of language proficiency for individuals who are bilingual in English and Spanish. Unfortunately, proficiency tests in other languages are scarce.

To appropriately administer the BCA (Bil) tests to bilingual English/Spanish individuals, the examiner must first determine language proficiency and dominance in English and Spanish. The results of this testing will help the examiner determine whether to administer the cognitive tests in English using the WJ-R COG or Spanish using the Batería-R COG. The English and Spanish oral language clusters from the *Woodcock-Muñoz Language Survey* (Woodcock & Muñoz-Sandoval, 1993a, 1993b) provide a convenient way to screen language proficiency and dominance. The English and Spanish oral language clusters from the *Woodcock Language Proficiency Battery–Revised*, (Woodcock, 1991; Woodcock & Muñoz-Sandoval, 1995) or from the WJ-R COG and the Batería-R COG may also be used for this purpose.

For bilingual individuals who speak English and one of the BVAT languages (other than Spanish), the BVAT can be administered as part of their language proficiency and dominance testing. The resulting ELP and BVA score will allow the examiner to determine the subject's current level of English proficiency and to view the discrepancy between the subject's English proficiency and bilingual verbal ability. The examiner can use this information to make decisions about the subject's proficiency levels and dominance. (Note that the BVA score will later be used as part of the BCA (Bil) Scale.)

Selecting Tests to Administer

Figure 1 illustrates the test selection process for three types of bilingual subjects. If a bilingual English/Spanish subject is judged to be Spanish dominant, the examiner administers the English/Spanish BVAT. In addition, the following tests from the Batería-R COG are administered: Prueba 1: Memoria para nombres, Prueba 17: Inversión de números, Prueba 3: Pareo visual, Prueba 18: Configuración de sonidos, Prueba 12: Reconocimiento de dibujos, and Prueba 7: Análisis-Síntesis.

If a bilingual English/Spanish subject is judged to be English dominant, the examiner administers the English/Spanish BVAT and the following tests from the WJ-R COG: Test 1: Memory for Names, Test 17: Numbers Reversed, Test 3: Visual Matching, Test 18: Sound Patterns, Test 12: Picture Recognition, and Test 7: Analysis-Synthesis.

If the subject is bilingual in English and one of the BVAT languages (other than Spanish), the examiner administers the BVAT in English and the subject's other language(s). Provided the subject has sufficient English language proficiency to understand the test instructions, the examiner administers the following from the WJ-R COG: Test 1: Memory for Names, Test 17: Numbers Reversed, Test 3: Visual Matching, Test 18: Sound Patterns, Test 12: Picture Recognition, and Test 7: Analysis-Synthesis.

Completing the BCA (Bil) Worksheet

To calculate the BCA (Bil) score, administer and score the BVAT and administer the six tests from the WJ-R COG or Batería-R COG. Calculation of the BCA (Bil) score requires using the worksheet in Figure 2. The worksheet may be reproduced as needed. The necessary calculations can easily be completed using a hand-held calculator. For the final step in the worksheet, the examiner will need to use certain norm tables from the WJ-R COG. (Note that the WJ-R COG Norm Tables are also used to score the Batería-R COG.)

