DO THE BRIGANCE SCREENS DETECT DEVELOPMENTAL AND ACADEMIC PROBLEMS?*

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The Brigance Screens are a series of popular measures designed to quickly detect children between two and seven years of age who may have developmental difficulties. With the exception of the Kindergarten form, it is not known which score (out of a possible 100) is the best cutoff for sensitively detecting children with possible problems while also minimizing over-referrals. In order to locate optimal cutoffs, 408 children between 21 and 48 months of age were recruited from sites representing the geographic regions and demographic characteristics of the United States. Each child was administered the appropriate Brigance Form and a criterion battery that included measures of achievement, language, adaptive behavior, and intelligence. Receiver Operating Characteristic analyses were used to locate optimal cutoff scores for each form of the Brigance. Using these cutoff scores, between 72% and 100% of children with developmental difficulties were identified. At the same time, between 73% and 100% of children with normal development could also be correctly identified. These values approach standards for screening tests and suggest that the Brigance Screens are a valuable early detection tool, if appropriate cutoff scores are used.

The Brigance Screens are popular developmental and academic screening tools administered annually to almost three-quarters of a million children (Curriculum Associates, Inc., personal communication, December 15, 1995). Designed to identify those who appearto need early special education or other intervention services such as Title I Reading and Math, the Brigance Screens assess children between 21 months of age through first grade. There are six separate instruments housed in three test manuals: the Early Preschool Screen includes the Two-Year and Two-and-a-Half-Year Forms (Brigance, 1990); the Preschool Screens includes the Three-Year and Four-Year Forms (Brigance, 1985), and the K & 1 Screen-Revised includes the Kindergarten and First Grade Forms (Brigance, 1992). Each Form consists of eight to thirteen subtests that sample fine and gross motor (in younger children only), expressive and receptive lan-

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guage, cognitive readiness, and academic skills. Table 1 includes a brief description of the subtests across the various Forms. Most subtests assess specific skills in a criterion-referenced manner (e.g., knowledge of all basic colors, all letters of the alphabet, etc.).

To score the Brigance, skills are given numerical weights and then totaled. The author suggests that scores below 70 to 75 (out of a possible 100 points) indicate a need for follow-up assessment. Use of local norms is also encouraged. The problem with both approaches is that their accuracy is unknown. What percentage of children who actually need special services are detected? What percentage of normally developing children are over-referred? The absence of ready answers to these questions suggests the need for research that identifies optimal cutoff scores-those that have the greatest power to discriminate children with and without probable disabilities, thus rendering the most accurate decisions about screening results. Such accuracy helps ensure that children who need early intervention are correctly identified and that limited diagnostic resources are allocated parsimoniously.

Accuracy in developmental screening is defined by sensitivity (the percentage of children with disabilities who failed screening) and specificity (the percentage of children with normal development who pass screening). The standards for sensitivity and specificity are that each figure should approach 80% or higher. Less than 70% is considered poor (Barnes, 1982; Frankenburg, 1974, Glascoe, 1991).

There have been several studies of the accuracy of the Brigance Screens although these only extended to one of its six forms. Mantzicopoulos and Jarvinen (1993) administered the Brigance Kindergarten Screen to 134 Indiana school children. Of those nominated for special class placement or retention, only about two-thirds received scores less than 75 on the Brigance (sensitivity = 67%). Of children without school difficulties, most received Brigance scores of 75 or more points (specificity = 82%). This suggests that a cutoff higher than 75 is needed.

McCarthy (1994) addressed the value of a higher cutoff by comparing Brigance Kindergarten Screens on 191 students to their performance nine months later on the MacMillan Reading Test. Such a comparison would be expected to produce somewhat limited agreement between measures due to elapsed time and opportunities to acquire skills. Nevertheless, 76% of children who scored below 84 on the Brigance later performed poorly on the MacMillan. At the same time, 86% of those who performed well on the reading test received scores of 84 or higher.

