

# Assessment

<http://asm.sagepub.com>

---

## **WAIS-III Percentile Scores by Education and Sex for U.S. and Canadian Populations**

R. Stewart Longman, Donald H. Saklofske and Tak S. Fung

*Assessment* 2007; 14; 426

DOI: 10.1177/1073191107304114

The online version of this article can be found at:  
<http://asm.sagepub.com/cgi/content/abstract/14/4/426>

---

Published by:

 SAGE Publications

<http://www.sagepublications.com>

**Additional services and information for *Assessment* can be found at:**

**Email Alerts:** <http://asm.sagepub.com/cgi/alerts>

**Subscriptions:** <http://asm.sagepub.com/subscriptions>

**Reprints:** <http://www.sagepub.com/journalsReprints.nav>

**Permissions:** <http://www.sagepub.com/journalsPermissions.nav>

# WAIS-III Percentile Scores by Education and Sex for U.S. and Canadian Populations

**R. Stewart Longman**

*Calgary Health Region*

**Donald H. Saklofske**

**Tak S. Fung**

*University of Calgary*

*Tables are presented for the Wechsler Adult Intelligence Scale—Third Edition (WAIS-III) IQ and index scores by education level for both the U.S. and Canadian normative samples. This allows clinicians to provide more accurate identification of relative strengths or weaknesses, compared to expectations from an individual's background, rather than the general population. Because sex differences are notable on the Processing Speed Index, data for this measure are presented separately. The similarities and differences between the two national samples are noted, with particular reference to the relatively weaker demographic effects found in the Canadian sample.*

**Keywords:** WAIS-III; demographic effects; sex effects; intelligence

Intellectual assessment is a usual component of vocational, psychoeducational, and neuropsychological testing. Full-scale, domain IQ, and index scores, reflecting a summary of data from several (or more) subtests, can provide an indication of current cognitive abilities, aptitude and potential performance at various occupations, or indicate whether skills are markedly below expectations for academic and occupational background, perhaps as a consequence of an acquired injury or illness. The Wechsler tests are among the most often used for such assessments and include the *Wechsler Adult Intelligence Scale—Revised* (WAIS-R; Wechsler, 1981) and *Wechsler Adult Intelligence Scale—Third Edition* (WAIS-III; Wechsler, 1997a).

Previous research has documented a strong relationship between education level and WAIS-R performance (e.g., Reynolds, Chastain, Kaufman, & MacLean, 1987) and

again with the WAIS-III (Taylor & Heaton, 2001). More recently, the six-factor structure (Tulsky, Ivnik, Price, & Wilkins, 2003) of the WAIS-III and *Wechsler Memory Scale—Third Edition* (WMS-III; Wechsler, 1997b) has been examined for the demographic effects of education, ethnicity, age, and sex (Heaton, Taylor, & Manly, 2003). Tables are available for WAIS-R performance by education level (Ryan, Paolo, & Findley, 1991). Currently, WAIS-III *T*-scores calculated by gender, education level, and ethnicity may be derived in a computer-based presentation (The Psychological Corporation, 2001); however, this is available only for users of computerized-scoring software. Moreover, these values have only been calculated for the U.S. standardization data and not for any other country. Although it is tempting to believe that the size of the relationship between education and intellectual skills will be

---

R. Stewart Longman, Calgary Health Region, Calgary, Alberta, Canada. Donald H. Saklofske, Division of Applied Psychology, University of Calgary. Tak S. Fung, Information Technologies, University of Calgary. Standardization data from the *Wechsler Adult Intelligence Scale—Third Edition* Copyright © 1997 (U.S.), Copyright © 2001 (Canada). Harcourt Assessment Inc. Used with permission. All rights reserved. We wish to acknowledge Claire S. Sira for discussion on this topic. Correspondence concerning this article should be addressed to R. Stewart Longman, Department of Psychology, Foothills Hospital, 1403 29th St. N.W., Calgary, Alberta, Canada T2N 2T9; e-mail: Stewart.Longman@calgaryhealthregion.ca.