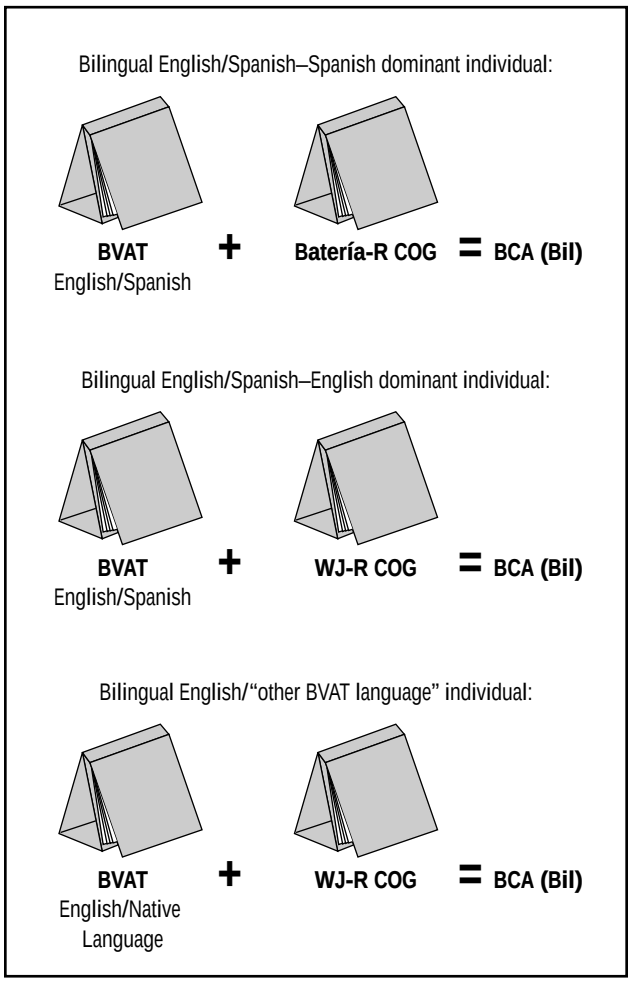

Figure 1.
Procedures followed for three bilingual subjects.

Broad Cognitive Ability–Bilingual Scale Worksheet

English/ _____

specify native language

Student's Name: _____ ID Number: _____

Specify test used: ☐ WJ-R COG ☐ Batería-R COG

Norms based on: ☐ Age _____ ☐ Grade Placement _____

Step 1: Average *W* Scores.

The Average *W* Score is used in Step 2.

		W Score
BVA from English/_____	BVAT (BVA AE or GE _____)*	_____
Memory for Names	Memoria para nombres	_____
Numbers Reversed	Inversión de números	_____
Visual Matching	Pareo visual	_____
Sound Patterns	Configuración de sonidos	_____
Picture Recognition	Reconocimiento de dibujos	_____
Analysis/Synthesis	Análisis/Síntesis	_____

Total _____ ÷ 7 = _____ (Avg. *W*)

*Use Table 2 or 3 to convert the BVA AE or GE into a *W* score.

Step 2: Calculate BCA (Bil) *W* Score.

(_____) × .894 + 53.3 = _____

(Avg. *W*) (BCA (Bil) *W*)

Step 3: Record AE or GE and Developmental Level Band.

(Pages 5–7 in WJ-R COG Norm Tables)

AE or GE for BCA (Bil) _____ Developmental Level Band _____ to _____

Step 4: Obtain Relative Mastery/Proficiency Index, Standard Score, and Percentile Rank

Use the data provided in the BCA (Std) row of WJ-R COG Norm Table B (pages 35–104) if norms are to be based on age. Use Norm Table C (pages 105–147) if norms are to be based on grade.

W		REF W		SEM (SS)	+DIFF / – DIFF		DIFF	RMI / RPI	SS	SS –1 SEM	SS +1 SEM	PR	PR –1 SEM	PR +1 SEM
	–				/	=		/90		to			to	
BCA (Bil)		B OR C		B OR C	B OR C		+ OR –	D	D			D	E	E

Figure 2.

BCA (Bil) Worksheet.

(Note: A larger version of this worksheet appears on the back of this booklet.)

Step 1: Average *W* Scores. The first step to obtain the BCA (Bil) score is to convert the BVAT BVA Age Equivalent (AE) or Grade Equivalent (GE) to a *W* score and then record the score in the appropriate space under "Step 1" on the worksheet. (Use Table 2 for converting the AE to *W* or Table 3 for converting the GE to *W*.)

Next, record the *W* score for each of the six cognitive tests administered from either the WJ-R COG or the Batería-R COG. Total the seven *W* scores and calculate the average *W* score (Avg. *W*).

Step 2: Calculate BCA (Bil) *W* Score. Record the Avg. *W* score in the equation under "Step 2" on the worksheet. Calculate the BCA (Bil) *W* score following the steps in the equation.

