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Sex Differences on the WISC-V in Taiwan

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Sex differences in the 2017 standardization sample of the Wechsler Intelligence Scale for Children – Fifth Edition (WISC-V) in Taiwan are reported for the Full Scale IQ, the five Index IQs and the 16 subtests. Males obtained a slightly higher Full Scale IQ than females of 0.04*d* (0.6 IQ points), but this difference is not statistically significant. There was no consistent sex difference in variability. There were statistically significant differences between males and females in a number of index IQs and subtests, notably the higher scores obtained by boys on the Fluid Reasoning Index and Information and the higher scores obtained by girls on the Processing Speed Index and Coding. Also given are the sex differences on the American WISC-III. The results show similar sex differences in the two samples.
Key Words: Intelligence; Taiwan; WISC-V; Sex differences; Variability

The Wechsler Intelligence Scale for Children (WISC) was constructed in the United States in the mid-1940s by Wechsler (1949) and was designed for children aged between 6 and 16 years. It consisted of six verbal subtests designated Information, Vocabulary, Arithmetic, Similarities, Comprehension and Digit span, the first five of which are averaged to give the Verbal IQ, and six performance subtests designated Picture completion, Picture arrangement, Object assembly, Coding, Block design and Mazes, the first five of which are averaged to give the Performance IQ. The Verbal IQ and Performance IQ are averaged to give the Full

Scale IQ. There have been four subsequent versions and standardizations of the WISC produced in the United States designated the WISC-R, WISC-III, WISC-IV and WISC-V.

The Full Scale IQ of the WISCs is derived from a wide range of verbal, spatial, perceptual, reasoning and memory abilities and is widely regarded as providing an excellent measure of general intelligence. It has frequently been asserted that there is no gender difference in general intelligence on the Wechsler tests. For example, Anderson (2004, p. 829) has written: "The evidence that there is no sex difference in general ability is overwhelming. This is true whether general ability is defined as an IQ score calculated from an omnibus test of intellectual abilities such as the various Wechsler tests, or whether it is defined as a score on a single test of general intelligence, such as the Raven's Matrices."

The WISCs have been administered in a number of countries. The results of gender differences in 32 studies of these have been summarized in Lynn (2017). This showed that for the Full Scale IQ girls obtained a higher mean than boys in three samples (in Bahrain, Italy and American blacks) while boys obtained a higher mean than girls in the other 29 samples. The median advantage of boys in the 32 studies was .19*d,* equivalent to 2.85 IQ points. These results evidently do not confirm the assertion that there is no gender difference on the WISCs.

Sex differences on the WISC-III in Taiwan have been published by Chen, Lynn & Cheng (2016) in which boys obtained a significantly higher Full Scale IQ than girls of .21*d* (3.15 IQ points). Sex differences on the WISC-IV in Taiwan have been reported by Chen and colleagues (Chen et al., 2010; Chen & Lynn, 2020) in which girls obtained a slightly higher Full Scale IQ than boys of .02*d* (0.3 IQ points).To provide further evidence on this issue, we report data for sex differences on the WISC-V in Taiwan.

Method and Results

The Wechsler Intelligence Scale for Children – Fifth Edition (WISC-V) was standardized in Taiwan between July and December, 2017. The standardization sample consisted of 1034 individuals (52.2% male, 47.8% female) aged from 6 to 16 years and was drawn from the north, central, east and south geographical regions with parental education levels matched to those of the population given in the most recent census (Wechsler, 2018).

The Taiwanese version of the WISC-V is the same as the American WISC-V (Wechsler, 2014). It consists of 16 tests: Similarities, Vocabulary, Information, Comprehension, Block design, Matrix reasoning, Visual puzzles, Figure weights, Picture concepts, Arithmetic, Digit span, Picture span, Letter-number sequencing, Coding, Symbol search and Cancellation. It also consists of five index scales.