*Assessment*, Volume 14, No. 4, December 2007 426-432

DOI: 10.1177/1073191107304114

© 2007 Sage Publications

**TABLE 1**  
**Demographic Characteristics**  
**of the U.S. and Canadian WAIS-III**  
**Standardization Samples**

<i>Education Level</i>	<i>Men (%)</i>	<i>Women (%)</i>	<i>Total (%)</i>
U.S. sample			
8 years or less	121 (4.9)	163 (6.6)	284 (11.6)
9 to 11 years	134 (5.5)	155 (6.3)	289 (11.8)
12 years	403 (16.4)	450 (18.4)	853 (34.8)
13 to 15 years	272 (11.1)	307 (12.5)	579 (23.6)
16 or more years	217 (8.8)	228 (9.3)	455 (18.6)
Canadian sample			
8 years or less	31 (2.8)	59 (5.4)	90 (8.2)
9 to 11 years	87 (7.9)	117 (10.6)	204 (18.5)
High school	79 (7.2)	98 (8.9)	177 (16.1)
College/vocational	169 (15.4)	218 (19.8)	387 (35.2)
16 or more years	108 (9.8)	134 (12.2)	242 (22.0)

the same across countries, this should not be assumed. A comparison of the standardization studies between geographically proximate and relatively similar countries (e.g., language) such as the United States and Canada have shown mean differences at the subtest, index, and full-scale levels across a wide age range (Saklofske, Patterson, Gorsuch, & Tulsy, 2001), with the Canadian sample tending to perform slightly better overall.

Following from the arguments in support of using demographic corrected norms, Heaton et al. (2003) contend that such factors as education and ethnicity can have major clinical significance in the neurodiagnostic assessment process, particularly in relation to incorrect classification versus diagnostic accuracy. We contend that practitioners can benefit from the presentation of data showing demographic effects (means, distributions, and percentiles) on the WAIS-III IQ and index measures. Presentation of data across countries can also be helpful to identify consistencies and determine whether it will be necessary to calculate these data separately or whether the results from the U.S. population can be generalized to other nations. For U.S. clinicians, these tables have not been presented in paper form before, and will aid those who do not have the most recent scoring software. For Canadian clinicians, these data are not available in any form and should aid in interpretation.

## METHODS

Data were obtained for the U.S. and Canadian WAIS-III standardization samples. The standardization studies are fully described in the technical manuals (Wechsler, 1997a, 2001, 2002). In addition to IQ and index scores, sex and

ethnic background were recorded for each participant. Table 1 lists the distribution of each sample by education level and sex, as coded in the sample. It is worth noting that, just as the U.S. standardization sample was collected to reflect the 1995 national census for education level, ethnicity/race, and geographical location, the Canadian sample was selected to reflect the 1991 Canadian census, in terms of education level, ethnicity/race, and region. In sampling, those with higher levels of education ended up being overrepresented, whereas those with lower levels of education ended up being underrepresented. For example, 41% of the Canadian population has not completed high school but only 27% of the sample had comparable levels of education. Similarly, 57% of the sample had further education after high school but only 45% of the Canadian population had the same experience. In developing the norms for the Canadian standardization, this was addressed by using continuous norming techniques which use the regression of demographic factors to variables of interest (Gorsuch, 1983; Wechsler, 2001, p. 30), as a more practical and efficient strategy than collecting more data. Several issues were identified for the Canadian context. First, although a substantial proportion of the Canadian population is Francophone, only English-speaking adults were included. As a consequence, the eastern portion of Canada was relatively underrepresented in this sample (20% of the population but 10% of the normative sample), whereas central and western portions were slightly overrepresented. Second, given the different ethnic mix in Canada, appropriate ethnic classifications were derived from the 1991 Canadian census data. Although the U.S. sample was classified as African American, Hispanic, Other or White, the Canadian sample was classified as British, French/European, Other single origin, and multiple origin. This precludes comparison between ethnic groups across samples.