Step 3: Record AE or GE and Developmental Level Band. To obtain the AE or GE and the corresponding Developmental Level Band for the BCA (Bil) *W*, refer to the "Broad Cognitive Ability–Standard" section (pages 5–7) in Norm Table A of the WJ-R COG Norm Tables.

Table 2.
Age Equivalents to *W*

BVA AE	BVA *W*	BVA AE	BVA *W*	BVA AE	BVA *W*	BVA AE	BVA *W*
4-0[1]	411	4-10	455	8-10	492	18-4	529
4-0[2]	414	4-11	456	9-0	493	18-8	530
4-0[3]	417	5-0	457	9-2	494	18-10	531
4-0[4]	419	5-1	458	9-4	495	19	532
4-0[5]	420	5-2	459	9-6	496	20	533
4-0[6]	422	5-3	460	9-8	497	21	534
4-0[7]	423	5-4	461	9-10	498	22	536
4-0[8]	424	5-5	462	10-0	499	23	537
4-0[9]	425	5-6	463	10-2	500	24	538
4-0[10]	426	5-7	464	10-4	501	26	539
4-0[12]	427	5-8	465	10-7	502	28	540
4-0[13]	428	5-10	466	10-10	503	30	541
4-0[15]	429	5-11	467	11-0	504	34[50]	542
4-0[16]	430	6-0	468	11-2	505	34[54]	543
4-0[18]	431	6-1	469	11-5	506	34[57]	544
4-0[20]	432	6-2	470	11-8	507	34[61]	545
4-0[22]	433	6-3	471	11-10	508	34[65]	546
4-0[24]	434	6-4	472	12-1	509	34[68]	547
4-0[26]	435	6-6	473	12-4	510	34[71]	548
4-0[29]	436	6-7	474	12-6	511	34[74]	549
4-0[31]	437	6-8	475	12-10	512	34[77]	550
4-0[34]	438	6-10	476	13-1	513	34[80]	551
4-0[36]	439	6-11	477	13-4	514	34[83]	552
4-0[39]	440	7-0	478	13-8	515	34[85]	553
4-0[42]	441	7-2	479	14-0	516	34[87]	554
4-0[44]	442	7-3	480	14-3	517	34[89]	555
4-0[47]	443	7-4	481	14-6	518	34[90]	556
4-0[50]	444	7-6	482	14-10	519	34[92]	557
4-1	445	7-8	483	15-2	520	34[93]	558
4-2	446	7-9	484	15-6	521	34[94]	559
4-3	447	7-10	485	15-9	522	34[95]	560
4-4	448	8-0	486	16-1	523	34[96]	561
4-5	449	8-2	487	16-6	524	34[97]	562
4-6	450	8-4	488	16-10	525	34[98]	564
4-7	451	8-6	489	17-1	526	34[99]	571
4-8	452	8-7	490	17-6	527		
4-9	454	8-8	491	18-0	528		

