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Sex Differences in the WAIS-IV on the South Korean Standardization Sample

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Data are reported for the scores of men and women on the standardization of the WAIS-IV in South Korea. Men obtained a significantly higher Full Scale IQ than women by 4.65 IQ points and on the Block Design, Information and Arithmetic subtests, while women obtained higher scores than men on the Symbol Search and Coding subtests. Men showed greater variability than women on the Full Scale IQ.

Key Words: South Korea, WAIS-IV, Sex differences, Intelligence, Male variability

Despite more than a century of research on sex differences in intelligence there is no consensus on the issue. There are three contemporary positions. The first is that there is no sex difference in general intelligence defined as the average of a number of abilities and expressed as the IQ obtained from tests like the Wechsler, the Stanford-Binet, the Cattell Culture Fair and many others. This position has been asserted by numerous authorities from the early twentieth century and has been reaffirmed by Halpern (2012, p. 233), who writes "females and males score identically on IQ tests."

The second position has been taken by Lynn (1994, 1998, 1999), Lynn and Irwing (2004) and Irwing and Lynn (2005) and states that there is no sex difference in general intelligence up to the age of 16 years but from this age onwards males have a small advantage that increases with age reaching

approximately 4-5 IQ points among adults. This position has been confirmed by Colom et al. (2002), Nyborg (2003), Colom and Lynn (2004) and Irwing (2012).

The third position has been taken by Mackintosh (2011, 2014) and contends that men had a higher average IQ than women in the past but that in recent years the IQ of women has increased relative to that of men and there is now no difference between the average IQs of men and women.

The Wechsler tests provide some of the best data with which to evaluate these three positions because they have been standardized on representative samples and measure a wide range of verbal, spatial, perceptual, reasoning and memory abilities that are summed to give the Full Scale IQ as a measure of general intelligence. It has been asserted by those who contend that there is no sex difference in general intelligence that there is no difference between men and women in the Wechsler Full Scale IQ (Anderson, 2004; Halpern, 2012, p. 115), but these assertions are incorrect in so far as it has been found in several studies that men obtained a higher Wechsler Full Scale IQ than women. These include the American standardization samples of the 1955 WAIS in which men obtained a higher average IQ of 1.5 IQ points (Matarazzo, 1972, Table 12.10, p. 353), the 1978 WAIS-R in which men obtained a higher average IQ of 2.2 IQ points (Matarazzo et al., 1986), and the 1995 WAIS-III in which men obtained a higher average IQ of 1.5 points (Irwing, 2012). Men obtained a higher Wechsler Full Scale IQ than women of 4.95 IQ points on the WAIS-R in China (Lynn & Dai, 1993), of 3.1 IQ points on the WAIS-R in Japan (Hattori & Lynn, 1997), and of 3.6 IQ points on the WAIS-III in Spain (Colom et al., 2002). In the present paper we provide further evidence on this issue by presenting data for men and women on the standardization sample of the WAIS-IV in South Korea.

Method

Participants

The South Korean WAIS-IV standardization sample consisted of 1228 individuals aged from 16 years 0 months to 69 years 11 months collected in 2011 on the basis of the stratified sampling scheme. The 2010 South Korean Census provided the basis for stratification in terms of age, years of education, sex, and geographic region. The standardization sample was divided into nine age groups for years 16-17, 18-19, 20-24, 25-29, 30-34, 35-44, 45-54, 55-64 and 65-69. For the purpose of the present study, however, the age groups are combined to form three groups: Late Adolescents (16-19 years; N = 159 males, 159 females), Early Adults (20-34 years; N = 210 males, 214 females), and Adults (35 to 69 years; N = 211 males, 275 females).

Measures

The South Korean WAIS-IV is the same as the American WAIS-IV (Wechsler, 2008) in consisting of 15 tests: Block Design, Similarities, Digit Span, Matrix Reasoning, Vocabulary, Arithmetic, Symbol Search, Visual Puzzles, Information, Coding, Letter-Number Sequencing, Figure Weights, Comprehension, Cancellation, and Picture Completion. Ten of these 15 tests are used to produce four index scales: Verbal Comprehension Index (VCI) based on three verbal tests (Similarities, Vocabulary and Information), Perceptual Reasoning Index (PRI) based on three perceptual reasoning tests (Block Design, Matrix Reasoning and Visual Puzzles), Working Memory Index (WMI) based on two working memory tests (Digit Span and Arithmetic), and Processing Speed Index (PSI) based on two processing speed tests (Symbol Search and Coding). In addition, the South Korean WAIS-IV provides the Full Scale IQ based on the composites of the ten core tests.