In another study of the predictive accuracy of the Brigance, Bobo

Table 1. Subtests, Domains and Specific Content Across BRIGANCE® Screens

FORM:	Two-Year	Two-And-A-Half-Year	Three-Year	Four-Year	Kindergarten	First Grade
DOMAINS			**SPECIFIC CONTENT**			
Visual/ Fine/ and Grapho-Motor	uses crayon, stacks 2 - 6, blocks *Subtests 1A, 2A*	uses crayons, stacks 2 - 6 blocks *Subtests 1B, 2B*	copies circle, vertical/ horizontal lines, stacks 3 - 7 blocks *Subtests 6A, 8A*	copies cross, vertical/ horizontal lines, stacks 6 - 10 blocks *Subtests 6B, 8B*	copies shapes, writes first name *Subtests 5A, 11A*	copies shapes, draws a 10 part person, prints first/last name, *Subtests 5B, 11B, 12B*
Gross Motor	walks (side-ways, backward) synchronous arm swing *Subtest 7A*	jumps, walks backward, stands on one foot *Subtest 8B*	stands on one foot, walks on tiptoes and heel-toe *Subtest 3A*	tiptoes,stands on one foot, heel-toe *Subtest 3B*	walks heel-toe backwards/ forward, stands on one foot with eyes closed *Subtest 6A*	
Quantitative Concepts		gives "one", points to big/little *Subtest 7B*	gives "one", "one more" "two" *Subtest 7A*	gives "two", "three", "five" *Subtest 7B*	rote counts to 10, matches quantities up to 5 with numerals *Subtests 7A, 10A*	writes numerals in sequence; matches quantities up to 10 with numerals; counts to 20 *Subtests 6B, 8B, 13B*
Personal Information			gives first and last name, age *Subtest 1A*	gives first, middle, last name, age *Subtest 1B*	gives name, age, address, birthday *Subtest 1A*	gives name, age, address, birthdate *Subtest 1B*
Receptive Vocabulary	points to body parts, people, and objects according to use *Subtests 3A, 5A, 6A*	points to body parts *Subtest 3B*	points to body parts, pictures, matches colors, objects according to use, *Subtest 2A, 4, 9*	points to colors and body parts *Subtests 2B, 9*	follows one and two-step directions, points to body parts *Subtests 8A, 9A.*	auditorily discriminates same/ different word pairs, finds letter letter/words that are "different" *Subtests 4B, 10B*
Prereading/ Reading Skills					visually discriminates shapes and upper case letters *Subtest 4A*	names lower case/uppercase letters, recites alphabet *Subtests 7B, 9B*
Expressive Vocabulary	names pictures *Subtests 4A*	names pictures, identifies objects according to use *Subtests 4B, 5B, 6B*	names pictures, *Subtest 10A*	names pictures, tells use of objects *Subtests 4, 10B*	names colors, names pictures *Subtests 2A, 3A*	names 10 colors, and pictures *Subtest 2B, 3B*
Articulation/ Verbal Fluency/ Syntax	intelligibility ratings, use of two-word combinations *Subtest 8A*	intelligibility ratings, two and three word combinations *Subtest 9B*	uses -s, -ing; repeats sentences *Subtests 5A, 11*	uses prepositions, irregular plurals, repeats sentences *Subtests 5B, 11*	intelligibility rating use of complete sentences *Subtest 12A*	not directly assessed but may be observed on *Subtest 7B* (recites alphabet)

(1992) compared the performance of 457 children on the Brigance Kindergarten Screen to their eligibility or lack of eligibility for special education programs as determined six years later. She found the Brigance to have high specificity because 91% of children without subsequent difficulties received scores of 75 or above. Sensitivity in detecting children enrolled in special education was far lower at 49%. However, Bobo's data were presented in such a way that the effects of alternative cutoff scores could be estimated: Raising the cutoff to 80 increased sensitivity to 67% and lowered specificity to 78%, whereas a cutoff of 85 increased sensitivity to 91% and lowered specificity to 70%.

