

ACADEMIC PERFORMANCE OF BRAZILIAN MIDDLE SCHOOL CHILDREN AS ASSESSED BY AN ADAPTATION OF THE WIDE RANGE ACHIEVEMENT TEST (WRAT 3)

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Abstract

Objective: to assess the academic performance of Brazilian children by an adaptation of the Blue and Tan forms of the WRAT3 (Brazil - WRAT 3). **Methods:** the performance of 722 children (281 boys and 441 girls with mean age of 13.5 years, SD = 1.4) was evaluated. The data were subjected to multivariate statistical analysis to determine the relationships between performance on Spelling, Arithmetic and Reading and demographic characteristics of the children, history of grade failure, handedness, and auditory and visual dysfunction. **Results:** the form (Blue vs Tan) of the test had a significant effect on performance and so the data were analyzed separately for each form of the Brazil-WRAT3. It was found that sex, ethnic group, paternal and maternal occupation and history of the grade failure were significantly related to performance on Spelling, Arithmetic and Reading of both forms. Furthermore, age and handedness had significant effects on the overall performance of the subtests of the Blue form and children with auditory or visual dysfunction performed the subtests of the Tan form worse than normal children. **Conclusion:** it is possible that the profile of the academic performance of Brazilian public school children shown in this study is associated with more fundamental aspects of language skills and research along this direction is currently underway.

Key words: achievement; cognition; child development.

Research in child neuropsychology in Brazil is hampered by the lack of adequate normative information for neurobehavioral assessment instruments. Brito and Santos-Morales¹ noted that methodological shortcomings like insufficient description of the demographic characteristics of the participants, and naive statistical procedures, render the information that exists of limited value for use in the Brazilian setting. It is, therefore, critical that adequate locally-derived data for instruments used in the neurobehavioral assessment of children be developed in our country. Previous research from our laboratory has made several of these assessment instruments available for use in Brazil: the Conners Abbreviated Teacher Rating Scale^{2,3}, the Composite Teacher Rating Scale^{4,5}, the Edinburgh Handedness Inventory^{6,7,8}, the Attention Deficit Hyperactivity Disorder (ADHD) (DSM-IIIR) Teacher Rating Scale⁹, the Bender Gestalt Test^{10,11}, the Benton Right-Left Discrimination Test, Motor Persistence Tests, the Color Span Test, the WISC-R's Digit Span Test and the Human Figure Drawing Test^{11,12,13}, the Gardner Steadiness Test

and the Purdue Pegboard Test¹. The application of these instruments in clinical research in child neuropsychology in Brazil has been described¹⁴.

The Wide Range Achievement Test-3¹⁵ was developed for the assessment of academic skills and is composed of three subtests: Spelling, Arithmetic, and Reading. In the present study, an adaptation of this instrument (Brazil-WRAT3) was used to assess the academic performance of Brazilian children attending a large public school in the metropolitan area of Rio de Janeiro. Since the inception of this study, another version of the WRAT (WRAT4) was published¹⁶. However, except for the addition of a new subtest, Sentence Comprehension, the fundamental aspects of its construction and contents are basically equivalent to that of the WRAT3.

The objective of the study was to determine the relationships between performance on the three subtests of the Brazil-WRAT3 (Spelling, Arithmetic and Reading) and demographic characteristics of the children (sex, age, ethnicity, parental occupation), history of grade failure, handedness,

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and auditory and visual dysfunction. Since the assessment of academic skills is critically important for the characterization of developmental learning disabilities¹⁷, it is hoped that the information herein presented will be of value for studies in the field of child development in our country.

METHODS

Participants

All 920 children registered in the 5th through 8th grades of middle school at the Instituto de Educação Prof. Ismael Coutinho (IEPIC), a large public school in Niterói, a city which is part of Rio de Janeiro metropolitan area participated in this study. As reported previously^{1,2,10,11,18,19}, this school was selected not because of its large enrollment but also because it attracts children from all ethnic and socioeconomic groups, although mostly from lower social classes, and whose places of residence are in communities distributed throughout Niterói, a city located across the Guanabara Bay from Rio de Janeiro, and adjacent localities, e.g., São Gonçalo, Maricá and Itaboraí. There were no exclusionary criteria for participation in the study. However, a total of 198 participants who requested a school transfer or otherwise dropped out of the IEPIC during the study were excluded because their data could not be completed. Therefore, the final number of participants was 722 children (281 boys, 38.9%, and 441 girls, 61.1%) with a mean age of 13.5 years (SD = 1.4).