Table 3.
Grade Equivalents to *W*

BVA GE	BVA *W*	BVA GE	BVA *W*	BVA GE	BVA *W*	BVA GE	BVA *W*
K.0[1]	422	1.0	471	5.4	503	14.3	535
K.0[2]	435	1.1	472	5.6	504	14.8	536
K.0[3]	437	1.2	473	5.8	505	15.0	537
K.0[4]	438	1.3	474	6.0	506	15.2	538
K.0[5]	439	1.4	475	6.2	507	15.4	539
K.0[6]	440	1.5	476	6.4	508	15.8	540
K.0[7]	441	1.6	477	6.6	509	16.2	541
K.0[8]	442	1.7	478	6.8	510	16.7	542
K.0[10]	443	1.8	479	7.1	511	16.9[50]	543
K.0[11]	444	1.9	480	7.4	512	16.9[54]	544
K.0[13]	445	2.0	481	7.7	513	16.9[58]	545
K.0[15]	446	2.2	482	8.0	514	16.9[62]	546
K.0[17]	447	2.3	483	8.2	515	16.9[66]	547
K.0[20]	448	2.4	484	8.5	516	16.9[70]	548
K.0[23]	449	2.5	485	8.8	517	16.9[73]	549
K.0[26]	450	2.6	486	9.0	518	16.9[76]	550
K.0[29]	451	2.8	487	9.4	519	16.9[80]	551
K.0[32]	452	3.0	488	9.7	520	16.9[82]	552
K.0[35]	453	3.1	489	10.0	521	16.9[85]	553
K.0[39]	454	3.2	490	10.2	522	16.9[87]	554
K.0[43]	455	3.4	491	10.6	523	16.9[89]	555
K.0[46]	456	3.6	492	10.8	524	16.9[91]	556
K.0[50]	457	3.7	493	11.1	525	16.9[93]	557
K.1	458	3.8	494	11.4	526	16.9[94]	558
K.2	460	4.0	495	11.7	527	16.9[95]	559
K.3	462	4.1	496	12.0	528	16.9[96]	560
K.4	464	4.3	497	12.3	529	16.9[97]	562
K.5	465	4.5	498	12.6	530	16.9[98]	564
K.6	466	4.6	499	13.0	531	16.9[99]	570
K.7	468	4.8	500	13.3	532		
K.8	469	5.0	501	13.6	533		
K.9	470	5.2	502	14.0	534		

Step 4: Obtain Relative Mastery/Proficiency Index, Standard Score, and Percentile Rank. Transfer the BCA (Bil) *W* score to the space provided under "Step 4." Refer to the "BROAD COG. ABILITY (Standard)" row in Norm Table B (norms based on age) of the WJ-R COG Norm Tables (pages 35–104) or Norm Table C (norms based on grade) (pages 105–147) to obtain the Reference *W* (REF *W)*. Proceed from this point in the same way as hand-scoring the WJ-R COG or Batería-R COG, using the "BROAD COG. ABILITY (Standard)" information, to obtain the relative mastery/proficiency index (RMI in the WJ-R, RPI in the Batería-R), standard score (SS) and percentile rank (PR). Be sure to indicate the norm group for comparison by placing a check mark in the box for norms based on age or on grade placement at the top of the worksheet.

Figure 3 illustrates a completed Broad Cognitive Ability–Bilingual Scale Worksheet. In this example, the examiner determined that Karina's dominant language was Spanish. Age norms were selected to interpret Karina's performance on the BCA (Bil) tests. First, an English/Spanish BVAT was administered and an age equivalent of 7-8 was obtained. The examiner then referred to Table 2 and recorded a BVA *W* score of 483 on the Worksheet. Because it was determined that Karina is Spanish dominant, the Batería-R COG was administered. The examiner recorded the appropriate Batería-R COG *W* scores on the worksheet. The seven *W* scores were totaled and averaged (489). The Avg. *W* was transferred into the transformation equation in Step 2. The BCA (Bil) *W* was calculated as 490. The examiner referred to the "Broad Cognitive Ability–Standard" sec-

Broad Cognitive Ability–Bilingual Scale Worksheet

English/ Spanish
specify native language

Student's Name: Karina Alvarez ID Number: 061973

Specify test used: ☐ WJ-R COG ☒ Batería-R COG

Norms based on: ☒ Age 6-9 ☐ Grade Placement _____

Step 1: Average *W* Scores.

The Average *W* Score is used in Step 2.

		W Score
BVA from English/ Spanish	BVAT (BVA (AE) or GE 7-8)*	483
Memory for Names	Memoria para nombres	492
Numbers Reversed	Inversión de números	489
Visual Matching	Pareo visual	480
Sound Patterns	Configuración de sonidos	489
Picture Recognition	Reconocimiento de dibujos	495
Analysis/Synthesis	Análisis/Síntesis	496
	Total 3424 ÷ 7 =	489 (Avg. *W*)

*Use Table 2 or 3 to convert the BVA AE or GE into a *W* score.

