PRACTICAL RESOURCES for the Mental Health PROFESSIONAL

Culture and Children's Intelligence

Cross-Cultural Analysis of the WISC-III

Edited by
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Psychologists and special educators are increasingly called upon to assess students newly immigrated from another country. The Wechsler tests are perhaps the most widely translated intelligence tests in the world and yet, little is known about the standardization efforts in different countries or how well the WISC-III travels across country, cultural and linguistic borders. This book informs professionals about these issues with respect to 16 different countries in which the WISC has been translated and validated for use.

Sources for obtaining translated versions are provided so that psychologists can assess immigrant students with greater confidence in multiple languages, and the assistance of a bilingual examiner. Issues presented are history of the development of the Wechsler tests, use of the WISC-III in each country and its potential use with ethnic groups in multicultural societies, and intelligence and cognitive processes from cross-cultural and indigenous perspectives. Relationships between WISC-III scores and affluence and education are also discussed.

The cross-cultural analysis of the data strongly indicates that the WISC-III is a remarkably robust measure of intelligence with cross-cultural relevance. It would appear that over fifty years of experience with the Wechsler tests and the periodic revisions during this period have resulted in a refined and valid measure of cognitive processes that has considerable power for assessing children's intelligence, even in different cultural contexts.

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The standardization of the Hellenic Wechsler Intelligence Scale for Children—Third Edition (WISC-III) began in 1993 and was completed in 1997 by the Psychometric Laboratory of the Department of Psychology of the School of Philosophy of the University of Athens (Wechsler, 1997). Psychologists have employed the WISC-R and the WISC for many years in Greece, but these versions were based mostly on translations by individual psychologists from the U.S. WISC without authorization. The norms employed were based on the U.S. sample and not on a representative sample of Greece. As expected, the evaluation of cognitive functioning and computation of IQs and Scaled Scores with the U.S. version of the WISC based on American norms led to questionable diagnoses and prognostic decisions.

The standardization of the WISC-III in Greece was subsequently necessary in order to provide a reliable and valid measure of children's intelligence.

Intelligence and aptitude tests standardized in Greece in the past were an Intelligence Test for Children (Georgas, 1971, 1972), for children ages 6–12 and the Greek adaptation of the Illinois Test for Psycholinguistic Abilities (Paraskevopoulos, 1973). There has been an increase of adaptations and construction of Greek psychological tests during the past 10 years, primarily personality scales, but also tests of learning disabilities (Paraskevopoulos, Kalantzi-Azizi, & Giannitsas, 1999).

ADAPTATION PROCESS

The UK version of the WISC-III (Wechsler, 1992) was employed in the standardization of the Hellenic WISC-III. The adaptation process began with an examination of primarily the verbal items for cultural bias. History of use of the WISC test in Greece indicated that Greek children did not have problems with the nonverbal items. Thus, they appeared to be valid for use in Greece. A panel of experts, including the authors, examined the items of the verbal scales for potential cultural bias. Items from the Greek culture were added as parallel items to those UK items which appeared to be culturally biased, with the intention of making a final decision which items to select for the standardization after the pilot study. Greece has a special problem in terms of item bias. Because many scientific or technical terms have Greek roots, some difficult items in the English language are very simple in Greek. For example in the Information subtest, "hieroglyphics" is not a difficult item in Greek. Also, "capital of Greece" could obviously not be employed and the capital of Portugal was substituted.

Thus, in addition to items from the UK version, items from the Greek culture were also added to the pilot test version. The number of items employed for the pilot study was 30 for Information, 26 for Similarities, and 80 Vocabulary items split into two forms. For Comprehension, an initial study with 40 children indicated that one item, paperback books and hardcover books, was not appropriate since in Greece hardcover books are expensive and most printed books are paperback and school books are all paperback, etc. An item comparing phonograph records and cassettes was substituted.[1] These 18 items were employed for the pilot study and the standardization. The 24 Arithmetic items were maintained, with changes in content. That is, because in some items, differences in monetary value between the pound sterling and the drachma were so great, e.g., 1 pound equaled over 500 drachmas at the time of the standardization, the question was framed differently, without money, but maintaining the same calculations. For example, an item such as, "Phil was paid 25 pounds. He was paid 5 pounds an hour. How many hours

[1] In the meantime, cassettes have been replaced by CDs, and it appears that the replacement of CDs with flexible discs which resemble phonograph records is only a matter or time. This appears to be the danger of employing items based on current technology, which changes so rapidly, in these tests.

did he work?" was changed to "Eleutheria solved 25 problems. She solved 5 problems an hour..."

The pilot study had four goals: (1) to select the items to be employed in the standardization of the WISC-III; (2) to evaluate the adequacy of the Greek translation of the examiner instructions and the syntax of the questions; (3) to add to the sample responses of the UK items which would be retained, and to generate sample responses to the substituted Greek items; and (4) to try out the procedure of administration of the tests and scoring of the responses in order to identify problems requiring further modification for the standardization. The pilot study sample consisted of 216 children ages 5–17, half males and half females, from the greater Athens area. The specific age groups chosen were 5, 6, 8, 10, 12, 14, 16, and 17. The age groups 5 and 17 were chosen so as to provide wider variation of scores in lower and upper age levels of each scale necessary for determining the degree of item differentiation at ages 6 and 16.