Ethnic group membership was assigned solely on the basis of visual inspection of the child. The categorization of occupations used in the present study was originally developed by Hollingshead and Redlich²⁰. Occupational levels 1 and 2 include university-educated executives, business managers in large concerns, and major and lesser professionals; occupational levels 3 and 4 comprise administrative personnel, owners of small independent businesses and minor professionals; and occupational levels 5, 6 and 7 include skilled, semi-skilled and unskilled laborers with lower educational levels. History of grade failure was obtained for each participant through school records and hand used for writing was ascertained at testing. The children had their auditory and visual functions screened through the federal program Quem Ouve Bem, Aprende Melhor/Olho no Olho-Programa Nacional de Saúde do Escolar-PNSE²¹ (Who Listen Well, Learn Better/Eye to Eye Health Program of the National Schooland) the presence of auditory or visual dysfunction was treated as a variable in data analysis.

The study was approved by the Board of Directors of the IEPIC and was performed under the auspices of the agreement between the IEPIC and the Instituto Fernandes Figueira of the Fundação Oswaldo Cruz (FIOCRUZ). Since the main objective of the study was to raise information on

the academic performance of the students in a school context, the author and the Board of Directors of IEPIC pondered that it would not be required to submit the project to a Human Research Ethics Committee.

Academic assessment

The academic performance of the participants was assessed by an adaptation of the Wide Range Achievement Test-3¹⁵ developed for use in Brazilian school children. The WRAT3 is composed of the three subtests: Spelling, writing of names, letters and words from dictation; Arithmetic, counting, reading number symbols, solving oral problems and performing written computations; and Reading, the recognition and naming of letters and the pronunciation of words out of context. There are two alternate forms (Blue and Tan) which allow for the initial measure and reassessment of academic skills.

The adaptation of the WRAT3 for middle school children at public schools in the metropolitan area of Rio de Janeiro followed a multiple-step procedure. The contents of the Arithmetic subtest were unaltered. However, the subtests Spelling and Reading were constructed in Portuguese and were not directly translated from the English version. Two alternate forms of the Spelling (words from dictation) and Reading (pronunciation of words) subtests were constructed such that the selection of the items for one of the forms took into account mirrored items on the alternate form. Each form was built to have an adequate range of item difficulty. Several item compositions were constructed and screened by professionals in the areas of linguistics, speech therapy and psychology. After each review of the materials, a field-test study with a sample of 5th through 8th grade children from the IEPIC was conducted and content changes were introduced depending on their response profiles on the two alternate forms (Blue and Tan) of the Brazil-WRAT3. Three such field-test studies were performed in the academic years of 1996 (N = 40), 1997 (N = 26) and 1998 (N = 147) until the two forms were deemed appropriate by the panel of experts.

In the present study, only one of the two forms of the Brazil-WRAT3 was administered to each participant. Half the classes within each grade, 5th through 8th, were administered the Blue form, whereas the other half filled the Tan form. The form administered was determined randomly by the use of a table of random numbers, but with the restriction that the distribution of the forms for the classes was balanced. In addition, only the written computations section of the Arithmetic subtest was administered since the other sections of this subtest (counting, reading number symbols and solving oral problems) do not apply to Brazilian middle school children. The number of correct responses for each of the subtests was used in the statistical analyses of the data. The two forms of the Brazil-WRAT3 are available from the author upon request.

An error analysis of the performance on the Spelling subtest was conducted in order to determine a profile of error types, including accentuation (e.g., marking of the vowel of the stressed syllable in a word by a specific diacritic), addition, omission and substitution of graphemes, orthography, hyphenization, addition and omission of syllables, word substitution and omission, and decompounding (e.g., irregular morphosemantic construction) of words. Error type was also included in the statistical analysis of the data.