Step 2: Calculate BCA (Bil) *W* Score.

(489) × .894 + 53.3 = 490
Avg. *W* BCA (Bil) *W*

Step 3: Record AE or GE and Developmental Level Band.

(Pages 5–7 in WJ-R COG Norm Tables)

(AE) or GE for BCA (Bil) 8-2 Developmental Level Band 6-8 to 10-3

Step 4: Obtain Relative Mastery/Proficiency Index, Standard Score, and Percentile Rank

Use the data provided in the BCA (Std) row of WJ-R COG Norm Table B (pages 35–104) if norms are to be based on age. Use Norm Table C (pages 105–147) if norms are to be based on grade.

W		REF W		SEM (SS)	+DIFF / – DIFF		DIFF	RMI / RPI	SS	SS –1 SEM	SS +1 SEM	PR	PR –1 SEM	PR +1 SEM
490	–	481		4	13 / 66	=	9	96 /90	119	115	123	89	84	94
BCA (Bil)		B OR C		B OR C	B OR C		(+) OR –	D	D	to		D	to E	E

Figure 3.

Example of a completed BCA (Bil) Worksheet for Karina.

tion on page 6 of Norm Table A of the WJ-R COG Norm Tables to determine the AE and corresponding Developmental Level Band (AE = 8-2, Developmental Level Band = 6-8 to 10-3). The BCA (Bil) *W* score was transferred into the row for the final calculation of scores under "Step 4." The examiner, using Karina's age (6-9), referred to page 49 of Norm Table B of the Norm Tables and used the "BROAD COG. ABILITY (Standard)" row to find the REF W (481), SEM for the standard score (4), and +DIFF/–DIFF columns (13/66). The REF *W* was subtracted from the BCA (Bil) *W* and recorded as the difference (DIFF) score (+9). The examiner used the difference score and appropriate column (13) in Norm Table D (page 151) to obtain the RMI/RPI (96/90), SS (119), and PR (89). The SEM value was subtracted from and also added to the SS. The two resulting scores were recorded in the spaces provided for –1 SEM (115) and +1 SEM (123). Page 204 of Norm Table E was referenced to obtain the PR –1 SEM (84)/+1 SEM (94) associated with the SS –1 SEM /+1 SEM.

Development and Technical Characteristics of the BCA (Bil) Scale

Normative data for each of the WJ-R COG BCA (Bil) tests were gathered from 6,359 English-speaking subjects. Subjects were randomly selected within a stratified sampling design. Norming variables included 10 specific community and subject variables. The *Standards for Educational and Psychological Testing* as outlined by the American Psychological Association (1985) were carefully followed in the development of these tests. Refer to the *WJ-R Tests of Cognitive Ability–Standard and Supplemental Batteries: Examiner's Manual* (Woodcock & Mather, 1989) or to the *WJ-R Technical Manual: A Reference on Theory and Current Research* (McGrew, Werder, & Woodcock, 1991) for more information on the development, standardization, and technical characteristics of the English tests.

Item calibration data for each of the six Batería-R COG BCA (Bil) tests were gathered from more than 2,000 native Spanish-speaking subjects. The sample was drawn from five Spanish-speaking countries and the United States. Subjects tested in the United States reported more than 21 countries of birth. The Spanish calibration data were equated to the English calibration data to scale the Spanish test items according to the empirical difficulty of the counterpart English test items. Refer to the *Batería Woodcock-Muñoz: Pruebas de habilidad cognitiva–Revisada, Supplemental Manual* (Woodcock & Muñoz-Sandoval, 1996b) for more information on the technical characteristics of the Spanish tests.