Item selection was based on three criteria. The first criterion was cultural bias. If the UK item was not culturally appropriate for Greece, the parallel Greek item was chosen. The second criterion was the degree of item discrimination according to age level and the difficulty level of the item in terms of percent of children passing at a specific age level. First, the percent of children passing each item was plotted according to age levels 5–17. The item was potentially useful if an S curve indicated discrimination between lower and higher age levels. Second, a horizontal line at the point where 50% of the sample correctly answered the question was drawn to the curve, and a vertical line from that point indicated the age level of the item. This enabled selection of the item on the basis of its order of difficulty, but also ensured that items were equally spaced across all age levels. The third criterion was to estimate the biserial correlation of the school marks of each student with pass or failure on each item, as well as the correlation of school marks of each student with total score on each subtest.

In choosing the items for the standardization version, the criterion was employed of maintaining as many items as possible of the UK version in order to minimize changes in the content of each subtest which might have the effect of changing the constructs of the subtests. The final number of items chosen for each Verbal subtest was the same as in the UK version. Of the 30 items of the Information subtest, 20 were identical with the UK version, content appropriate to the Greek culture was substituted for 7 UK version items, e.g., "the distance between two Greek cities," and 3 items were directly from the Greek culture, e.g., "Who was a famous Greek poet?" Nineteen of the twenty items of the UK revision were maintained from Similarities. The computations of all Arithmetic items were maintained, but the content was changed on items with currency. Vocabulary had the most changes. Nineteen items of the UK version were maintained, and 11 Greek items were substituted. Only one item was changed in Comprehension. All the items of the Performance tests of the UK version were appropriate for the Greek context and were maintained.

SAMPLE CHARACTERISTICS

Greece is a homogeneous country in which at the time of the standardization, approximately 98% of the population was ethnically Greek. Approximately 2% of the population of Greece is Moslem and lives in northeastern Greece, although Greek speaking. The standardization sample consisted of 956 children, 482 males and 474 females, with the number of children in each age group ranging from $n = 81$ to 96. The proportions of children from each geographical area of Greece were based on demographic data of 1991 from the National Statistical Service of Greece. These were separated into urban, semi-urban, and towns. Greater Athens is in Attica, and includes the city of Athens, a relatively small area, the port of Piraeus, urban municipalities, suburban areas, and rural towns comprising approximately 45% of the population of Greece; the sample tested in this region was 47% of the total sample. Thessalonike is the second largest city in Greece and the sample tested was 10% of the total, which corresponds to approximately the same percent of the general population. The remainder of the sample was drawn from 14 cities and small towns near the cities, representing all geographical areas in Greece. A special problem were the hundreds of inhabited islands in Greece. Two relatively large islands, Crete and Rhodes, were chosen.

The 127 schools in these areas taking part in the standardization were chosen randomly from the catalog of schools of the Ministry of Education. School marks from the previous year were obtained, as well as information on parent education (Table 13.1). Children were chosen for testing in the following manner. The tester opened a book at random and pointed to the first letter of the first word on left-hand side of the page. The tester then employed the class record of students, and if there was a student whose last name began with that letter, selected the first student with that letter, that is, a boy and a girl from each grade in the school, e.g., one boy and one girl from grade 1, one boy and one girl from grade 2, etc.

The WISC-III was administered by 45 psychologists and graduate students in clinical psychology and school psychology programs. In order to ensure similarity of administration, they attended a specially prepared seminar which presented the details of the method of sample selection, administration procedures, and other aspects of the WISC-III test.

RELIABILITY

The split-half reliability coefficients and standard errors of measurement across ages, for the subtests, IQ, and index scores are presented in Table 13.2. The split-half reliabilities for the Verbal IQ (VIQ) scores ranged between $r = 0.92$ and $r = 0.97$ across the age span, with average $r = 0.96$; the Performance IQ (PIQ) reliabilities ranged from $r = 0.94$ to $r = 0.97$ with average $r = 0.95$; Full Scale IQ (FSIQ) reliabilities ranged from $r = 0.87$ to $r = 0.94$ with average $r = 0.91$. These split-half reliabilities were all above 0.90 and similar to those of the American and UK samples. The average reliability for the Index scores were $r = 0.98$

TABLE 13.1 Demographic Characteristics of the Standardization Sample: Percentages by Age and Parent Education Level

Age	n	Parent education (years)				
		≤6	7–11	12	13–15	≥16
6	96	14.6	8.3	35.4	16.7	25.0
7	88	32.0	14.0	16.0	12.0	26.0
8	86	18.2	12.7	29.1	14.5	25.5
9	83	33.3	27.1	16.7	12.5	10.4
10	85	19.3	29.8	19.3	8.8	22.8
11	87	16.4	20.0	25.5	10.9	27.3
12	96	20.3	20.3	24.3	24.3	10.8
13	81	12.3	29.2	21.5	23.1	13.8
14	90	20.8	13.9	26.4	15.3	23.6
15	81	17.1	18.6	12.9	37.1	14.3
16	83	20.9	14.9	28.4	17.9	17.9
Total	956[a]	20.10	19.10	23.10	18.30	19.40
Greek population (N = 9,039,479)	57.10	10.77	20.65	4.83	6.65	
Greek adults (25–60 years old; N = 3,956,049)		53.07	7.33	25.33	3.82	10.46

Note: The large differences of the population percentages for education level of 11 years or less may be explained in regard to the census data (1991). The 1991 census conveys information selected from people who did not receive any education at all, or received just the basic education, because compulsory education (9 years) was established a few decades ago. Also, young parents have received more years of education than the census data imply, thus the highest categories (13 years or more) are represented by larger percentages in the Greek standardization data.