Statistical analysis

The data were analyzed using PC-SAS²². Proc GLM (General Linear Model) was used to perform multi-(MANOVA) and univariate (ANOVA) analyses

of variance. Multivariate procedures were applied to provide control for the error rate²³. Significant MANOVAs were followed up with ANOVAs for each dependent variable and significant ANOVAs were followed up with multiple comparisons of means with the conservative Scheffé's procedure. Significance levels were set at 0.05.

RESULTS

Descriptive characteristics of the participants

Table 1 shows the descriptive characteristics of the participants in the study. As shown in the table, most of the children were of European and African ancestry, although a substantial proportion were multiethnic.

Table 1: Descriptive characteristics of the participants

Variables	Boys (N=281, 100%)	Girls (N=441, 100%)	Total (N=722, 100%)
Age (yrs)			
10-11	45 (16.0)	66 (15.0)	111 (15.4)
12	61 (21.7)	88 (19.9)	149 (20.6)
13	63 (22.4)	133 (30.2)	196 (27.1)
14	67 (23.9)	80 (18.1)	147 (20.4)
15 +	45 (16.0)	74 (16.8)	119 (16.5)
Ethnicity			
European	105 (37.4)	188 (42.6)	293 (40.6)
African	104 (37.0)	171 (38.8)	275 (38.1)
Multiple	72 (25.6)	82 (18.6)	154 (21.3)
Occupational Level			
Father			
1	14 (5.0)	14 (3.2)	28 (3.9)
2	6 (2.1)	15 (3.4)	21 (2.9)
3	28 (10.0)	55 (12.5)	83 (11.5)
4	41 (14.6)	49 (11.1)	90 (12.5)
5	15 (5.3)	28 (6.3)	43 (5.9)
6	71 (25.3)	126 (28.6)	197 (27.3)
7	92 (32.7)	133 (30.2)	225 (31.2)
N/A	14 (5.0)	21 (4.7)	35 (4.8)
Mother			
1	13 (4.6)	9 (2.0)	22 (3.0)
2	5 (1.8)	22 (5.0)	27 (3.7)
3	9 (3.2)	17 (3.9)	26 (3.6)
4	18 (6.4)	20 (4.5)	38 (5.3)
5	3 (1.1)	5 (1.1)	8 (1.1)
6	33 (11.8)	51 (11.6)	84 (11.6)
7	160 (56.9)	249 (56.5)	409 (56.7)
N/A	40 (14.2)	68 (15.4)	108 (15.0)
Grade Failure ¹	112 (39.9)	131 (29.7)	243 (33.7)
Handedness (Writing)			
Left	41 (14.6)	31 (7.0)	72 (10.0)
Right	240 (85.4)	410 (93.0)	650 (90.0)
Auditory Handicap ²	12 (4.3)	25 (5.7)	37 (5.1)
Visual Handicap ³	36 (12.8)	114 (25.9)	150 (20.8)

1 Data not available for 47 children, 14 boys and 33 girls.

2 Data not available for ten children, three boys and seven girls.

3 Data not available for four children, one boy and three girls.

The distribution of parental occupation revealed that fathers and mothers of the participants were mostly skilled, semi-skilled and unskilled laborers with lower educational levels. However, the table also demonstrates that parents with higher occupational and educational levels were represented in the study. In addition, the data clearly indicates that a substantial number of participants had failed at least one school grade. Furthermore, about 90% of the participants used their right hand for writing, consistent with data reported elsewhere^{7,8}. Moreover, a substantial number of participants were deemed to have auditory and visual dysfunction at the time of the study.

Performance on the Brazil-WRAT3

A MANOVA of the data on the performance of the Spelling, Arithmetic and Reading subtests of the Brazil-WRAT3 indicated a significant effect of test form ($F_{3,713} = 28.39, P < .001$). Individual ANOVAs showed that the form of the test was significantly associated with performance on the Spelling ($F_{1,716} = 5.71, P = .017$) and Reading ($F_{1,716} = 31.80, P < .001$) subtests. Posthoc Scheffé’s tests indicated that the Spelling subtest of the Blue form was significantly easier than the corresponding subtest of the Tan form and, conversely, the Reading subtest of the Tan form was significantly easier than

the same subtest of the Blue form. Since the MANOVA demonstrated significant differences between the two test forms, subsequent analyses were performed on each form separately.