Results

Table 1. *Means and standard deviations (SD) in 10 tests, the four index scores, and the Full Scale IQ for three age groups on the South Korean WAIS-IV. All scores are standardized residuals corrected for years of education.*

	Age 16-19		Age 20-34		Age 35-69	
Test[a]	♂ mean ± SD	♀ mean ± SD	♂ mean ± SD	♀ mean ± SD	♂ mean ± SD	♀ mean ± SD
BD	0.02 ± 1.01	0.01 ± 0.98	0.16 ± 0.92	-0.15 ± 1.04	0.11 ± 1.05	-0.08 ± 0.95
SI	0.11 ± 1.00	-0.08 ± 0.98	0.20 ± 1.00	-0.20 ± 0.96	0.10 ± 1.03	-0.07 ± 0.97
DS	0.11 ± 1.02	-0.09 ± 0.97	0.25 ± 1.02	-0.25 ± 0.92	0.11 ± 1.04	-0.09 ± 0.95
MR	0.22 ± 0.95	-0.16 ± 0.95	0.24 ± 0.95	-0.24 ± 0.99	0.01 ± 1.02	0.00 ± 0.98
VC	-0.02 ± 1.01	0.07 ± 0.94	0.07 ± 1.02	-0.07 ± 0.98	-0.05 ± 0.99	0.04 ± 1.00
AR	0.24 ± 0.93	-0.21 ± 0.98	0.31 ± 0.96	-0.30 ± 0.94	0.19 ± 1.02	-0.13 ± 0.96
SS	-0.19 ± 1.01	0.21 ± 0.95	-0.05 ± 1.00	0.05 ± 1.00	-0.07 ± 1.02	0.06 ± 0.98
VP	0.17 ± 0.94	-0.13 ± 0.99	0.23 ± 0.98	-0.22 ± 0.97	0.18 ± 1.09	-0.13 ± 0.91
IN	0.21 ± 1.01	-0.21 ± 0.95	0.37 ± 0.93	-0.37 ± 0.93	0.32 ± 0.98	-0.25 ± 0.95
CD	-0.25 ± 0.94	0.24 ± 0.99	-0.17 ± 1.01	0.17 ± 0.96	-0.15 ± 0.97	0.13 ± 1.00
VCI	0.30 ± 2.48	-0.22 ± 2.20	0.64 ± 2.34	-0.64 ± 2.16	0.37 ± 2.36	-0.28 ± 2.29
PRI	0.41 ± 2.24	-0.29 ± 2.21	0.63 ± 2.20	-0.60 ± 2.38	0.30 ± 2.60	-0.21 ± 2.30
WMI	0.36 ± 1.63	-0.30 ± 1.66	0.56 ± 1.68	-0.55 ± 1.57	0.29 ± 1.83	-0.22 ± 1.68
PSI	-0.44 ± 1.72	0.45 ± 1.70	-0.22 ± 1.69	0.22 ± 1.67	-0.22 ± 1.84	0.19 ± 1.82
FSIQ	0.62 ± 5.93	-0.35 ± 5.67	1.61 ± 5.88	-1.57 ± 5.54	0.74 ± 6.67	-0.52 ± 6.48

[a] BD = Block Design, SI = Similarities, DS = Digit Span, MR = Matrix Reasoning, VC = Vocabulary, AR = Arithmetic, SS = Symbol Search, VP = Visual Puzzles, IN = Information, CD = Coding. VCI = Verbal Comprehension Index, PRI = Perceptual Reasoning Index, WMI = Working Memory Index, PSI = Processing Speed Index, FSIQ = Full-Scale IQ.

Table 1 shows means and standard deviations for men and women for the scores of the ten subtests, the four index scores and the Full Scale IQ for the ages of 16-19, 20-34, and 35-69. As educational attainment is significantly correlated with cognitive abilities and educational attainment of men was higher than that of women, we corrected the raw scores of the subtests for years of education within each age group using linear regression. We summed the standardized residuals of the subtest scores to produce the VCI, PRI, WMI and PSI. The Full Scale IQ was the sum of the standardized residuals of the ten subtests scores. We computed Cohen's *d* and calculated two-tailed t tests. Because of multiple comparisons, we consider a p value of .01 as the threshold for statistical significance. The results are presented in Table 2 together with the variance ratio (male standard deviation divided by female standard deviation), as a measure for the sex difference in score variability

Table 2. *Standardized effect size of the sex difference (d), t statistic of the sex difference, and variance ratio (VR) for 10 tests, the four index scores, and the Full Scale IQ for three age groups on the South Korean WAIS-IV. Positive d means males score higher. * = Sex difference significant at p < .01; ** = Sex difference significant at p < .005, two-tailed t tests.*