[a]For the parent education level, n = 661.

for Processing Speed Index (PSI), r = 0.97 for Perception Organization Index (POI), and r = 0.96 for Verbal Comprehension Index (VCI) (identical to that of the Verbal IQ scores, since as will be discussed below, three factors were found in the Greek standardization). The average subtest reliabilities ranged from r = 0.71 for Object Assembly to r = 0.87 for Block Design.

The stability coefficients were determined by n = 200 children retested after a period of between 8 and 16 weeks. Pearson r correlations for the subtests, IQ, and index scores for age groups 6, 8, 12, and 16 and the average correlations across age groups are presented in Table 13.3. The average correlations for the subtests ranged from r = 0.71 for Object Assembly to r = 0.85 for Information. The average correlation for VIQ was r = 0.92, for PIQ was r = 0.87, and r = 0.91 for FSIQ. As expected, the retest correlations were lower for the 6 year olds as compared to the older age groups.

EVIDENCE OF VALIDITY

The intercorrelations of subtest scaled scores are presented in Table 13.4. The pattern of intercorrelations between the four Verbal subtests, Vocabulary,

TABLE 13.2 Reliability Coefficients and Standard Errors of Measurement of the Subtests Scaled Scores, IQ Scores, and Index Scores by Age[a]

	Age in years											
Subtest/scale	6	7	8	9	10	11	12	13	14	15	16	
n	96	88	86	83	85	87	96	81	90	81	83	Average[c]
Information	0.69	0.79	0.78	0.88	0.89	0.83	0.85	0.87	0.88	0.79	0.77	0.83
(SEm)	1.67	1.37	1.41	1.04	0.99	1.24	1.16	1.08	1.04	1.37	1.44	1.12
Similarities	0.68	0.65	0.56	0.65	0.84	0.75	0.85	0.84	0.85	0.75	0.73	0.76
(SEm)	1.70	1.77	1.99	1.77	1.20	1.50	1.16	1.20	1.16	1.50	1.56	1.23
Arithmetic	0.87	0.89	0.88	0.73	0.84	0.8	0.88	0.76	0.75	0.77	0.72	0.82
(SEm)	1.08	0.99	1.04	1.56	1.20	1.34	1.04	1.47	1.50	1.44	1.59	1.14
Vocabulary	0.69	0.67	0.81	0.84	0.88	0.86	0.83	0.83	0.09	0.79	0.86	0.82
(SEm)	1.67	1.72	1.31	1.20	1.04	1.12	1.24	1.24	0.95	1.37	1.12	1.13
Comprehension	0.81	0.83	0.67	0.79	0.8	0.78	0.74	0.73	0.78	0.81	0.47	0.76
(SEm)	1.31	1.24	1.72	1.37	1.34	1.41	1.53	1.56	1.41	1.31	2.18	1.22
Digit span	0.77	0.82	0.8	0.8	0.85	0.86	0.84	0.8	0.87	0.87	0.88	0.84
(SEm)	1.44	1.27	1.34	1.34	1.16	1.12	1.20	1.34	1.08	1.08	1.04	1.10
Picture completion	0.74	0.85	0.74	0.78	0.81	0.86	0.82	0.78	0.73	0.74	0.68	0.78
(SEm)	1.53	1.16	1.53	1.41	1.31	1.12	1.27	1.41	1.56	1.53	1.70	1.19
Coding	0.77	—[b]	—[b]	0.46	—[b]	—[b]	0.62	—[b]	—[b]	—[b]	0.94	0.72
(SEm)	1.44	—[b]	—[b]	2.20	—[b]	—[b]	1.85	—[b]	—[b]	—[b]	0.73	1.29
Picture arrangement	0.79	0.78	0.62	0.82	0.84	0.82	0.76	0.81	0.85	0.78	0.80	0.79
(SEm)	1.37	1.41	1.85	1.27	1.20	1.27	1.47	1.31	1.16	1.41	1.34	1.17
Block design	0.82	0.83	0.09	0.83	0.87	0.88	0.88	0.83	0.89	0.92	0.88	0.87
(SEm)	1.27	1.24	0.95	1.24	1.08	1.04	1.04	1.24	0.99	0.85	1.04	1.04
Object assembly	0.68	0.73	0.7	0.69	0.75	0.77	0.8	0.65	0.69	0.76	0.55	0.71
(SEm)	1.70	1.56	1.64	1.67	1.50	1.44	1.34	1.77	1.67	1.47	2.01	1.27
Symbol search	0.75	—[b]	—[b]	0.8	—[b]	—[b]	0.68	—[b]	—[b]	—[b]	0.67	0.73