Blue Form

Table 2 shows means and SDs for correct scores on the Spelling, Arithmetic and Reading subtests of the Blue form of the Brazil-WRAT3 and Table 3 presents a summary of the statistical analysis of these data. A MANOVA showed a significant effect of the age and sex of the child on the performance of the three subtests. In addition, the interaction of age and sex was significant. An ANOVA indicated that sex was significantly related only to the performance on the Spelling subtest such that girls performed significantly better than boys. Furthermore, sex interacted with age such that older girls performed significantly better than older boys. Moreover, additional ANOVAs showed that age was significantly associated with performance on Arithmetic and Reading, but the interactions of age and sex were not significant. Scheffé’s tests indicated that 14-year old children performed better than children in the 15-years+age group on the Arithmetic subtest and that 13- and 14-year old children performed better than 10-11-year-old children on the Reading subtest.

Table 2: Means and SDs for correct scores on the Spelling, Arithmetic and Reading subtests of the Blue Form of the Brazil-WRAT3

Age		SPELLING		BLUE FORM ARITHMETIC		READING	
		Boys	Girls	Boys	Girls	Boys	Girls
10-11	M	25.0	26.5	17.2	17.7	33.5	33.1
	SD	6.6	5.1	2.4	2.5	4.2	5.7
	N	22	28	22	28	22	28
12	M	24.8	27.4	16.1	16.9	35.0	35.1
	SD	5.0	5.1	2.5	2.7	3.6	3.8
	N	23	40	23	40	23	40
13	M	27.3	26.0	17.5	16.8	35.7	36.1
	SD	6.2	5.4	2.7	2.7	4.1	3.1
	N	28	65	28	65	27	65
14	M	24.0	29.0	17.5	17.9	35.6	37.3
	SD	6.9	5.0	2.7	2.4	4.0	2.6
	N	35	43	35	43	35	41
15+	M	23.0	27.1	16.2	16.0	34.5	36.0
	SD	5.4	6.4	3.1	2.8	4.2	3.7
	N	28	37	29	37	28	36

Table 3: Summary of the statistical analysis of the data on the performance of the Spelling, Arithmetic and Reading subtests of the Blue Form of the Brazil-WRAT3

	BLUE FORM									
	MANOVAs			SPELLING		ANOVAs ARITHMETIC		READING		p
	N	F	p	F	p	F	p	F		
Age	345	3.63	<.001	1.22	ns	3.70	.005	5.50	<.001	
Sex	345	5.79	<.001	15.67	<.001	0.29	ns	2.38	ns	
Age x Sex	345	1.98	.02	4.09	.003	0.93	ns	0.81	ns	
Ethnic Group	345	5.80	<.001	12.59	<.001	5.93	.002	8.64	<.001	
Paternal Occupation	330	1.99	.008	3.33	.003	3.17	.004	1.79	ns	
Maternal Occupation	277	2.83	<.001	5.24	<.001	1.33	ns	4.71	<.001	
Grade Failure	320	15.30	<.001	29.09	<.001	32.65	<.001	13.14	<.001	
Handedness	345	4.27	.005	9.88	<.001	4.14	.04	0.43	ns	
Auditory Handicap	338	2.19	ns	-	-	-	-	-	-	
Visual Handicap	344	1.45	ns	-	-	-	-	-	-	

A MANOVA of error types on Spelling showed a significant effect only for the sex of the child ($F_{10,331}=2.23, P=.016$), but not for age. The interaction of age with sex was not significant. ANOVAs demonstrated that girls made significantly fewer accentuation errors compared to boys. There were no other associations between sex and error types.