Although two of the three studies on the accuracy of the Brigance were predictive and not concurrent, all suggest that cutoffs other than those listed in the Brigance manuals are needed for achieving rates of sensitivity and specificity that approach standards for screening tests. Given that existing studies only viewed the accuracy of the Brigance Kindergarten Screen, there is clearly a need for research on the other forms. Thus the goal of this study was to: (a) explore the accuracy of the recommended cutoff score of 75 and; (b) determine whether alternative cutoffs would ensure that all Forms of the Screens meet standards for screening test accuracy.

METHOD

Sites

Four sites were selected to represent the broad geographic regions of the United States: North (Plymouth, Massachusetts); Central (Denver, Colorado which is within 250 miles of the geographic epicenter of the U.S.); South (Tampa, Florida); and West (Carson City, Nevada). Two sites (Plymouth and Carson City) are relatively small towns and Carson City, although bordered by the larger city of Reno to the north, is otherwise surrounded by rural areas. The remaining two sites were exclusively urban. Within each site, a school was identified that had a balance of children from high, middle and lower socioeconomic status (approximately one-third of students participated in the federal free/reduced lunch program). At each school, a single kindergarten and first grade classroom was identified and students were recruited via consent letters sent to parents by each child's teacher. In order to ensure an adequate mix of upper, middle and lower socioeconomic groups for younger children, two- through four-year olds were recruited if they were siblings of any kindergarten or first grade student in the target schools. In two sites, there were insufficient

numbers of younger siblings and recruitment was extended to children attending preschool programs in the zone of the targeted elementary schools. These preschool programs: (a) had federal or local subsidies; (b) served children from varying socioeconomic backgrounds; and (c) were neither oriented for special eduaction students nor exclusive of children with known disabilities. Overall the recruitment procedures helped ensure that the validation sample included children and families representative of the US as a whole (as indicated by the Census of the United States, 1990).

Subjects

A total of 408 children participated in the study; an average of 102 at each site. They represented at least 80% of children in the targeted classrooms. For all sociodemographic variables, distributions were similar to those found in the US Census (1990) except as noted. Parents, 91% of whom were mothers, had completed an average of 13.0 grades: 16% completed fewer than 12 grades, 33% attended through grade 12, 24% attended but did not complete college, while 27% held college degrees. Sixty-seven percent of parents were employed full or part-time and 65% were married. Twelve percent were both unmarried and unemployed. Children ranged in age from 21 - 84 months and 53% were boys. Free or reduced lunches were provided to 30% of subjects or their sibling(s). Thirty-five percent had not participated in educational programs such as preschool or day care at any time prior to participating in the study. Racial and ethnic backgrounds included: Caucasians (69%), Asian or other races/nationalities (5%), African-American (6%), and Hispanic, (20%). These figures were similar to US averageswith the exception of 11% more Hispanic participants and 6% fewer African-American participants (Census of the United States, 1990). Table 2 summarizes the characteristics of subjects and their families.

Procedures

At each site, diagnosticians were recruited from among those employed by the public schools. In the Northern and Western sites, the diagnosticians were licensed psychological examiners or certified school psychologists and in the remaining sites were master's level educational diagnosticians. The majority of children were tested during late fall of 1994 through mid-winter of 1995. Children whose primary language was Spanish were tested exclusively in that language using standardized Spanish directions; their parents were interviewed with Spanish versions of the

Table 2: Characteristics of 408 Children and their Families

Characteristic	N	%
Family Income Indicators		
Free/Reduced Lunch	127	31
Unsubsidized Lunch	281	69
Parent's Education		
Attended High School	66	16
High School Degree	133	33
Attended College	99	24
College Degree	110	27
Age (in months)		
21-26	18	4
27-32	46	11
33-44	85	21
45-56	57	14
57-68	74	18
69+	128	31
Site		
South	114	28
West	112	27
North	114	28
Central	68	17

demographics questionaire and other measures. This involved 25 parent-child dyads, comprising 6% of the study sample.