For both samples, the Working Memory Index (WMI) was given to only a subset of participants, (1,299 for the U.S. sample, 897 for the Canadian sample) because the final composition of this index was determined part way through the standardization process.

## RESULTS

For both samples, the predictors of education, sex, and ethnicity/race were entered sequentially, and each additional predictor was compared to the previous one(s) for incremental increases in prediction, as shown in Table 2.

For the U.S. sample as a whole, the correlations between education level and both IQ and index scores are all statistically significant and potentially meaningful in clinical assessment practices. These values are highest for the

**TABLE 2**  
**Squared Multiple Correlations, Sequentially**  
**Entering Education Level, Sex, and Ethnicity as**  
**Predictors of IQ and Index Scores for the U.S.**  
**and Canadian Samples**

	Education	Education, Sex	Education, Sex, and Ethnicity
<b>U.S.</b>			
FSIQ	.260**	.267**	.333**
VIQ	.263**	.276**	.333**
PIQ	.183**	.183	.246**
VCI	.265**	.272**	.323**
POI	.148**	.155**	.223**
WMI	.136**	.147**	.220**
PSI	.138**	.166**	.211**
<b>Canada</b>			
FSIQ	.063**	.065	.066
VIQ	.078**	.082*	.083
PIQ	.025**	.025	.029
VCI	.077**	.080	.082
POI	.015**	.018	.023
WMI	.025**	.030*	.031
PSI	.037**	.048**	.048

NOTE: FSIQ = full-scale IQ; VIQ = verbal IQ; PIQ = performance IQ; VCI = Verbal Comprehension Index; POI = Personal Orientation Inventory; WMI = Working Memory Index; PSI = Processing Speed Index.

\*Increment from previous step significant at  $p < .05$ .

\*\*Increment from previous step significant at  $p < .001$ .

**TABLE 3**  
**Sex Differences and Effect Sizes**  
**for the U.S. and Canadian**  
**Standardization Samples**

	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI
<b>U.S. data</b>							
Men	101.5	102.1	100.5	101.6	101.4	102.1	97.5
Women	98.7	98.1	99.5	98.6	98.5	98.6	102.2
<i>d</i>	.19*	.27*	.07	.20*	.19*	.23*	.31*
<i>N</i>	2,450	2,450	2,450	2,450	2,450	1,299	2,450
<b>Canadian data</b>							
Men	103.8	104.3	102.1	104.2	102.7	103.3	100.9
Women	102.1	101.9	101.6	102.3	100.9	100.9	103.8
<i>d</i>	.11	.16	.03	.13	.12	.16	.19*
<i>N</i>	1,104	1,104	1,104	1,104	1,104	897	1,092

NOTE: See note to Table 2.

\*Significant at  $p < .001$ .

measures with substantial reliance on acquired knowledge or crystallized intelligence (Verbal IQ, Verbal Comprehension Index, and Full Scale IQ [FSIQ]). Sex effects, although substantially smaller, were also statistically significant, with the exception of Performance IQ (PIQ). Finally, ethnic/racial effects were significant for all measures, and

**TABLE 4**  
**U.S. Norms, 8 Years Education or Less**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	114	122	115	120	120	127	114	120
95	109	110	111	112	111	120	111	114
90	106	105	106	105	106	112	106	108
75	96	96	98	95	99	100	96	99
70	94	94	96	93	97	96	93	99
60	90	90	91	90	92	94	91	93
<b>50</b>	<b>86</b>	<b>87</b>	<b>86</b>	<b>87</b>	<b>88</b>	<b>90</b>	<b>88</b>	<b>91</b>
40	82	84	84	85	85	86	84	84
30	79	80	80	81	82	83	81	81
25	78	78	78	78	79	81	76	79
10	67	68	69	69	71	71	68	69
5	59	62	62	65	64	65	60	60
2	49	54	53	55	56	62	54	54
<i>N</i>	284	284	284	284	284	149	121	163
<i>M</i>	85.8	86.7	87.1	86.9	88.4	90.7	86.9	89.1
<i>SD</i>	15.1	14.9	14.5	14.3	14.7	15.2	14.9	15.2

NOTE: See note to Table 2. Median values in bold.

added more than sex effects, although much less than education effects.