These are: Verbal Comprehension Index (VCI) the average of Similarities and Vocabulary; Visual Spatial Index (VSI), the average of Block Design and Visual Puzzles; Fluid Reasoning Index (FRI), the average of the two nonverbal reasoning tests Matrix Reasoning and Figure Weights; Working Memory Index (WMI), the average of the verbal and nonverbal working memory tests Digit span and Picture span; and Processing Speed Index (PSI), the average of Coding and Symbol search. The Taiwan WISC-V also provides the Full Scale IQ as the average of the seven core tests Similarities, Vocabulary, Block design, Matrix reasoning, Figure weights, Digit span, and Coding.

The results are given in Table 1. Positive values of the sex difference *d* denote higher scores by males. Shown in the right hand column are the sex differences in the American WISC-III given in Chen, Lynn and Cheng (2016) for the measures that are in the Taiwan WISC-V.

Table 1. *Sex differences on the WISC-V in Taiwan. SD = standard deviation, VR = variance ratio (♂ SD / ♀ SD); d = Cohen's d ((♂ mean - ♀ mean) / SD); t = t statistic; US WISC-III = d on the US standardization of WISC-III. * p<.05; ** p<.01; *** p<.001.*

IQ/subtest	Sex	Mean ± SD	VR	*d*	t	US WISC-III
Full Scale IQ	M	100.27 ± 14.80	0.97	0.04	0.58	0.11**
	F	99.72 ± 15.24				
Verbal Compreh. Index	M	100.56 ± 15.07	1.00	0.08	1.24	0.13**
	F	99.40 ± 15.00				
Visual Spatial Index	M	100.48 ± 15.03	1.00	0.07	1.05	-
	F	99.50 ± 14.96				
Fluid Reasoning Index	M	101.21 ± 15.16	1.03	0.17**	2.70	-
	F	98.69 ± 14.73				
Working Memory Index	M	99.72 ± 15.02	1.00	-0.04	-0.64	-
	F	100.31 ± 15.09				
Processing Speed Index	M	98.42 ± 14.91	1.00	-0.22**	-3.56	-0.46**
	F	101.73 ± 14.95				
Similarities	M	10.09 ± 3.00	1.00	0.06	1.00	0.10*
	F	9.90 ± 3.00				
Vocabulary	M	10.12 ± 3.00	1.00	0.08	1.31	0.08
	F	9.87 ± 3.00				
Information	M	10.53 ± 3.03	1.05	0.37***	6.05	0.25***
	F	9.42 ± 2.88				
Comprehension	M	9.99 ± 2.98	0.98	-0.01	-0.06	0.03
	F	10.01 ± 3.03				
Block Design	M	9.99 ± 2.94	0.96	-0.01	-0.12	0.23***
	F	10.01 ± 3.06				
Visual Puzzles	M	10.18 ± 3.08	1.06	0.13*	2.04	-
	F	9.80 ± 2.90				
Matrix Reasoning	M	10.12 ± 3.04	1.03	0.08	1.33	-
	F	9.87 ± 2.95				
Figure Weights	M	10.29 ± 3.06	1.05	0.20**	3.25	-
	F	9.68 ± 2.91				

IQ/subtest	Sex	Mean ± SD	VR	*d*	t	US WISC-III
Picture Concepts	M F	10.02 ± 2.92 9.99 ± 3.08	0.95	0.01	0.18	-
Arithmetic	M F	10.37 ± 2.99 9.60 ± 2.96	1.01	0.26***	4.19	0.11*
Digit Span	M F	10.01 ± 3.00 10.00 ± 2.99	1.00	0.00	0.02	-0.07
Picture Span	M F	9.91 ± 2.97 10.11 ± 3.06	0.97	-0.07	-1.06	-
Letter Number Sequencing	M F	9.92 ± 3.09 10.09 ± 2.91	1.06	-0.06	-0.91	-
Coding	M F	9.66 ± 2.98 10.37 ± 2.98	1.00	-0.24***	-3.82	-0.53**
Symbol Search	M F	9.77 ± 3.01 10.25 ± 2.97	1.01	-0.16*	-2.54	-0.27***
Cancellation	M F	10.06 ± 2.93 9.94 ± 3.07	0.95	0.04	0.62	-