(SEm)	1.50	—[b]	—[b]	1.34	—[b]	—[b]	1.70	—[b]	—[b]	—[b]	1.72	1.25
Mazes	0.78	0.67	0.66	0.75	0.81	0.75	0.77	0.46	0.62	0.82	0.77	.73
(SEm)	1.41	1.72	1.75	1.50	1.31	1.50	1.44	2.20	1.85	1.27	1.44	1.26
Verbal IQ	0.94	0.95	0.95	0.96	0.97	0.96	0.97	0.97	0.97	0.95	0.92	.96
(SEm)	3.61	3.22	3.29	3.07	2.64	2.85	2.64	2.64	2.42	3.22	4.22	1.75
Performance IQ	0.94	0.95	0.94	0.94	0.96	0.96	0.96	0.95	0.96	0.97	0.96	.95
(SEm)	3.70	3.32	3.64	3.58	3.15	3.07	3.15	3.49	3.11	2.60	2.92	1.80
Full scale IQ	0.87	0.90	0.90	0.90	0.92	0.93	0.93	0.92	0.94	0.93	0.88	0.91
(SEm)	5.41	4.84	4.74	4.79	4.24	4.11	3.85	4.27	3.79	4.11	5.15	2.12
Percept. organ. index	0.96	0.97	0.96	0.97	0.97	0.97	0.97	0.96	0.97	0.97	0.96	0.97
(SEm)	3.00	2.72	3.07	2.81	2.55	2.46	2.60	2.85	2.81	2.72	3.11	1.67
Processing speed index	0.98	0.982	0.972	0.971	0.97	0.972	0.971	0.972	0.972	0.984	0.984	0.98
(SEm)	2.12	2.01	2.51	2.55	2.60	2.51	2.55	2.51	2.51	1.90	1.90	1.53

[a] N varies with group. The reliability coefficients for all subtests except Coding and Symbol Search are split-half correlations corrected by the Spearman-Brown formula. For Coding and Symbol Search, raw-score test-retest correlations are presented for four age groups; these coefficients, which are based on samples of 50 children tested twice, were corrected for the variability of the appropriate standardization group (Guilford & Fruchter, 1978). The coefficients for the IQ and factor-based scales were calculated with the formula for the reliability of the composite (Nunnally, 1978); the values for the supplementary subtests (Digit Span, Mazes, and Symbol Search) were not included in these computations. The standard errors of measurement are reported in scaled-score units for the subtests, in IQ units for the Verbal, Performance, and Full Scale scores, and in index units for the Perceptual Organization, and Processing Speed scores. For the Freedom from Distractibility Index no coefficients are reported since this factor does not emerge in the Greek data. Also, for the Verbal Comprehension Index, no coefficients are reported since the respective first factor in the Greek data is the same with the Verbal IQ index.

[b] For Coding and Symbol Search, the best estimates of the reliability coefficient at an age level for which retesting was not done is the value obtained at the adjacent age level. These "best estimates" for Coding and Symbol Search were used for computing the reliabilities of the composites to which these subtests contribute. For ages 14 and 15 the reliability coefficient of age 16 was used as the best possible estimate.

[c] The average r was computed with Fisher's z transformation. The average Standard Errors of Measurement (SEms) were calculated by averaging the sum of the squared SEms for each age group and obtaining the square root of the results.

TABLE 13.3 Stability Coefficients of the Subtests and IQ Scales by Age ($n = 200$)

	Ages								
	6 ($n = 50$)		8 ($n = 50$)		12 ($n = 50$)		16 ($n = 50$)		
Subtest/scale	r_{12}	r_c^a	r_{12}	r_c^a	r_{12}	r_c^a	r_{12}	r_c^a	Average[b]
Information	0.69	0.74	0.89	0.83	0.86	0.91	0.89	0.86	0.85
Similarities	0.60	0.45	0.83	0.69	0.76	0.80	0.90	0. 88	0.74
Arithmetic	0.42	0.54	0.71	0.79	0.87	0.88	0.75	0.76	0.77
Vocabulary	0.55	0.44	0.80	0.72	0.90	0.93	0.83	0.81	0.78
Comprehension	0.70	0.80	0.83	0.80	0.58	0.67	0.61	0.77	0.77
Digit span	0.66	0.85	0.57	0.57	0.63	0.68	0.76	0.90	0.78
Picture completion	0.75	0.75	0.81	0.69	0.89	0.90	0.93	0.91	0.83
Coding	0.65	0.77	0.55	0.55	0.75	0.62	0.93	0.94	0.77
Picture arrangement	0.67	0.67	0.73	0.60	0.78	0.64	0.86	0.84	0.70
Block design	0.56	0.61	0.62	0.62	0.87	0.85	0.92	0.94	0.80
Object assembly	0.64	0.77	0.76	0.71	0.77	0.79	0.57	0.53	0.71
Symbol search	0.53	0.75	0.74	0.80	0.70	0.68	0.72	0.67	0.73
Mazes	0.63	0.64	0.73	0.72	0.78	0.72	0.76	0.83	0.74
Verbal IQ	0.79	0.84	0.92	0.94	0.91	0.95	0.93	0.93	0.92
Performance IQ	0.83	0.91	0.83	0.75	0.88	0.84	0.94	0.93	0.87
Full scale IQ	0.87	0.93	0.92	0.88	0.90	0.91	0.94	0.93	0.91

[a] Correlations were corrected for the variability of WISC-III scores on the first testing (Guilford & Fruchter, 1978).