In the Canadian sample, education effects were significant for all measures, as expected. However, a substantial sex effect (with female advantage) was noted only for Processing Speed Index (PSI), although smaller effects were noted for both Verbal IQ (VIQ) and the WMI, both featuring a slight male advantage. Finally, there was no evidence for ethnic/racial differences among the chosen categories for the Canadian sample.

The correlations between education and both the index and IQ scores were compared for the U.S. and Canadian samples using  $z$  tests. Unexpectedly, the correlations between IQ or index scores and education level are substantially smaller in the Canadian than in the U.S. sample.

Analysis of variance (ANOVA), using sex and education as grouping variables, was performed to examine if sex effects or sex by education interactions made noteworthy contributions to test scores. In general, sex effects were relatively small, as shown in Table 3, even though generally statistically significant. However, there was a somewhat larger female advantage for the PSI ( $d = .31$ ), possibly enough to affect individual interpretations. The Canadian data showed several sex by education interactions for FSIQ,  $F(4, 1090) = 2.39, p = .049$ , and WMI,  $F(4, 885) = 4.20, p = .002$ . Here, men showed the expected increase of IQ and index scores with increasing levels of education, whereas women showed decreasing or stable scores at the three lowest levels of education but increasing scores for college and university education. Interestingly, the participants in the three lowest education groups tended to be

**TABLE 5**  
**U.S. Norms, 9 to 11 years Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	117	120	123	120	122	117	122	122
95	116	116	115	112	116	113	114	120
90	107	108	108	108	110	110	108	114
75	100	98	102	97	103	102	99	106
70	98	96	101	96	101	101	96	103
60	94	92	96	94	97	96	93	96
<b>50</b>	<b>92</b>	<b>90</b>	<b>92</b>	<b>90</b>	<b>94</b>	<b>92</b>	<b>91</b>	<b>93</b>
40	88	88	89	89	89	88	88	91
30	86	86	85	86	85	86	86	88
25	84	84	82	83	83	84	84	86
10	76	76	76	76	76	76	76	76
5	72	72	73	72	72	67	69	73
2	66	68	66	68	69	65	66	69
<i>N</i>	289	289	289	289	289	164	134	155
<i>M</i>	91.2	91.1	92.7	91.0	93.2	92.1	91.9	94.6
<i>SD</i>	12.6	12.3	13.2	12.4	13.5	13.8	12.9	13.9

NOTE: See note to Table 2. Median values in bold.

**TABLE 7**  
**U.S. Norms, 13 to 15 Years Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	128	132	129	131	132	133	126	137
95	125	125	124	124	126	128	125	128
90	120	120	119	120	120	124	117	122
75	112	113	112	112	112	114	108	115
70	110	110	110	110	109	112	106	114
60	107	107	106	107	106	110	103	111
<b>50</b>	<b>103</b>	<b>102</b>	<b>104</b>	<b>103</b>	<b>102</b>	<b>105</b>	<b>99</b>	<b>106</b>
40	100	99	100	100	99	100	96	103
30	98	97	98	98	96	96	93	99
25	96	95	95	96	94	94	91	96
10	90	90	87	87	88	86	86	88
5	84	83	83	82	80	80	81	86
2	77	76	76	77	76	71	76	81
<i>N</i>	579	579	579	579	579	284	272	307
<i>M</i>	103.6	103.5	103.3	103.5	102.6	104.1	100.3	106.3
<i>SD</i>	12.3	13.0	12.6	12.9	13.3	15.0	12.5	13.4

NOTE: See note to Table 2. Median values in bold.