Measures

In addition to the age-appropriate form of the Brigance, each subject was administered a broad battery of assessment-level tests. Assessment–level tests are more thorough than screening tests but less rigorous than diagnostic tests. They are used to identify areas of strength and weakness and and to help focus the content of diagnostic evaluations when indicated. Because many school systems use assessment–level measures as an initial response to screening failures, it is helpful to know how well screening tests compare to assessment–level measures (Lichenstein & Ireton, 1984).

The particular battery used for this study was designed to assess the same broad range of developmental skills sampled by the Brigance Screens, i.e., expressive and receptive language, fine and gross motor, cognitive and preacademic development. The battery was designed to produce a score in each developmental domain in order to facilitate a careful view of the strengths and weaknesses of each Brigance Screen.

This battery included:

Slosson Intelligence Test-Revised (SIT). In order to determine which children appeared to have cognitive delays, superior ability, or academic difficulties, the SIT was administered to each subject (Slosson, 1983; Jensen & Armstrong, 1985). The SIT correlates highly with the Wechsler Intelligence Scale for Children-Revised (Clarke & Scagliotti, 1989; Karnes & Oehler, 1986), with the McCarthy Scale of Children's Abilities (Bondy, Constantino, Norcross & Sheslow, 1984), and with the Stanford-Binet with which the average SIT score varies by an average of 1 point (Jensen & Armstrong, 1985).

Child Development Inventory (CDI). Parents were asked to complete the CDI, a parent-report measure of social, self-help, fine and gross motor skills, expressive and receptive language, and academics for children 15 months to 72 months (Ireton, 1992). The Child Development Inventory is a 1992 revision of the Minnesota Child Development Inventory— a 270 item measure that produces scores (pass/fail/advanced and age equivalents) for fine and gross motor, social, self-help, expressive and receptive language, and preacademic skills. The CDI has high levels of predictive validity with correlations of .69 between CDIs administered at the beginning of kindergarten with achievemnet tests administered at the end of the year (Ireton, 1992). The CDI was administered by interview when parents responded to offers of assistance in completing the questionaire; a Spanish translation was used when needed.

Woodcock -Johnson Psychoeducational Battery: Tests of Achievement-Revised (WJR). In order to assess basic academic and preacademic skills, several subtests, all normed for young children, were selected from the WJR (Woodcock & Johnson, 1990). These subtests included the Letter-Word Identification subtest as an indicator of reading and reading readiness, the Applied Problems subtest as a measure of math and math readiness skills, and Dictation, a measure of grapho-motor and written language skills. These tests were administered only to children 30 months or older.

Examiner/Teacher Ratings. As a further check on the validity of the concurrent battery, diagnosticians were asked to state their perceptions of children's performance (for those less than kindergarten age). Specifically, each examiner was asked to indicate whether they thought children qualified for special education, Title 1, or gifted/talented services. For children enrolled in kindergarten or first grade, teachers were asked to rate each pupil as above average, average, or as having difficulty with school tasks.

Other. Demographic information was also collected on all subjects. Data were analyzed using the Statistical Package for the Social Sciences.

RESULTS

In order to assess the accuracy of the Brigance Screens, children were grouped according to those who: 1) met criteria for special education placement; 2) those who were candidates for Title 1 or other non-special education services due to significant delays in academic and preacademic skills; or 3) performed adequately for their age and grade placement. Special education criteria were drawn from the Individuals with Disabilities Education Act, the federal mandate that provides special eduction services. Although criteria vary slightly across states, special education enrollment does not differ markedly suggesting that slight differences in criteria do not have a large impact on prevalence (Council for Exceptional Children, 1993). Table 3 shows the classification criteria. Of the 408 children, 71% (N = 288) performed within normal limits, 12% (N = 51) met eligibility criteria for special education services, and 17% were categorized as Title 1 Reading and Math eligible but not as meeting criteria for special education (N = 69). Of the 51 special education candidates, 48 had speech-language impairments with or without hearing impairment, 6 had learning disabilities, 6 had mental retardation, 2 had autism or other developmental disorders, and one had health impairments. Several children had more than one disability.

