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Sex Differences on the WISC-IV in Taiwan and Germany

Hsinyi Chen
National Taiwan Normal University, Taipei, Taiwan

Richard Lynn*
Ulster Institute for Social Research, London, UK

*Corresponding author, email: lynnr540@aol.com

The sex differences on the standardization sample of the Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV) in Taiwan (N = 968, age 6-16, 49.9% female) are reported for the Full Scale IQ, the four Index IQs and the subtests and compared with those in the German standardization sample. There was no statistically significant difference in the Full Scale IQ in either Germany or Taiwan. Sex differences were very small in both samples, but their direction in the four Index IQs and the subtests was generally similar in the two samples notably in the higher scores obtained by males on the Verbal Comprehension Index IQ and the Perceptual Reasoning Index IQ and the higher score obtained by females on the Processing Speed Index IQ. Relative to females, males obtained higher scores in the German sample than in the Taiwan sample. In the Taiwan sample, males had greater variance than females on 16 measures and females had greater variance than males on three measures.
Key Words: Intelligence; Sex differences; Taiwan; Germany; WISC-IV; 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. All subtests in 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 sex 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".

This contention has not been confirmed in a review of sex differences on the WISCs in 32 studies in a number of countries summarized in Lynn (2017). This showed that on the Full Scale IQ males obtained a higher mean than females in 29 samples while females obtained a higher mean than males in three samples (in Bahrain, Italy and American blacks). The median advantage of males 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 sex difference on the WISCs.

The present paper provides further evidence on this issue by reporting the sex differences on the WISC-IV in Taiwan and comparing them with those in Germany.

Method

The Wechsler Intelligence Scale for Children – Fourth Edition (WISC-IV) was standardized in Taiwan from May to August, 2007. The standardization sample consisted of 968 individuals (50.1% male, 49.9% female) aged from 6 to 16 years and was drawn from the north, central, east and south regions with parental education level percentages matched to those of the population given in the most recent census.

The main structure of the Taiwan WISC-IV (Wechsler, 2007) is the same as the American WISC-IV (Wechsler, 2003) in consisting of 14 tests: Similarities, Vocabulary, Information, Comprehension, Block Design, Matrix Reasoning, Picture Concepts, Picture Completion, Arithmetic, Digit Span, Letter-Number Sequencing, Coding, Symbol Search, and Cancellation. Four core index scales were produced by combining tests: Verbal Comprehension Index (VCI) based on three verbal tests (Similarities, Vocabulary, and Comprehension), Perceptual

Reasoning Index (PRI) based on three tests (Block Design, Picture Concepts, and Matrix Reasoning), Working Memory Index (WMI) based on two tests (Digit Span and Letter-Number Sequence), and Processing Speed Index (PSI) based on two tests (Coding and Symbol Search). The Taiwan WISC-IV also provides the Full Scale IQ based on the composite of the above ten core tests.

Results

The results are given in Table 1. Shown in the right-hand column are the sex differences in the German standardization sample of WISC-IV (N = 1,650) given by Goldbeck et al. (2010). This study did not give the sex differences for Information, Picture Completion, Arithmetic and Cancellation.

Table 1. *Sex differences on the WISC-IV in Taiwan (N = 968), with Germany results (last column) for comparison (N = 1,650). VR, variance ratio (male SD / female SD); d, Cohen's d ((male mean - female mean) / pooled SD); t, t statistic. * p<.05; ** p<.01; *** p<.001, two-tailed.*

IQ/subtest	Sex	Mean ± SD	VR	*d*	t	Germany *d*
Full Scale IQ	M F	99.81 ± 15.11 100.18 ± 14.91	1.01	-.02	-0.39	0.06
Verbal Comprehension Index	M F	100.05 ± 15.25 99.63 ± 14.82	1.03	.03	0.44	0.19*
Perceptual Reasoning Index	M F	100.30 ± 15.21 99.70 ± 14.83	1.03	.04	0.62	0.13*
Working Memory Index	M F	100.28 ± 15.10 99.71 ± 14.89	1.01	.04	0.59	0.08
Processing Speed Index	M F	98.28 ± 15.09 101.56 ± 14.76	1.02	-.22***	-3.42	-0.33***
Similarities	M F	10.06 ± 3.07 9.94 ± 2.96	1.04	.04	0.65	0.16***
Vocabulary	M F	10.11 ± 3.07 9.88 ± 2.96	1.04	.08	1.18	0.25***
Information	M F	10.19 ± 3.17 9.80 ± 2.89	1.10	-.13*	1.99	-
Comprehension	M F	9.92 ± 3.00 10.08 ± 3.03	0.99	-.05	-0.86	0.10*
Block Design	M F	10.14 ± 3.14 9.85 ± 2.89	1.09	.10	1.50	0.22***
Matrix Reasoning	M F	9.98 ± 3.00 10.02 ± 3.03	0.99	-.01	-0.22	0.01
Picture Concepts	M F	10.01 ± 2.97 9.98 ± 3.08	0.96	.01	0.17	0.07
Picture Completion	M F	10.18 ± 3.11 9.81 ± 2.92	1.07	.12	1.90	-
Digit Span	M F	10.11 ± 3.08 9.89 ± 2.97	1.04	.007	1.09	0.08
Letter Number Sequencing	M F	10.00 ± 3.11 10.00 ± 2.94	1.06	.00	-0.04	0.06