[b] Weighted averages of corrected correlations for all ages were obtained with Fisher's z transformation ($n = 200$).

Similarities, Arithmetic, and Comprehension was high, ranging from $r = 0.33$ between Arithmetic and Comprehension to $r = 0.60$ between Information and Vocabulary. On the other hand, the intercorrelations between the Performance subtests were lower than the Verbal subtests. In general, the patterns are similar with those of the U.S. test.

The construct validity of the Greek adaptation of the WISC-III was tested through several factor-analytic models, both on the exploratory and on the confirmatory levels. The methods employed were the same as in the U.S. and the UK standardizations. For the exploratory factor analysis models the maximum likelihood method was employed followed by orthogonal rotation of the axes. Oblique rotations resulted in similar factor structures, thus the orthogonal factor solutions were explored further. These exploratory factor analyses were performed for all age groups ($n = 956$) and for four age-bands: 6–7 years ($n = 185$), 8–10 years ($n = 253$), 11–13 years ($n = 264$), and 14–16 years ($n = 254$). At the first stage of exploratory factor analysis it appeared that for the Greek data there was no

TABLE 13.4 Intercorrelations of Subtest Scaled Scores ($n = 956$)

Subtest/scale	Inf	Sim	Ari	Voc	Com	DS	PCom	Cd	PA	BD	OA	SS	Mz
Information													
Similarities	0.60												
Arithmetic	0.50	0.40											
Vocabulary	0.59	0.58	0.44										
Comprehension	0.37	0.40	0.33	0.43									
Digit span	0.28	0.30	0.35	0.30	0.21								
Picture completion	0.31	0.33	0.27	0.27	0.27	0.12							
Coding	0.24	0.28	0.26	0.24	0.15	0.24	0.22						
Picture arrangement	0.38	0.30	0.36	0.35	0.31	0.18	0.36	0.24					
Block design	0.39	0.38	0.38	0.35	0.26	0.27	0.39	0.32	0.41				
Object assembly	0.29	0.29	0.26	0.28	0.20	0.21	0.37	0.24	0.37	0.59			
Symbol search	0.28	0.29	0.34	0.28	0.24	0.23	0.20	0.44	0.31	0.39	0.30		
Mazes	0.20	0.20	0.27	0.20	0.14	0.18	0.24	0.15	0.29	0.38	0.35	0.23	

clear-cut four factor solution. Arithmetic was not closely linked to Digit Span, neither for the four age-bands nor for the total sample. In addition, there were strong indications that Arithmetic was closely linked to the other verbal subscales and that Digit Span did not emerge on any factor.

At a second stage, a three-factor solution was attempted which resulted in the factor loadings presented in Table 13.5. These factor structures also indicated the existence of three factors, a Verbal Comprehension factor (Vocabulary, Information, Similarities, Arithmetic, and Comprehension), a Perceptual Organization factor (Picture Completion, Picture Arrangement, Block Design, and Object Assembly), and a Processing Speed factor (Coding, and Symbol Search). For the Processing Speed factor a discrepancy was observed for the age group of 6–7 years, for which this third factor did not appear. For the Perceptual Organization Index the Mazes subscale also loaded highly on the factor, but the supplementary nature of the subscale led to the decision not to include it in the final POI index (after having employed the methods followed in the WISC-III^{UK} standardization, as well, as described in the UK standardization manual) (Wechsler, 1992, p. 82).

The exploratory factor analyses structures were tested through successive confirmatory factor analysis models as well. The null model was tested followed by unifactorial, two-, three-, four-, and five-factor models. These models were tested for all 956 cases and for each age-band separately. Improvement for goodness-of-fit and other criteria (root mean square error of approximation and χ^2 significance levels) favored a three-factor solution, but also indicated a possibility for a four-factor solution for two age-bands (8–10 and 14–16), although the improvement from the three-factor structures was not very high. Also, for the

TABLE 13.5 Maximum-Likelihood Factor Loadings (Varimax Rotation) for Three Factors