Three verbal ability tests drawn from the WJ-R COG compose the BVAT. The BVAT norming sample includes 5,602 subjects age 5 years and above. The BVAT testing procedure was validated through a two-way study with 542 English/Spanish bilingual subjects. The subjects were tested in English and then failed items were re-administered in Spanish. A parallel, but independent, experimental procedure was developed that tested ability in Spanish first and then re-administered failed items in English. The subjects were administered both the BVAT and the experimental BVAT. Table 4 reports correlations between the two estimates of BVA. Refer to the *BVAT Comprehensive Manual* (Muñoz-Sandoval, Cummins, Alvarado, & Ruef, 1998b) for more information on the development, standardization and technical characteristics of these tests.

Table 5 reports correlations between BCA (Std) and BCA (Bil) at several grade and age levels. These data are drawn from the WJ-R norming sample. The median correlation is .88 across all grade and age levels.

Summary

The BCA (Bil) scale allows the examiner to tailor a battery of tests to more accurately assess a bilingual subject's current cognitive abilities. The scale uses both lan-

Table 4.
Correlations Between Two Estimates of BVA

Dominance Level	*n*	Standard Procedure BVA After Correction	Experimental Procedure BVA After Correction	Mean Difference	Correlation of Corrected BVAs
1. Monolingual Spanish	83	487.2	488.4	–1.2	.90
2. Bilingual Spanish	152	488.7	490.2	–1.5	.86
3. Bilingual Spanish-English	148	491.9	494.1	–2.2	.95
4. Bilingual English	77	495.3	494.5	+0.8	.97
5. Monolingual English	82	493.7	493.5	+0.2	.94
Total Sample	542	491.0	492.1	–1.1	.93

Table 5.
Correlation of BCA (Bil) with BCA (std) by Grade or Age

Level	*n*	Correlation
Grade		
K	173	.85
1	294	.89
2	151	.86
3	281	.90
4	135	.87
5	290	.88
6	137	.84
7	130	.88
8	281	.87
9	97	.87
10	102	.83
11	218	.86
12	89	.82
13–16	180	.89
Age		
20–29	241	.90
30–39	195	.90
40–49	124	.92
50–59	84	.90
60–69	76	.89
70–79	53	.88
80+	18	.97
Median Correlation		.88

guage-reduced and language-enriched approaches to testing. The complexities of the subject's bilingualism do not limit the testing, but are taken into account.

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Broad Cognitive Ability–Bilingual Scale Worksheet

English/ _____
specify native language

Student's Name: _____ ID Number: _____

Specify test used: ☐ WJ-R COG ☐ Batería-R COG

Norms based on: ☐ Age _____ ☐ Grade Placement _____

Step 1: Average *W* Scores.

The Average *W* Score is used in Step 2.

		W Score
BVA from English/_____	BVAT (BVA AE or GE _____)*	_____
Memory for Names	Memoria para nombres	_____
Numbers Reversed	Inversión de números	_____
Visual Matching	Pareo visual	_____
Sound Patterns	Configuración de sonidos	_____
Picture Recognition	Reconocimiento de dibujos	_____
Analysis/Synthesis	Análisis/Síntesis	_____
	Total _____ ÷ 7 =	_____ Avg. *W*

*Use Table 2 or 3 to convert the BVA AE or GE into a *W* score.

Step 2: Calculate BCA (Bil) *W* Score.

(_____) × .894 + 53.3 = _____
Avg. *W* BCA (Bil) *W*

Step 3: Record AE or GE and Developmental Level Band.

(Pages 5–7 in WJ-R COG Norm Tables)

AE or GE for BCA (Bil) _____ Developmental Level Band _____ to _____

Step 4: Obtain Relative Mastery/Proficiency Index, Standard Score, and Percentile Rank

Use the data provided in the BCA (Std) row of WJ-R COG Norm Table B (pages 35–104) if norms are to be based on age. Use Norm Table C (pages 105–147) if norms are to be based on grade.

W		REF W		SEM (SS)	+DIFF / – DIFF		DIFF	RMI / RPI	SS	SS		PR	PR	
	–				/	=		/90		–1 SEM	+1 SEM		–1 SEM	+1 SEM
BCA (Bil)		B OR C		B OR C	B OR C		+ OR –	D	D	_____ to _____		D	E to	E