IQ/subtest	Sex	Mean ± SD	VR	*d*	t	Germany *d*
Arithmetic	M F	10.31 ± 3.18 9.69 ± 2.81	1.13	.21**	3.20	-
Coding	M F	9.63 ± 3.01 10.38 ± 2.98	1.01	-.25***	-3.92	-0.40***
Symbol Search	M F	9.79 ± 3.05 10.21 ± 2.95	1.03	-.14*	-2.14	-0.19*
Cancellation	M F	10.13 ± 3.10 9.87 ± 2.92	1.30	.08	1.37	-

Discussion

There are five points of interest in the results. First, the females had a fractionally higher Full Scale IQ of 0.02*d* in the present Taiwan sample, or 0.3 IQ points. There have been three other studies of sex differences on the WISC-IV. In Germany, males had a higher Full Scale IQ of 0.06*d* (0.9 IQ point), as shown in the table. In China, males had a higher Full Scale IQ of 0.12*d* (Li et al., 2016). In Italy, females had a higher Full Scale IQ of 0.03*d* (Pezzuti & Orsini, 2016). None of these differences is statistically significant and it can be concluded that males and females have the same mean Full Scale IQ on the WISC-IV. This is in contrast to the standardization of the WISC-III in Taiwan in 1997 in which males obtained a higher Full Scale IQ than females of 0.21*d* (3.15 IQ points) (Chen, Lynn & Cheng, 2016) and to the 32 studies of sex differences in earlier versions of the WISCs in 29 of which males obtained a higher mean Full Scale IQ than females (Lynn, 2017), as noted in the Introduction. A possible explanation for the absence of a sex difference in the four WISC-IV samples is that the intelligence of females has increased in recent years as argued by Flynn (2012). An alternative possibility is that the item composition is more favorable to females on the WISC-IV than on the earlier versions of the WISC, perhaps as a result of deliberate attempts to reduce “gender bias”.

Second, the general trend in the comparison between the Taiwan and the German samples is that the direction of the sex differences on the subtests and Index IQs was very similar. When sex differences on the 10 subtests are compared between the two samples, the correlation between them is 0.953. We can therefore conclude that the sex-typical ability profiles are virtually identical in Germany and Taiwan. This cross-cultural consistency, despite presumed differences in school systems, gender roles and gender ideologies between Taiwan and Germany, suggests that gender-typical ability profiles are biologically based and more or less universal cross-culturally.

Third, on eight of the 10 subtests and three of the four Index IQs, sex differences favored males more in the German sample than in the Taiwan sample. In consequence, on the Full Scale IQ females obtained a fractionally higher IQ

than males in the Taiwanese sample (0.02*d*, 0.3 IQ points) but males obtained a fractionally higher IQ than females in the German sample (0.06*d*, 0.9 IQ points), although neither of the differences is statistically significant. Although it is tempting to speculate that relative to Germany, conditions in Taiwan are more favorable to the development of female and/or less favorable for the development of male intelligence, the very small magnitude of the differences between the samples makes such speculations futile.

Fourth, sex differences between the samples were reversed on Coding and Symbol Search, and on the Processing Speed Index IQ. These are female-biased tests in that females obtained significantly higher scores than males in both samples. On these tests, the sex differences favoring females were greater in Germany than in Taiwan. Therefore, rather than concluding that sex differences tend to favor males in Germany and females in Taiwan, the more appropriate conclusion is that sex differences tend to be greater in Germany than in Taiwan. Cognitively, German males tend to be more masculine than Taiwanese males, and German females tend to be more feminine than Taiwanese females. Indeed, average subtest sex differences were only about half as large in Taiwan as in Germany. Thus sex differences are generally smaller in Taiwan than in Germany, no matter whether males or females are the higher-scoring sex on a particular test. This finding is similar to results from personality tests, which often find smaller sex differences in non-Western than in Western cultures (Costa, Terracciano & McCrae, 2001).

Fifth, in the Taiwan sample males had greater variance than females on 16 measures and females had greater variance than males on three measures confirming the frequent finding that males have greater variance of intelligence than females, e.g., Deary et al. (2007).

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