	Factor 1: Verbal comprehension				Factor 2: Perceptual organization				Factor 3: Processing speed			
	Ages				Ages				Ages			
Subtest/scale	6–7	8–10	11–13	14–16	6–7	8–10	11–13	14–16	6–7	8–10	11–13	14–16
Information	0.68	0.80	0.73	0.80	0.24	0.26	0.26	0.26	0.31	0.24	0.12	0.10
Similarities	0.73	0.71	0.75	0.72	0.23	0.27	0.23	0.23	0.00	0.20	0.19	0.29
Arithmetic	0.73	0.49	0.52	0.43	0.25	0.24	0.48	0.36	0.87	0.37	0.14	0.16
Vocabulary	0.69	0.68	0.82	0.76	0.19	0.30	0.17	0.20	0.19	0.31	0.17	0.25
Comprehension	0.54	0.57	0.56	0.49	0.22	0.21	0.22	0.17	0.20	0.26	0.06	0.09
Picture completion	0.23	0.42	0.38	0.21	0.46	0.51	0.40	0.51	0.13	0.21	0.15	0.01
Picture arrangement	0.20	0.45	0.38	0.31	0.60	0.39	0.41	0.51	0.16	0.26	0.13	0.19
Block design	0.26	0.37	0.28	0.21	0.69	0.66	0.71	0.75	0.09	0.25	0.26	0.33
Object assembly	0.17	0.19	0.13	0.16	0.68	0.81	0.70	0.72	-0.04	0.18	0.09	0.24
Coding	0.16	0.27	0.19	0.27	0.34	0.25	0.21	0.18	0.15	0.69	0.96	0.58
Symbol search	0.30	0.24	0.26	0.17	0.38	0.24	0.41	0.24	0.19	0.66	0.41	0.72
Digit span	0.33	0.34	0.28	0.33	0.30	0.18	0.19	0.19	0.16	0.38	0.17	0.23
Mazes	0.09	0.18	0.20	0.16	0.58	0.46	0.46	0.45	0.12	0.20	0.09	0.13

age group of 6–7 years, a two-factor solution seemed to fit the subscale covariance matrix quite well, which verified the discrepancy observed in the exploratory phase. However, for the total standardization sample the improvement from the three- to the four-factor model was not large. For these reasons and also due to the results of the exploratory factor analyses, we concluded that the three-factor solution was the more appropriate for the Hellenic WISC-III standardization data.

Most of the studies of the U.S. WISC-III supported a four-factor solution (e.g., Roid, Prifitera, & Weiss, 1993; Tupa, Wright, & Fristad, 1997; Wechsler, 1991). One possible explanation for the three-factor outcome for the Greek standardization might be that the Greek school curriculum emphasizes formal arithmetic teaching instead of problem solving techniques, mainly addressed by the Arithmetic subscale. Thus, Arithmetic items might be addressed more "formally" by Greek students and less as a way of implementing mathematical knowledge for problem solving. As a consequence, it is possible that Arithmetic loads better on a Verbal-Cognitive factor rather than forming a Freedom from Distractibility Index together with Digit Span.

An indication of external validity was the correlations between father's and mother's education and performance on the subtests, IQ scores, and index scores (Table 13.6). Low correlations were found on all the subtests, an average of $r = 0.20$ on the Verbal subtests and somewhat lower on the Performance subtests. The correlations between father's and mother's education and VIQ were $r = 0.36$ and $r = 0.33$, respectively; with PIQ, $r = 0.24$ and $r = 0.19$; and with FSIQ, $r = 0.22$ and $r = 0.30$. The correlations between father's and mother's education and the VCI were $r = 0.22$ and $r = 0.19$, respectively; and with the POI, $r = 0.18$ and $r = 0.13$. In an intelligence test for children constructed and standardized by Georgas (1971, 1972) over 30 years ago, the correlations between a vocabulary test and three nonverbal tests with parental education and socioeconomic status were much higher, in the 0.60s for the verbal test. The lower correlations found with the WISC-III would be very likely due to greater homogeneity in education and socioeconomic status; increased percents of students attend high school and the economic level of Greece has increased during these past three decades.

Another measure of external validity was the correlation between school marks and performance on the WISC-III. The average correlations across all ages were $r = 0.31$ for VIQ, $r = 0.31$. $r = 0.22$ for PIQ, and $r = 0.30$ for FSIQ. The correlations ranged from a low of $r = 0.23$ for ages 11–13 for VIQ to $r = 0.50$ for ages 14–16 for VIQ.

CULTURAL ISSUES INFLUENCING WISC-III INTERPRETATION IN GREECE

Greece forms the base of the Balkan peninsula in the Eastern Mediterranean. Its geographic features are a spine of mountains that extends from north to south, a few fertile plains, and the hundreds of islands scattered throughout the Ionian,

TABLE 13.6 Correlations of Subscale Scores with Education Level of Father and Mother