	Age 16-19			**Age 20-34**			**Age 35-69**			**All ages**
Test[a]	*d*	*t*	VR	*d*	*t*	VR	*d*	*t*	VR	*d*
BD	0.01	0.06	1.03	0.32	3.18*	0.88	0.19	2.04	1.11	.17
SI	0.19	1.68	1.02	0.41	4.16**	1.04	0.17	1.89	1.06	.26
DS	0.20	1.85	1.05	0.52	5.35**	1.11	0.20	2.17	1.09	.31
MR	0.40	3.54**	1.00	0.49	5.08**	0.96	0.01	0.10	1.04	.30
VC	-0.09	-0.86	1.07	0.14	1.51	1.04	-0.09	-1.02	0.99	-.01
AR	0.47	4.16**	0.95	0.64	6.64**	1.02	0.32	3.53**	1.06	.48
SS	-0.41	-3.61**	1.06	-0.10	-1.08	1.00	-0.13	-1.36	1.04	-.21
VP	0.31	2.78*	0.95	0.46	4.69**	1.01	0.31	3.40**	1.20	.36
IN	0.43	3.78**	1.06	0.80	8.17**	1.00	0.59	6.43**	1.03	.61
CD	-0.51	-4.42**	0.95	-0.35	-3.53**	1.05	-0.28	-3.14*	0.97	-.38
VCI	0.22	1.93	1.13	0.57	5.86**	1.08	0.28	3.04*	1.03	.36
PRI	0.31	2.75*	1.01	0.54	5.5**	0.92	0.21	2.25	1.13	.35
WMI	0.40	3.52**	0.98	0.68	7.06**	1.07	0.29	3.23*	1.09	.46
PSI	-0.52	-4.57**	1.01	-0.26	-2.71*	1.01	-0.22	-2.43	1.01	-.25
FSIQ	0.17	1.49	1.05	0.56	5.73**	1.06	0.19	2.09	1.03	.31

[a] BD = Block Design, SI = Similarities, DS = Digit Span, MR = Matrix Reasoning, VC = Vocabulary, AR = Arithmetic, SS = Symbol Search, VP = Visual Puzzles, IN = Information, CD = Coding. VCI = Verbal Comprehension Index, PRI = Perceptual Reasoning Index, WMI = Working Memory Index, PSI = Processing Speed Index, FSIQ = Full-Scale IQ.

Discussion

There are seven points of interest in the results. First, men obtained a higher Full Scale IQ calculated as the average of the three age groups of .31*d*. This is equivalent to 4.65 IQ points and is a little greater than the higher male Full Scale IQs of 1.5, 2.2 and 2.7 IQ points in the three American standardization samples of the WAIS, WAIS-R and the WAIS-III, 3.1 IQ points on the WAIS-R in Japan and of 3.6 IQ points on the WAIS-III in Spain, but not so great as the 4.95 IQ points on the WAIS-R in China, noted in the introduction. The male advantage of 4.65 IQ points in the South Korean WAIS-IV confirms the thesis that there is a male advantage of around 4-5 IQ points proposed by Lynn (1994) and a disconfirmation of the assertions of Halpern (2000, 2012) and Anderson (2004) that there is no sex difference on the Wechsler tests.

Second, there is no consistent tendency for the male IQ advantage to be smaller in the younger than the older age groups, contrary to the hypothesis advanced by Mackintosh (2011, 2014), since the male advantage was virtually the same in the youngest (16-19 years) and oldest (35-69 years) age groups at .17*d* and .19*d*, respectively, while in the intermediate age group (20-34 years) the male advantage was .56*d*. It is probable that these differences are sampling errors. It could also indicate slower maturation and earlier senility for males. This would be compatible with later puberty and lower life expectancy of males.

Third, the higher average scores obtained by men on the subtests are similar to those frequently reported in previous studies. Men obtained a higher score (.17*d*) on the spatial subtest of Block Design, confirming numerous studies of a male advantage in spatial ability reviewed fifty years ago by Tyler (1965) and more recently by Voyer, Voyer and Bryden (1995). Men obtained a higher score on Matrix Reasoning (.30*d*), which is similar to the Raven's Progressive Matrices, confirming numerous studies of a male advantage on the Progressive Matrices summarized in meta-analyses by Lynn and Irwing (2004) and Irwing and Lynn (2005). Men obtained a higher score on Information (.61*d*) confirming studies of a male advantage in general knowledge reported by Lynn and Irwing (2002), Lynn, Irwing and Cammock (2002), Lynn, Wilberg and Margraf-Stiksrud (2004, 2005) and Tran, Hofer and Voracek (2014). Men obtained a higher score on Arithmetic (.48*d*) confirming the studies in Australia (Jorm et al., 2004), China (Lynn & Dai, 1993), Scotland (Lynn, 1998), Northern Ireland (Lynn & Irwing, 2002) and the United States (Irwing, 2012).

Fourth, there was no sex difference in Vocabulary (-.01*d*) confirming Tyler's (1965, p. 244) review of early studies concluding that "girls and women do not have larger vocabularies than boys and men."

Fifth, the female advantages on the Symbol Search (.21*d*) and Coding (.38*d*) subtests and on the Processing Speed Index IQ (.25*d*) are generally consistent with previous studies including the standardization sample of the American WAIS-III (Kaufman & Lichtenberger, 2002, p. 98).

Sixth, males showed greater variability than females on the Full Scale IQ in the three age groups confirming the greater variability of males reported in numerous previous studies e.g. Arden and Plomin (2006), Dykiert, Gale and Deary (2009) and Eysenck (1981, p. 42).

Seventh, the present study is unusual in showing that the higher male IQ is present when the differences of males and females in the tests are equated for education. This is not usually done in studies of this kind. The present results suggest that the male advantage present in a number of studies of the Wechsler tests is not attributable to educational differences favoring males.

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