**TABLE 6**  
**U.S. Norms, 12 Years Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	124	124	128	125	128	126	128	131
95	119	118	122	119	123	122	122	125
90	114	114	118	115	117	115	114	120
75	108	106	110	107	109	108	106	112
70	106	105	106	105	107	107	103	111
60	103	102	105	102	103	104	99	108
<b>50</b>	<b>100</b>	<b>99</b>	<b>100</b>	<b>99</b>	<b>100</b>	<b>101</b>	<b>96</b>	<b>103</b>
40	96	96	97	96	97	97	93	99
30	93	93	92	92	92	94	91	96
25	90	92	91	90	91	91	88	93
10	84	84	83	83	83	84	81	86
5	79	80	78	78	77	80	76	81
2	73	74	72	74	71	74	71	71
<i>N</i>	853	853	853	853	853	457	403	450
<i>M</i>	99.2	98.6	100.1	98.5	99.9	100.0	97.4	103.0
<i>SD</i>	12.8	12.4	13.8	12.6	14.1	12.9	13.5	13.8

NOTE: See note to Table 2. Median values in bold.

**TABLE 8**  
**U.S. Norms, 16 or More Years of Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	140	138	139	140	136	138	134	137
95	132	132	133	132	129	130	128	131
90	129	128	126	129	126	126	122	125
75	120	120	117	120	117	116	112	118
70	118	118	116	118	115	113	111	117
60	114	116	111	115	112	110	106	114
<b>50</b>	<b>112</b>	<b>113</b>	<b>109</b>	<b>113</b>	<b>108</b>	<b>108</b>	<b>103</b>	<b>108</b>
40	109	110	106	110	104	105	99	106
30	106	106	102	107	101	100	96	103
25	103	104	99	105	98	98	93	99
10	94	95	90	96	90	90	86	93
5	88	91	87	90	85	85	84	88
2	86	86	82	85	79	81	79	86
<i>N</i>	445	445	445	445	445	245	217	228
<i>M</i>	111.6	112.1	108.9	112.4	107.9	107.5	103.7	109.5
<i>SD</i>	13.2	12.7	13.9	12.6	13.7	13.7	13.4	13.4

NOTE: See note to Table 2. Median values in bold.

older than those in the more educated groups,  $F(4, 1090) = 5.51, p < .001$ , an effect that was slightly more pronounced for women than for men.

Given the different findings for the U.S. and Canadian standardization samples, separate tables of WAIS-III index and IQ scores by education level were calculated for the two data sets, and are presented in Tables 4 through 8 for the U.S. data, and Tables 9 through 13 for the Canadian data. We chose to combine data for men and women for all

but PSI in both the U.S. and Canadian data sets. Given the relatively small sample sizes for some groups (i.e., those with less than high school education), the combined groups are also likely to present more accurate estimates for extreme percentiles. Separate tables by ethnic/racial groups were not presented for the U.S. sample, because the smaller cell sizes would render percentiles unstable and data for African American and Caucasian groups are already available (The Psychological Corporation, 2001).

**TABLE 9**  
**Canadian Norms, 8 Years Education or Less**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	125	124	122	133	123	128	113	132
95	118	121	119	125	118	126	112	118
90	114	117	110	118	115	119	100	115
75	105	105	102	108	110	106	97	106
70	101	101	101	103	106	104	95	104
60	98	98	98	98	103	99	93	103
<b>50</b>	<b>94</b>	<b>96</b>	<b>97</b>	<b>94</b>	<b>100</b>	<b>97</b>	<b>92</b>	<b>100</b>
40	93	94	94	91	95	95	90	97
30	91	88	93	88	92	90	84	92
25	88	87	90	86	90	89	82	90
10	78	80	80	82	80	80	75	80
5	75	76	73	76	77	78	73	75
2	74	70	72	72	73	71	61	74
<i>N</i>	90	90	90	90	90	83	31	58
<i>M</i>	97.3	97.5	97.6	97.4	99.6	99.4	89.8	99.3
<i>SD</i>	13.9	14.2	13.2	15.0	13.5	14.7	11.3	14.3

NOTE: See note to Table 2. Median values in bold.