Table 3. Criteria for Student Classification

Category	Criteria
Special Education	
Speech-Language Impaired	Performance 2.0 standard deviations below the mean on the listening comprehension and expressive language subtests of the Child Development Inventory
Mental Retardation	IQ less than 74, and performance 2.0 standard deviations below the mean on four or more subtests of the Child Development Inventory
Specific Learning Disabilities	Performance 1 or more standard deviations below IQ on the Reading, Math, or Written Language Subtests of the Woodcock-Johnson
Other	Children with previously established eligibility for special education and currently receiving services (e.g., hearing impairment, autism, physical disability)
Title 1 Eligible	Scores on the Woodcock-Johnson>1 standard deviation below average, i.e., standard scores less than 85 but not special education eligible
Within normal limits	None of the above

Table 4 shows the median performance, ranges and standard deviation of performance on the Brigance according to age. These reveal considerable variability across Forms in terms of median performance. This is in keeping with prior standardization research conducted sponsored by the publisher (described in Glascoe, 1996). What the prior and current findings suggest is that different cutoffs may be needed across Forms. Table 4 also reveals that the Brigance Screens conform to typical performance trends: children of less educated parents tend to score lower than children of more educated parents. This trend is corroborated by predictable variation to characteristics such as socioeconomic status, ethnicity and exposure to preschool (Glascoe, 1996).

Using the original cutoff of 75, 46 children were detected out of the 120 children eligible for special education or Title 1 services (sensitivity = 38%) while 239 out of 288 children with normal development were correctly identified (specificity = 83%). When viewing accuracy at different ages, none of the Brigance Forms approached ideal standards for both sensitivity and specificity.

Table 4. Performance on the Brigance by Various Demographic Characteristics

Age in months	21-26	27-32	33-44	45-56	57-68	69+	All Ages
Brigance Form	**2 Yr**	**2 1/2 Yr**	**3 Yr**	**4 Yr**	**K**	**1st**	
Range	61-100	28-100	31-100	54-100	53-100	44-100	28-100
Median	84	73	84	85	90	91	87
Standard Deviation	10.8	18.6	16.3	11.3	11.5	10.5	13.9
Performance by Parents' Level of Education							
Less than High School (N = 66)							
Range	63	28-72	34-100	67-94	53-94	59-94	28-100
Median	63	47	76	82	88	85	82
Standard Deviation	-	19.5	18.2	10.1	13.1	9.3	15.8
High School (N = 133)							
Range	70-91	49-100	31-100	54-99	54-100	67-99	31-100
Median	77	72	84	80	83	90	85
Standard Deviation	10.7	16.1	19.2	14.3	12.9	9.0	14.5
At least some college (N = 209)							
Range	61-100	40-100	51-99	57-100	70-99	44-100	40-100
Median	85	77	86	88	93	95	90
Standard Deviation	10.1	17.2	10.8	10.1	7.6	11.7	12.3

In an effort to explore possible contributors to the Brigance's limited accuracy, the effects of children's ages on performance were evaluated. It was anticipated that children with recent birthdays (who were younger than the average age per Form) might account for many of those who were overidentified while those with later birthdays were more likely to be undetected). To assess this hypothesis, recency of birthday was used as a dependent variable in an analysis of variance in which Brigance scores were used as the predictor. Children with birthdays within the last six months scored on the average nine points lower than did children with less recent birthdays [$F(1,407) = 23.107$, $p < .0001$]. These findings suggest that each Form of the Brigance requires more than one cutoff in order to adjust for within age group differences.