Age	Educ. level	Inf	Sim	Ari	Voc	Com	DS	PCom	Cd	PA	BD	OA	SS	Mz	VIQ	PIQ	FSIQ	POI	PSI
6	Father	0.18	0.32	0.23	0.20	0.02	0.38	−0.09	−0.14	0.17	0.22	0.03	0.03	0.06	0.27	0.04	0.17	0.02	−0.11
	Mother	0.13	0.21	0.13	0.19	−0.08	0.29	−0.19	−0.25	0.05	0.34	−0.04	0.20	0.26	0.21	0.03	0.14	0.19	−0.09
7	Father	0.50	0.31	0.35	0.55	0.35	0.32	0.11	0.04	0.12	0.24	0.11	0.24	0.06	0.57	0.21	0.52	0.20	0.13
	Mother	0.42	0.29	0.32	0.40	0.24	0.26	0.20	−0.05	0.19	0.37	0.22	0.19	0.17	0.46	0.34	0.52	0.37	0.05
8	Father	0.18	0.17	0.09	0.17	−0.05	0.18	0.14	0.17	−0.13	−0.05	0.14	0.09	0.29	0.14	0.08	0.12	−0.01	0.19
	Mother	0.27	0.29	0.16	0.22	0.05	0.23	0.03	0.18	−0.14	0.00	0.05	0.14	0.03	0.29	0.05	0.19	−0.04	0.20
9	Father	0.25	0.36	0.10	0.30	0.28	0.24	0.32	0.20	0.11	0.11	0.09	0.13	0.02	0.31	0.22	0.30	0.15	0.17
	Mother	0.42	0.45	0.07	0.29	0.38	0.15	0.19	0.06	0.13	−0.03	0.00	0.09	0.03	0.39	0.09	0.29	0.06	0.07
10	Father	0.60	0.43	0.31	0.52	0.44	0.29	0.33	0.34	0.39	0.49	0.43	0.34	0.21	0.62	0.52	0.63	0.52	0.35
	Mother	0.50	0.47	0.30	0.42	0.29	0.31	0.25	0.37	0.31	0.37	0.37	0.27	0.15	0.54	0.45	0.55	0.43	0.34
11	Father	−0.01	0.36	0.10	0.15	0.30	0.00	0.30	0.20	0.11	0.14	0.20	−0.07	0.14	0.23	0.33	0.31	0.24	0.11
	Mother	0.25	0.26	0.31	0.09	0.15	0.08	0.22	0.12	0.29	0.30	0.18	−0.07	0.27	0.29	0.35	0.35	0.32	0.04
12	Father	0.16	0.20	0.32	0.26	0.36	0.37	0.15	0.24	0.28	0.19	0.07	0.26	0.06	0.34	0.27	0.33	0.25	0.27
	Mother	0.17	0.15	0.30	0.30	0.23	0.28	0.07	0.09	0.25	0.07	0.11	0.16	0.04	0.29	0.16	0.25	0.18	0.11
13	Father	0.24	0.38	0.21	0.25	0.10	0.07	0.31	−0.03	0.01	0.26	0.24	0.10	−0.07	0.30	0.21	0.30	0.24	0.21
	Mother	0.34	0.42	0.19	0.37	0.36	0.21	0.29	0.21	0.17	0.21	0.17	0.31	−0.01	0.40	0.31	0.41	0.15	0.22
14	Father	0.34	0.24	0.25	0.39	0.25	0.00	0.04	0.20	0.24	0.16	0.12	0.17	0.21	0.39	0.27	0.38	0.24	0.21
	Mother	0.29	0.22	0.11	0.38	0.24	0.02	0.05	0.24	0.18	0.12	0.06	0.17	0.06	0.32	0.21	0.31	0.15	0.22
15	Father	0.33	0.44	0.25	0.27	0.18	0.36	0.13	0.26	0.27	0.13	0.15	0.25	0.12	0.38	0.24	0.35	0.14	0.21
	Mother	0.11	0.16	0.07	0.03	0.09	0.27	0.16	0.00	0.12	−0.03	0.03	0.07	0.03	0.12	0.07	0.11	0.05	0.04
16	Father	0.40	0.37	0.11	0.34	0.27	0.00	0.04	0.18	0.01	0.14	0.17	0.22	−0.14	0.42	0.17	0.34	0.14	0.21
	Mother	0.27	0.27	0.13	0.33	0.35	0.15	0.05	0.04	0.00	0.06	−0.01	0.03	−0.17	0.37	0.06	0.24	0.04	0.04
All	Father	0.19	0.26	0.17	0.22	0.19	0.18	0.14	0.16	0.15	0.17	0.15	0.17	0.10	0.36	0.24	0.35	0.22	0.18
ages	Mother	0.20	0.21	0.15	0.19	0.17	0.17	0.12	0.10	0.14	0.14	0.12	0.12	0.08	0.33	0.19	0.30	0.19	0.13

Aegean, and Cretan seas. The population of Greece is approximately 10,500,000, with almost half living in the greater Athens region. Greece is a homogeneous country with approximately 98% of the population Greek and its religion is Greek Orthodox. Its ethnic composition has changed somewhat during the past 10 years with an influx of refugees from Albania and Middle East countries which represent perhaps 4% of the population at the present time.

One source of bias in psychological tests is a result of cultural influences. Language is both a cultural product and the means of communication of cultural ideas, products, behavior, values, etc. The modern Greek language has evolved from ancient Greek. An important feature of the Greek language within the geographical context of Europe, the Middle East, and North Africa is that no language in these countries, except for Cyprus, is directly related to Greek. French, Italian, and Spanish, for example, are derived from Latin, countries in the Balkans speak variations of Slavic languages, English has Anglo-Saxon roots, and there are the Germanic languages, the Scandinavian languages, in addition to Arabic, Turkish, and other languages. Thus, the Greek language is unique in this context, in addition to its employment of the Greek alphabet.

On the other hand, Greek words have been incorporated into many other languages. It has been estimated that approximately 30% of the words in the English language have Greek roots. They include common terms such as "airplane," "taxi," "new," many scientific terms such as, "therapy," "geography," "arithmetic," "physics," terms in political science such as "democracy," "hegemony," "ideology," "technological," and "cybernetics." Approximately 20% more words are required to express the same sentence in Greek as compared to English. In addition, Greek syntax differs from that in English and other languages.