**TABLE 11**  
**Canadian Norms, High School Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	136	135	135	140	138	131	135	135
95	128	129	126	128	126	124	128	132
90	122	120	120	121	120	118	118	121
75	110	108	108	111	110	108	109	109
70	107	107	107	108	108	107	106	106
60	103	102	103	104	104	102	100	103
<b>50</b>	<b>100</b>	<b>99</b>	<b>100</b>	<b>102</b>	<b>100</b>	<b>98</b>	<b>97</b>	<b>100</b>
40	96	95	96	96	98	96	95	95
30	92	92	94	93	93	93	90	92
25	90	90	93	92	91	90	90	91
10	82	80	84	80	80	80	84	84
5	76	76	78	76	74	78	75	75
2	72	75	72	75	71	73	73	70
<i>N</i>	177	177	177	177	177	142	79	97
<i>M</i>	100.2	99.6	100.5	100.7	100.2	99.3	99.7	101.4
<i>SD</i>	15.5	15.4	13.9	15.2	15.2	14.9	14.6	15.2

NOTE: See note to Table 2. Median values in bold.

**TABLE 10**  
**Canadian Norms, 9 to 11 Years Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	132	132	136	132	138	130	132	128
95	124	126	126	128	126	126	124	124
90	120	118	118	120	120	121	118	121
75	109	109	106	108	109	112	107	115
70	107	106	104	105	106	109	106	112
60	103	101	102	100	102	103	100	106
<b>50</b>	<b>98</b>	<b>98</b>	<b>98</b>	<b>97</b>	<b>100</b>	<b>98</b>	<b>97</b>	<b>103</b>
40	94	93	95	93	95	95	92	97
30	90	90	93	90	92	91	87	92
25	88	86	92	86	89	88	84	90
10	78	80	80	80	79	76	77	82
5	74	76	74	78	73	74	66	75
2	71	70	69	72	70	71	64	70
<i>N</i>	204	204	204	204	204	183	86	115
<i>M</i>	98.6	98.3	99.3	98.2	99.3	99.3	97.1	101.4
<i>SD</i>	15.2	15.3	15.1	15.2	15.4	14.9	16.6	15.4

NOTE: See note to Table 2. Median values in bold.

**TABLE 12**  
**Canadian Norms, College/Technical/  
Vocational Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	130	132	131	132	130	132	132	135
95	125	124	125	125	126	125	128	128
90	121	120	120	122	122	120	124	124
75	114	113	110	113	112	112	113	118
70	113	112	109	112	111	110	112	112
60	108	108	106	108	106	106	109	109
<b>50</b>	<b>104</b>	<b>104</b>	<b>103</b>	<b>104</b>	<b>103</b>	<b>103</b>	<b>103</b>	<b>106</b>
40	101	101	100	101	100	100	97	103
30	97	97	96	96	96	97	95	97
25	96	95	94	94	93	95	92	96
10	86	86	85	85	83	85	84	84
5	80	80	80	82	78	81	82	80
2	74	77	73	78	73	71	75	79
<i>N</i>	387	387	387	387	387	326	166	217
<i>M</i>	103.8	103.8	102.8	103.7	102.4	103.0	103.3	105.8
<i>SD</i>	13.7	13.3	13.6	13.6	14.2	13.9	14.9	14.8

NOTE: See note to Table 2. Median values in bold.