Receiver Operating Curve (ROC) analyses were used to determine which cutoff scores for each Form of the Brigance Screens best discriminated children eligible for Title 1 and special education services from those who were developing normally. ROC involves computing pairs of sensitivity and specificity figures as the cutoff is raised and lowered (Murphy, et al., 1987). Because of the substantial age-discriminating power of the Brigance, separate cutoffs were identified for younger and older children within each Form. Table 5 reveals the optimum cutoff that best discriminated children with and without difficuties. This showed that with revised cutoffs, each Form of the Brigance Screens approached the suggested accuracy standards for screening tests.

Finally, teacher/examiner ratings were intersected with the alternative cutoffs for the Brigance Screens. Of those children rated as below average by teachers or examiners, 61% scored below the alternative cutoffs on the Brigance. Of children rated as average or above average by teachers or examiners, 75% scored above the alternative cutoffs. Overall, the alternative cutoffs accurately reflected teacher/examiner ratings on 71% of the 408 subjects.

DISCUSSION

The lifetime value of early intervention is substantial, both for children with disabilities and for those at-risk due to psychosocial disadvantage (Barnett & Escobar, 1990). The profound nature of these benefits to individuals and society makes early identification essential. Despite this, there are numerous popular screening tests that fail to be sensitive and/or specific detectors of developmental difficulties (Barnes, 1982; Glascoe, 1991; Meisels & Provence, 1989). Unlike other countries, in the U.S. there is little in the way of federal or professional regulation of screening test pub-

Table 5. Cutoff Scores, Sensitivity and Specificity for Age-Appropriate Forms of the Brigance in Detecting Children With and Without Delays

Form	Age	Cutoff	Not At-Risk		At-Risk and Special Education Candidates	
			N detected	%a	N detected	%b
2 Year	21-26	<67	16/16	100%	2/2	100%
2 1/2 Year	27-29	<67				
	30-32	<72	35/38	92%	6/8	75%
3 Year	33-36	<67				
	37-40	<83	47/62	76%	17/23	74%
	41-44	<87				
4 Year	45-50	<73				
	51-56	<88	31/42	74%	11/15	73%
Kindergarten	57-62	<83				
	63-68	<92	36/48	75%	20/26	77%
1st Grade	69-74	<80				
	74+	<93	60/82	73%	33/46	72%

[a]specificity = the number of children without difficulties who performed at or above Brigance cutoffs, divided by the total number of children without difficulties, expressed as a percentage

[b]sensitivity = the number of children with difficulties who performed below Brigance cutoffs divided by the total number of children with difficulties, expressed as a percentage

note. The over referral or false-positive rate is the difference between the ideal identification rate of 100% and the test's specificity (e.g., for 1st graders, 100% - 73% = 27%). Similarly, the under-referral or false-negative rate for the same group is the difference between the ideal and actual sensitivity (100 - 72% = 28%).

lication (e.g., the Canadian Psychological Association [1991] attaches criminal penalties and fines for noncompliance with standards). This means that school personnel responsible for test selection must become well-informed about the psychometric properties of measures and insist on those that meet essential standards for screening test accuracy. The original cutoffs established for the Brigance screens were found to be insensitive to developmental problems in this study. However, changing the cutoffs for each Form and for age groups within Forms, enabled the Brigance to approach standards for accuracy in screening tests. Overall, sensitivity was found to be 72% to 100% across Forms while specificity ranged from 73% to 100%. The findings suggests that the use of the cutoffs identified in this study greatly improves the value of the Brigance in the early detection of children with developmental problems.

Limitations in the current and prior research include a small sample size in the 21 - 32 month range. This appears to explain the absence of age-related effects on performance found for other ages and certainly expected for very young children. Additional research with this age group is

needed. Continued research is needed to address other sampling limitations, including the low number of African-American children. Finally, future studies should compare the new cutoffs in comparison with a more rigorous diagnostic test battery than that employed in the current study in order to cross-validate and confirm the results.