Further analyses of the data showed that the ethnic group of the child had a significant effect on the performance of the three subtests. ANOVAs indicated that ethnic group was significantly related to performance on Spelling, Arithmetic and Reading. Scheffé's tests demonstrated that European-Brazilian and multiethnic children performed the Spelling subtest better than African-Brazilian children. Moreover, European-Brazilian children performed the Arithmetic subtest better than African-Brazilian and multiethnic children and performed the Reading subtest better than African-Brazilian children.

In addition, paternal occupation also had a significant effect on the performance of the subtests. ANOVAs showed that paternal occupation was significantly associated only to performance on Spelling and Arithmetic. However, Scheffé's tests did not indicate any significant difference between means. Maternal occupation also had a significant overall effect on the performance of the subtests and ANOVAs demonstrated that maternal occupation was significantly related only to performance on Spelling and Reading. However, Scheffé's tests did not show any significant difference between means.

Additional analyses revealed that children who had failed at least one school grade had a significantly worse overall performance on the Spelling, Arithmetic and Reading subtests compared to children who had never failed a grade. ANOVAs demonstrated that having failed at least one school grade was significantly associated with performance on Spelling, Arithmetic and Reading. Scheffé's tests revealed that children who had failed at least one school grade performed significantly worse than children who had never failed a grade on each of the three subtests.

Furthermore, handedness was significantly related to the overall performance on the Spelling, Arithmetic and Reading subtests. ANOVAs showed that handedness was significantly associated only to performance on Spelling and Arithmetic. Scheffé's tests demonstrated that right-handed children performed both of these subtests significantly better than left-handed children.

Moreover, MANOVAs did not show that children with auditory or visual dysfunction performed the Spelling, Arithmetic subtests any worse than children with normal auditory or visual function.

Tan Form

Table 4 shows means and SDs for correct scores on the Spelling, Arithmetic and Reading subtests of the Tan form of the Brazil-WRAT3 and Table 5 presents a summary of the statistical analysis of these data. A MANOVA showed a significant effect of the sex of the child on the performance of the three subtests. Age and the

Table 4: Means and SDs for correct scores on the Spelling, Arithmetic and Reading subtests of the Tan Form of the Brazil - WRAT3

Age		TAN FORM					
		SPELLING		ARITHMETIC		READING	
		Boys	Girls	Boys	Girls	Boys	Girls
10-11	M	23.7	23.3	17.1	15.6	37.0	36.0
	SD	4.6	6.6	2.3	2.6	3.5	3.8
	N	23	38	23	38	23	38
12	M	24.5	26.2	16.2	16.4	36.8	37.1
	SD	5.7	3.7	3.4	2.5	3.7	3.5
	N	38	48	38	48	38	48
13	M	23.6	25.6	16.3	16.9	37.0	36.7
	SD	5.6	5.6	2.6	2.8	3.5	4.4
	N	35	68	35	68	35	68
14	M	24.3	28.1	17.4	17.4	37.0	38.5
	SD	6.7	3.5	2.6	2.9	4.5	2.8
	N	32	37	32	37	32	37
15+	M	24.4	26.3	16.9	16.2	38.1	37.3
	SD	4.9	5.2	2.3	3.4	2.1	2.8
	N	16	37	16	37	16	37

Table 5: Summary of the statistical analysis of the data on the performance of the Spelling, Arithmetic and Reading subtests of the Tan Form of the Brazil-WRAT3

	TAN FORM								
	MANOVAs			SPELLING		ANOVAs ARITHMETIC		READING	
	N	F	p	F	p	F	p	F	p
Age	372	1.24	ns	-	-	-	-	-	-
Sex	372	6.54	<.001	9.31	.002	0.79	ns	0.02	ns
Age x Sex	372	0.95	ns	1.20	ns	1.34	ns	1.20	ns
Ethnic Group	372	6.53	<.001	10.69	<.001	9.90	<.001	12.81	<.001
Paternal Occupation	352	2.46	<.001	4.10	<.001	3.28	.003	4.55	<.001
Maternal Occupation	332	2.37	<.001	4.85	<.001	2.96	.008	2.56	.019
Grade Failure	350	12.65	<.001	33.93	<.001	3.72	ns	24.80	<.001
Handedness	372	1.40	ns	-	-	-	-	-	-
Auditory Handicap	369	5.10	<.001	9.01	.002	9.26	.002	10.01	<.001
Visual Handicap	369	4.06	.007	0.94	ns	2.78	ns	9.74	<.001

interaction of age and sex were not significant. ANOVAs indicated that sex was significantly related only to the performance on the Spelling subtest such that girls performed significantly better than boys.