**DISCUSSION**

Although both U.S. and Canadian data show expected and marked education effects, the relationship between education and IQ or index performance is substantially stronger in the U.S. sample. Similarly, attenuated association between education level and intellectual performance has been found for the French version of the WAIS-R

(Grégoire, 2001). As a consequence, the standard deviations are smaller for each education group in the U.S. samples. This effect is most pronounced for the extreme percentiles at each end of the distribution. In these cases, using education and country-specific comparisons will be more informative than relying on estimates from the population as a whole. If, for example, demographic-based U.S. norms were applied to university-educated Canadians,

**TABLE 13**  
**Canadian Norms, 16 or More Years**  
**of Education**

Percentile	FSIQ	VIQ	PIQ	VCI	POI	WMI	PSI	
							Male	Female
98	142	140	138	138	133	142	132	141
95	133	134	130	134	126	134	128	132
90	128	128	124	125	122	126	124	124
75	117	120	112	120	114	114	112	115
70	115	118	110	118	112	113	109	113
60	112	114	106	115	107	109	106	112
<b>50</b>	<b>109</b>	<b>109</b>	<b>104</b>	<b>109</b>	<b>105</b>	<b>107</b>	<b>103</b>	<b>108</b>
40	106	107	102	108	101	104	100	103
30	101	103	97	104	97	97	100	100
25	100	102	96	101	95	95	95	97
10	92	93	89	93	86	91	90	87
5	83	84	84	86	80	84	82	82
2	78	78	76	78	75	78	82	70
<i>N</i>	242	242	242	242	242	161	108	132
<i>M</i>	108.7	110.1	104.7	110.2	104.3	106.2	104.2	106.2
<i>SD</i>	14.3	14.2	14.0	13.7	14.2	14.9	12.8	14.9

NOTE: See note to Table 2. Median values in bold.

their performance may appear slightly weaker on PIQ and the Perceptual Organization Index (POI). In contrast, the typical Canadian with a markedly lower education level than the average may be characterized as performing somewhat better than expected for his or her background. These effects would be reversed, of course, for an American assessed with Canadian norms.

Sex effects were found but were not a major focus of this study. Small, but statistically significant effects can be expected because of the large normative samples. The female advantage on PSI is substantial enough to be considered in individual cases (.31 *SD*), and is consistent with data from other samples (e.g., Kaufman, MacLean, & Reynolds, 1988; van der Sluis et al., 2006) and other cognitive measures (Camarata & Woodcock, 2006; Feingold, 1988). The pattern of slight male advantage on the WMI is also consistent with other data (van der Sluis et al., 2006).

An unexpected finding is the relative lack of educational effects for Canadian women at the lower levels of education. Women with education levels ranging from less than Grade 8 to completing high school did not show meaningful differences in the WMI or FSIQ, although those with more than high school education did show the expected pattern, and men showed the expected pattern of increasing scores with increasing education level. With such an unexpected result, any explanations are post hoc and speculative. The relatively greater age for Canadian women in these lower education groups suggests that they may have had greater barriers to education than men, because of social or residential factors (e.g., limited

educational opportunities for women in rural areas). It may be worth examining whether this pattern is found in other countries and what factors are associated with this.

The ethnic/racial differences for the U.S. sample are not unexpected, given past findings (e.g., Neisser et al., 1996; Reynolds et al., 1987). A more detailed examination, looking at trends across education levels, and comparing the most recent standardization to previous samples would be more helpful than merely recording mean differences and would complement similar examinations reviewing data from children (e.g., Weiss, 2003). Perhaps more surprising, given the ubiquity of such differences in the U.S. context, is the lack of such findings for the Canadian sample.

The differences between these two samples are cautionary. If demographic effects on cognition and the expression of intelligence through psychometrically sound instruments such as the WAIS-III are not directly comparable from the United States to Canada, with their similarities in history, language, geography, education, and economies, then it is important to be careful when extrapolating to countries with even greater differences.