REFERENCES

Barnes, K.E. (1982). *Preschool screening: The measurement and prediction of children at risk.* Springfield, Illinois: Charles C. Thomas.

Barnett, W.S., & Escobar, C.M. (1990). Economic costs and benefits of early intervention. In S.J. Meisels & J.P. Shonkoff (Eds.). *Handbook of early childhood intervention* (pp. 560-582). Cambridge: Cambridge University Press.

Bobo, C.N. (1992). The Brigance K & 1 Screen as a predictor for early identification of students "at risk" for later special education placement (Doctural Disseration, University of Tenessee, 1992). *Dissertation Abstracts International. 53,* 1475.

Bondy, A.S., Constantino, R, Norcross, J.C. & Sheslow, D. (1984). Comparison of Slosson and McCarthy Scales for exceptional preschool children. *Perceptual and Motor Skills, 59,* 657-658.

Brigance A. (1985). *Brigance Preschool Screen.* North Billerica, MA: Curriculum Associates, Inc.

Brigance A. (1992). *Brigance K & 1 Screen - Revised.* North Billerica, MA: Curriculum Associates, Inc.

Brigance A. (1990). *Brigance Early Preschool Screen.* North Billerica, MA: Curriculum Associates, Inc.

Canadian Psychological Association (1991). *Guidelines for advertising preschool screening tests.* Quebec, Canada: Canadian Psychological Association.

Census of the United States (1990). Washington, D.C.: Government Printing Office.

Clarke, R., & Scagliotti, J. (1989). Are the Slosson Intelligence Test and the Wechsler Intelligence Scale for Children-Revised interchangeable for identifying gifted students? *Psychology: A Journal of Human Behavior,* 26, 33-38.

Council for Exceptional Children. *Statistical profile of special education in the United States* (from the 15th Annual Report to Congress). Reston, VA: Council for Exceptional Children, 1993.

Frankenburg, W.K. (1974). Selection of diseases and tests in pediatric screening. *Pediatrics. 54:* 1-5.

Glascoe, F.P. (1991). Developmental screening: Rationale, methods and application. *Infants and Young Children, 4:* 1-10.

Glascoe, F.P. (1996) *Technical report for the Brigance Screens.* North Billerica, Massachusetts: Curriculum Associates, Inc.

Ireton, H. (1992). *Child Development Inventories.* Minneapolis, Minnesota: Behavior Science Systems.

Jensen & Armstrong, (1985). *Slosson Intelligence Test and Expanded Norms.* East Aurora, NY: York: Slosson Educational Publications.

Karnes, F.A., & Oehler, J. (1986). Comparison of the renormed Slosson Intelligence Test with the WISC-R for gifted students. *Educational and Psychological Research. 6,* 207-211.

Mantzicopoulos, P., & Jarvinen, D.W. (1993). *An analysis of the Brigance K & 1 Screen with a disadvantaged pre-school sample.* Paper presented at the Annual Meeting of the American Educational Research Association, Atlanta, Georgia. Atlanta, GA, April, 1993.

McCarthy, K.H. (1994). The Brigance K & 1 Screen as a predictor for early identification of children at risk. Boston, MA: Boston University. *Dissertation Abstracts International,* in press.

Meisels, A.J., & Provence, S. (1989). Screening and assessment. *Guidelines for identifying young disabled and developmentally vulnerable children and their families.* Washington, DC: National Center for Clinical Infant Programs.

Murphy, J.M., Berwick, D.M., Weinstein, M.C., Borus, J.F., Budman, S.H. & Klerman, G.L. (1987). Performance of screening and diagnostic tests. *Archives of General Psychiatry. 44;* 550-555.

Slosson, R. (1983) *Slosson Intelligence Test.* East Aurora, NY: Slosson Educational Publications.

Woodcock, R.W., & Johnson, M.R. (1990). *Woodcock-Johnson Psycho-Educational Battery-Revised: Test of Achievement.* Chicago: Riverside Publishing Co.