A MANOVA of error types on the Spelling subtest showed a significant effect only for the sex of the child ($F_{1,353} = 2.03, P = .03$). Age and the interaction of age and sex were not significant. ANOVAs indicated that girls made significantly fewer accentuation errors and omission of syllables compared to boys. There were no other associations between sex and error types.

Further analyses of the data showed that the ethnic group of the child had a significant effect on the performance of the three subtests. ANOVAs indicated that ethnic group was significantly related to performance on Spelling, Arithmetic and Reading. Scheffé's tests demonstrated that European-Brazilian children performed the Spelling subtest better than African-Brazilian and multiethnic children. Moreover, European-Brazilian and multiethnic children performed the Arithmetic and the Reading subtests better than African-Brazilian children.

In addition, paternal occupation had a significant effect on the performance of the three subtests. ANOVAs showed that paternal occupation was significantly associated to performance on Spelling, Arithmetic and Reading. Scheffé's tests indicated that children with the highest level of paternal occupation had a significantly better performance on the Spelling and Reading subtests compared to children with the lowest level. Maternal occupation also had a significant overall effect on the performance of the subtests and ANOVAs demonstrated that maternal occupation was significantly related to performance on Spelling, Arithmetic and Reading. Scheffé's tests showed that children with the second highest level of maternal occupation performed significantly better than children with the lowest level on Spelling.

Additional analyses revealed that children who had failed at least one school grade had a significantly worse overall performance on the Spelling, Arithmetic and Reading subtests compared to children who had never failed a grade. ANOVAs demonstrated that having failed at least one school grade was significantly associated only with performance on Spelling and Reading. Scheffé's tests revealed that children who had failed at least one school grade performed significantly worse than children who had never failed a grade on Spelling and Reading. Handedness, however, was not related to the overall performance on the Spelling, Arithmetic and Reading subtests.

Furthermore, MANOVAs indicated that children with auditory or visual dysfunction performed the Spelling, Arithmetic and Reading subtests worse than children with normal auditory or visual function. Subsequent ANOVAs showed that auditory dysfunction was significantly associated with performance on Spelling, Arithmetic and Reading such that children with abnormal auditory function performed worse than normal children. Additional ANOVAs demonstrated that visual dysfunction was significantly related only to performance on Reading such that visually-impaired children performed worse than children with normal visual function.

DISCUSSION

The present study showed that the performance of Brazilian middle school children on the Spelling, Arithmetic and Reading subtests of the Brazil-WRAT3 was significantly different across the two tests forms (Blue vs Tan). The Spelling subtest of the Blue form was significantly easier than the Spelling subtest of the Tan form and, conversely, the Reading subtest of the Tan form was significantly easier than the Reading subtest of the Blue form.

Sex, ethnic group, parental (paternal and maternal) occupation and history of grade failure were significantly related to subtest performance of both forms. In addition, age, the interaction of age and sex, and handedness for writing, but not auditory and visual dysfunction, were significantly associated with the performance on the three subtests of the Blue form. Auditory and visual handicap, however, were significantly related to subtest performance of the Tan form, whereas age, the interaction of age and sex, and handedness for writing were not associated with subtest performance. Sex was significantly related with types of errors on the Spelling subtest of both forms.

Although the pilot studies showed that the Blue and Tan forms of the Brazil-WRAT3 were equivalent, the data herein presented did not support the equivalence of the two forms. Therefore, they should only be used for initial measurement and reassessment of academic skills if the examiner determines the standard scores (z values) independently for each of the forms in order to ascertain changes in the academic performance of the child. The nonequivalence of the alternate forms of the WRAT3 has been emphasized by other authors²⁴.