Discussion

There are five points of interest in the results. First, males obtained a slightly higher Full Scale IQ than females of .04*d* (0.6 IQ points), but this advantage is not statistically significant. This result confirms the results of the two studies of sex differences on the WISC-IV in Taiwan in that none of the sex differences is statistically significant. These results differ from that on the Full Scale IQ in the Taiwanese WISC-III in which boys obtained a higher Full Scale IQ than girls of .21*d* (3.15 IQ points) suggesting that a previous male advantage may have disappeared. This would be consistent with the evidence presented by Ceci & Williams (2007) and by Miller & Halpern (2014) that the male advantage in mathematics has declined in recent years with an improvement in gender equality. Another possibility is that the changed sex difference is due to changes in test composition or content that were introduced in the WISC-IV and WISC-V relative to the earlier WISC-III. The latter possibility is suggested by the observation that on the 9 tests that are shared between the WISC-III and the WISC-V, the average sex difference in the US standardization of the WISC-III was -0.01, while it is +0.04 in the Taiwanese WISC-V standardization. Given that the sex difference in Full Scale IQ in the US standardization was 0.11*d* favoring males, the discontinued tests must have been disproportionately those in which males scored higher than females.

Second, there are two index scores and six subtests on which there are statistically significant differences between males and females. On the Fluid Reasoning Index males obtained a significantly higher score than females of 0.17*d* (2.55 IQ points). This result is inconsistent with the absence of a gender difference in a meta-analysis of studies of 6-16 years olds on the Progressive

Matrices, a leading measure of fluid reasoning (Lynn & Irwing, 2004). This result is confirmed by the absence of a significant gender difference on the Matrix reasoning test. The present result appears to be due to the newly added Figure weights subtest which mainly measures quantitative reasoning in which, as shown in Table 1, males obtained a significantly higher score than females of 0.20*d* (3 IQ points).

On the Processing Speed Index females obtained a significantly higher score than males of 0.22*d* (3.3 IQ points). This is closely similar to the Taiwan WISC-III in which females obtained a significantly higher score than males of 0.25*d.* On Coding females obtained a significantly higher score than males of 0.24*d* (3.6 IQ points). This is consistent with the Taiwan WISC-III in which females obtained a significantly higher score than males of 0.23*d.* On Symbol search females obtained a significantly higher score than males of 0.16*d* (2.4 IQ points). This is consistent with the Taiwan WISC-III in which females obtained a significantly higher score than males of 0.19*d*.

On Information males obtained a significantly higher score than females of 0.37*d* (5.55 IQ points). This is consistent with the Taiwan WISC-III in which males obtained a significantly higher score than females of 0.18*d.* On Visual puzzles males obtained a significantly higher score than females of 0.13*d* (1.95 IQ points). This test is not in the WISC-III. On Arithmetic males obtained a significantly higher score than females of 0.26*d* (3.9 IQ points). This is consistent with the Taiwan WISC-III in which males obtained a significantly higher score than females of 0.18*d*.

Third, sex differences tend to be slightly smaller in Taiwan than in the United States. On the 9 tests shared between the WISC-III and the WISC-V, the average absolute sex difference is 0.186 standard deviations in the US and 0.132 standard deviations in Taiwan. However, the difference of 0.053 is not statistically significant (95% confidence interval -0.056 – 0.163). This observation nevertheless argues against the expectation that greater gender egalitarianism in the US than Taiwan leads to reduced cognitive sex differences in children.

Fourth, girls were more variable than boys on six measures including the Full Scale IQ, boys were more variable than girls on five measures, and there was no difference on eight measures. These results do not confirm the frequent contention that males have greater variance of intelligence than females, e.g. Deary et al. (2007).

Fifth, the sex differences in the present results and those in the American WISC-III are largely consistent. In both data sets, boys obtained slightly higher scores than girls on the Full Scale IQ, Verbal Comprehension Index, Information and Arithmetic while girls obtained much higher scores than boys on Processing

Speed Index and Coding. The most notable difference is in Block design, which is a male-biased test in the United States but not in Taiwan. The Pearson correlation between the sex differences in the 9 subtests that are shared between the US standardization of the WISC-III and the Taiwanese standardization of the WISC-V is .804, which is significant statistically ($p = .009$). This consistency in two such different racial and cultural populations suggests that these sex differences have a biological basis.

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