The decision to administer the Hellenic WISC-III to an ethnic Greek child or adolescent in another country or the version of that country depends upon the number of years of residence and the language facility in the Greek or host country language. The above aspects of the Greek language are important in evaluating the cognitive abilities on the Verbal subtests. If the language facility in Greek is not high, it may be preferable to employ the host country version. In borderline situations of language competence, it might be possible to employ a combination of both versions of the WISC-III.

Because of the uniqueness of the Greek language and the necessity for communication of Greeks with other member-states of the European Union, students begin studying foreign languages at an early age. The proportion of young people in Greece who are bilingual and trilingual is among the highest in the European Union. This foreign language facility can be reflected in performance on the Vocabulary subtest.

As indicated above, Arithmetic is part of the VCI. Its high correlations with Information (0.50), Vocabulary, (0.44) and Similarities (0.40) are in fact higher than the correlations between Comprehension and these same three Verbal subtests, suggesting closely related cognitive processes of mathematical thinking with these verbal tests.

Because of the homogeneity of the Greek culture, differences in intelligence test performance associated with socioeconomic status, parent education, and, particularly, rural-urban residence, have lessened during the past 30 years. The marginal increase in refugees and immigrants during recent years, particularly ethnic Greeks from the former Soviet Union, does raise an issue of evaluation of their intellectual functioning with the WISC-III. But the small numbers in each ethnic group do not warrant the high costs of standardization for each ethnic group. One of the desirable consequences of this book is that the comparisons of the standardizations of the WISC-III in different cultures will permit psychologists to make better judgments regarding the intellectual functioning of ethnic groups based on the degree of variability of the subtests in different cultures, for example, certain Performance tests as compared to Verbal tests.

PROFESSIONAL ISSUES IN THE USE OF INTELLIGENCE TESTS IN GREECE

Psychology has had a long history but only a brief presence in modern psychology in Greece. The history of psychology begins with the systematic study of psychological phenomena in the 7th century B.C. by Hellenic philosophers. The etymology of the term philosophy is the love of wisdom, and is characteristic of the belief of the ancient Greek philosophers that observation and logic are methods for understanding social and physical phenomena in contrast to the animistic beliefs of the cultures of that period. The term "psychology" denotes both psyche and logic. The precursors of many theories in modern psychology are of Hellenic origin. Locke's empiricism was originally discussed by Democritus, Epicouros, and Aristotle, and the term agraphos pinax was employed by Aphrodiseas many centuries before tabula rasa. The recent rise of cognitive psychology with its challenge to behaviorism and to psychoanalysis had its antecendents in the skepticism of the reality of the senses and its belief in rationalism as exemplified by Pythagoras, Heraclitos, Democritus, Anaxagoras, Socrates, Plato, and Aristotle. Plato discussed the relationship of nature and nurture, and his treatment of the role of dreams in the psyche antedates Freud's unconscious. Aristotle was the most eminent in defining and systematically studying the phenomena of psychology. He wrote about the senses and perception, about the nature of the psyche, about sleep and alertness, about dreams, about youth and old age. His writings on the phenomena of memory and recollections were precursors of the law of association by the British associationists. In social psychology, Holland's theory of attitude change has its precursors in Aristotle's Rhetorics.

The science of modern psychology in Greece begins with Theophilos Voreas, who wrote his Ph.D. under Wundt in 1897, and established the first Psychological Laboratory at the University of Athens in 1926. The first Greek book, *Child Psychology,* was written by G. Sakellariou in 1922, who also standardized

the Binet-Simon intelligence test, and went on to establish the Psychological Laboratory of the University of Thessalonike in 1937. However, the first programs issuing degrees in psychology were established in Greece beginning in the late 1980s. At the present time, there are four departments of psychology: at the Aristotelian University of Thessalonike, the University of Crete, the University of Athens, and Panteion University. The title of the degree is the Ptychion. Graduate programs (Metaptychiako diploma) are in areas such as clinical psychology, school psychology, organizational and economic psychology, and cognitive science. Programs leading to the Ph.D., Didaktoriko Diploma, by research, are offered in a variety of fields in psychology. Both the certification and licensing of psychologists was mandated by law in 1979 and in 1993, respectively.

There are two psychological associations in Greece. The Association of Greek Psychologists (AGP) was established in 1963. It is currently primarily an association of professional psychologists and membership is based on at least a Masters level degree in psychology. The AGP is a member of the European Federation of Psychologists' Associations (EFPA). The Hellenic Psychological Society was established in 1990. It is an association of university faculty and psychologists at research institutions, and the requisite for full membership is a Ph.D. in psychology. There is a code of ethics regulating teaching, research, and practice of psychology, including issues related to the use of psychological testing, and Greece is also bound by the code of ethics of EFPA. The sale of the WISC-III by the publisher is restricted to members of the AGP, to members of the Hellenic Psychological Society, and to university departments in psychology, mental health, and other institutions which have qualified psychologists on their staff. Intelligence tests are administered only by psychologists and the AGP has played an important role in monitoring the attempts to administer psychological tests by other professionals.

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