## REFERENCES

- Camarata, S., & Woodcock, R. (2006). Sex differences in processing speed: Developmental effects in males and females. *Intelligence, 34*, 231-252.
- Feingold, A. (1988). Cognitive gender differences are disappearing. *American Psychologist, 43*, 95-103.
- Gorsuch, R. L. (1983). The theory of continuous norming. Paper presented at the 91st Annual Convention of the American Psychological Association, Anaheim, CA.
- Grégoire, J. (2001). What factors underlie the aging effects on WAIS-R and WAIS-III subtests? *International Journal of Testing, 1*, 217-233.
- Heaton, R. K., Taylor, M. J., & Manly, J. (2003). Demographic effects and use of demographically corrected norms with the WAIS-III and WMS-III. In D. S. Tulsky, D. H. Saklofske, G. J. Chelune, R. J. Ivnik, A. Prifitera, R. K. Heaton, R. Bornstein & M. F. Ledbetter (Eds.), *Clinical interpretation of the WAIS-III and WMS-III* (pp. 181-210). San Diego, CA: Academic Press.
- Kaufman, A. S., MacLean, J. E., & Reynolds, C. R. (1988). Sex, race, residence, region, and education differences on the 11 WAIS-R subtests. *Journal of Clinical Psychology, 44*, 231-248.
- Neisser, U., Boodoo, G., Bouchard, T. J., Boykin, A. W., Brody, N., Ceci, S. J., et al. (1996). Intelligence: Knowns and unknowns. *American Psychologist, 51*, 77-101.
- The Psychological Corporation. (2001). *WAIS-III/WMS-III/WIAT-II scoring assistant*. San Antonio, TX: Author.
- Reynolds, C. R., Chastain, R. L., Kaufman, A. S., & MacLean, J. E. (1987). Demographic characteristics and IQ among adults: Analysis of the WAIS-R standardization sample as a function of the stratification variables. *Journal of School Psychology, 25*, 323-342.
- Ryan, J. J., Paolo, M., & Findley, P. G. (1991). Percentile rank conversion tables for WAIS-R IQs at six educational levels. *Journal of Clinical Psychology, 47*, 104-107.
- Saklofske, D. H., Patterson, C. A., Gorsuch, R. L., & Tulsky, D. S. (2001). Discussion and guidelines for using the WAIS-III Canadian norms. In D. Wechsler, *WAIS-III Canadian technical manual* (pp. 35-41). Toronto, Canada: Psychological Corporation.

- Taylor M. J., & Heaton, R. K. (2001). Sensitivity and specificity of WAIS-III/WMS-III demographically corrected factor scores in neuropsychological assessment. *Journal of the International Neuropsychological Society*, 7, 867-874.
- Tulsky, D. S., Ivnik, R. J., Price, L. R., & Wilkins, C. (2003). Assessment of cognitive functioning with the WAIS-III and WMS-III: Development of a six-factor model. In D. S. Tulsky, D. H. Saklofske, G. J. Chelune, R. J. Ivnik, A. Prifitera, R. K. Heaton, R. Bornstein & M. F. Ledbetter, (Eds.), *Clinical interpretation of the WAIS-III and WMS-III* (pp. 147-179). San Diego, CA: Academic Press.
- van der Sluis, S., Posthuma, D., Dolan, C. V., de Geus, E. J. C., Colom, R., & Boomsma, D. I. (2006). Sex differences on the Dutch WAIS-III. *Intelligence*, 34, 273-289.
- Wechsler, D. (1981). *Wechsler Adult Intelligence Scale—Revised*. San Antonio, TX: Psychological Corporation.
- Wechsler, D. (1997a). *WAIS-III administration and scoring manual*. San Antonio, TX: Psychological Corporation.
- Wechsler, D. (1997b). *Wechsler Memory Scale: Third Edition*. San Antonio, TX: Psychological Corporation.
- Wechsler, D. (2001). *WAIS-III Canadian technical manual*. Toronto, Canada: Psychological Corporation.
- Wechsler, D. (2002). *WAIS-III/WMS-III technical manual: Updated*. San Antonio, TX: Psychological Corporation.
- Weiss, L. G. (2003). United States. In J. Georgas, L. G. Weiss, F. J. R. van de Vijver & D. H. Saklofske (Eds.), *Culture and children's intelligence* (pp. 41-59). San Diego, CA: Academic Press.