This report also indicated a significant association between sex and spelling, such that girls performed better than boys. Additionally, it was found that boys committed more accentuation errors on the Blue and Tan forms and more errors of omission of syllables on the Tan form, compared to girls. The finding that girls outperformed boys on the Spelling subtest of both forms of the Brazil-WRAT3 was consistent with data reported previously with regard to other neuropsychological assessment instruments^{1,11}.

The present study indicated that the ethnic group of the child was significantly correlated with performance on the Spelling, Arithmetic and Reading subtests of both forms of the Brazil-WRAT3. The data for the Blue form showed that European-Brazilian and multiethnic children outperformed African-Brazilian children on the Spelling subtest. Moreover, European-Brazilian children performed the Arithmetic subtest better than African-Brazilian and multiethnic children and outperformed the African-Brazilian children on the Reading subtest. The data for the Tan form indicated that European-Brazilian children outperformed both African-Brazilian and multiethnic children on the Spelling subtest and furthermore European-Brazilian and multiethnic children performed the Arithmetic and the Reading subtests better than African-Brazilian children. It should be emphasized that ethnic group membership was assigned by the author solely on the visual inspection of the child. Although this method of group assignment could be open to criticism, it is consistent with current practices^{25,26}. It bears mention, however, that ethnicity had no significant correlation with several other instruments used in the neuropsychological assessment of children as shown in previous studies^{1,10,11}.

Therefore, the association of ethnicity and neuropsychological performance is not clear.

The socioeconomic background of the child measured by the occupation of their fathers and mothers was significantly related to the overall performance on the Spelling, Arithmetic and Reading subtests of both forms of the Brazil-WRAT3. Children of parents with higher occupational levels scored higher than children of parents with lower occupational levels on the Spelling and Reading subtests of the Tan form. For the Blue form, however, the conservative posthoc tests used in the analysis did not indicate any significant association between parental occupation and performance on the three subtests. Although the Tan form findings could be expected²⁷, previous studies showed that social status was not correlated with performance on other neuropsychological assessment instruments^{1,11}, as it was found for the Blue form of the Brazil-WRAT3. Therefore, the correlation between socioeconomic status and neuropsychological performance cannot be considered clearcut.

The present study also found that children who had failed at least one school grade scored lower than children who had never failed a grade in school on each of the subtests of the Blue form. For the Tan form, however, this difference in performance was observed only on Spelling and Reading. Therefore, it can be concluded that the data herein presented have criterion-related validity in the sense that children who had never failed a school grade scored higher than children who had failed at least one grade.

This report also presented the finding that children right-handed for writing performed the Spelling and Arithmetic subtests of the Blue form better than children who wrote with the left hand. However, there was no association between hand used for writing and subtest performance on the Tan form. A difference in the frequency of left handedness could not explain the discrepancy in the findings because the frequency of left handedness was equivalent for the two forms (Blue, 9.14% and Tan, 10.75%). In addition, a difference in difficulty could not explain the correlation between handedness and the performance on the Spelling and Arithmetic subtests of the Blue form because such a difference in difficulty between the Blue and Tan forms was not found for the Arithmetic subtest. Therefore, the finding of an association between handedness and performance on some subtests of the Brazil - WRAT3 needs to be further scrutinized.

The association of auditory and visual dysfunction with the performance on the Spelling, Arithmetic and Reading subtests of the Brazil-WRAT3 was found only for the Tan form. The reasons for the specificity of these findings are not clear. Difference in difficulty in the performance of the two forms could not explain these findings because the performance on the Arithmetic subtest was equivalent across forms. Thus, it would appear that

the relationship between disturbances in auditory and visual function, and academic performance needs to be further studied.

It is possible that the profile of the academic performance of Brazilian public school children shown in the present study is associated with more fundamental aspects of language skills which could not be addressed by the instruments used in this report as, for example, phonological decoding, phonological awareness and lexical access. Such research has recently begun.

In conclusion, the present study found that sex, ethnic group, paternal and maternal occupation and history of the grade failure were significantly related to performance on Spelling, Arithmetic and

Reading of both forms. Furthermore, age and handedness had significant effects on the overall performance of the subtests of the Blue form and children with auditory or visual dysfunction performed the subtests of the Tan form worse than normal children.

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