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Sex Differences in Intelligence in Young Children: Some Evidence from Taiwan

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In the standardization sample of the Wechsler Preschool and Primary Scale of Intelligence – Fourth Edition (WPPSI-IV) in Taiwan, girls at the age of 2:5-3:11 years generally had higher average cognitive abilities than boys but this advantage was not present at the age of 4:0-7:0 years. These results are consistent with other studies reporting that among young children, girls have higher average cognitive abilities than boys. Girls had greater variability than boys in the majority of measures.

Key Words: Taiwan; Wechsler tests; Sex differences; Intelligence; Young children; Variability

It has been asserted by numerous authorities that there is no sex difference in intelligence, e.g., Halpern & Kanaya (2017): “There are no overall differences in female and male intelligence”; Warne (2020, p. 245): “males and females are equal in average intelligence.” It has also been asserted that this is true of children as well as adults, e.g., Fraser Roberts (1945, p. 727): “It is a striking fact that in mean performance on intelligence-test scales there should be no difference between boys and girls”; Cattell (1971, p. 131): “It is now demonstrated by countless and large samples that on the two main general cognitive abilities — fluid and crystallized intelligence — men and women, boys and girls, show no significant differences.”

There is some evidence that this contention is not correct for young children up to and including the age of four years and that to the contrary girls have higher average cognitive abilities than boys at this young age. For example, McNemar (1942) reported that in the American standardization sample of the Stanford-Binet, girls obtained a 2.5 point higher average IQ than boys at the ages of 2, 3 and 4 years but there was no sex difference at the age of 5 years and above. Similar results have been reported in the United Kingdom by Toivanen et al. (2017) and in Germany and the Netherlands by Buczylowska et al. (2019). The present paper reports evidence on this issue from Taiwan.

Method

The Wechsler Preschool and Primary Scale of Intelligence – Fourth Edition (WPPSI-IV) was standardized in Taiwan in 2012 (Wechsler, 2013). The standardization sample consisted of 924 young children (52.13% boys, 47.87% girls) aged from 2.5 to 7 years and was drawn from the north, central, east and south geographical regions with parents' education level matched to those of the population given in the census. The main structure of the Taiwan WPPSI-IV is the same as the American WPPSI-IV (Wechsler, 2012) in consisting of 15 tests. The standardization sample was divided into a younger group (N = 252) aged 2:5-3:11 years, mean age 3.25 (SD 0.4) years and an older group (N = 672) aged 4:0 to 7:0 years, mean age 6:0 (SD 1.15) years.

Test structure is different between children aged 2:5-3:11 and children aged 4:0-7:0 years:

A. For children aged 2:5-3:11 there are 8 tests: *Receptive vocabulary*, *Information*, *Matrix reasoning*, *Picture naming*, *Block design*, *Object assembly*, *Picture memory*, *Zoo location*. Full Scale IQ (FSIQ) is calculated from 5 tests (*Receptive vocabulary*, *Information*, *Matrix reasoning*, *Block design*, *Picture memory*); the *Verbal Comprehension Index* (VCI) is calculated from 2 tests (*Receptive vocabulary*, *Information*); *Visual Spatial Index* (VSI) is calculated

from 2 tests (*Block design*, *Object assembly*); *Working Memory Index* (WMI) is calculated from 2 tests (*Picture memory*, *Zoo location*).

B. For children aged 4:0-7:0 there are 15 tests: *Information*, *Similarities*, *Vocabulary*, *Comprehension*, *Receptive vocabulary*, *Picture naming*, *Block design*, *Object assembly*, *Matrix reasoning*, *Picture concepts*, *Picture memory*, *Zoo location*, *Bug search*, *Cancellation*, *Animal coding*. FSIQ is calculated from 6 tests: *Similarities, Information*, *Block design*, *Matrix reasoning*, *Picture memory*, *Bug search*; VCI is calculated from 2 tests: *Similarities*, *Information*. VSI is calculated from 2 tests: *Block design*, *Object assembly*. WMI is calculated from 2 tests: *Picture memory*, *Zoo location*. *Fluid Reasoning Index* (FRI) is calculated from 2 tests: *Matrix reasoning*, *Picture concepts*. *Processing Speed Index* (PSI) is calculated from 2 tests: *Bug search*, *Cancellation*.

Results

The sex differences in the younger age group are given in Table 1 and those in the older age group are given in Table 2. These give, reading from left to right, the tests, the means for males and females, the VR (variance ratio: male SD / female SD), *d* ((male mean – female mean) divided by pooled SD), and t values for the statistical significance of the differences.

Table 1. *Sex differences for children 2:5 – 3:11 years on the WPPSI-IV in Taiwan; * p < .05*

IQ/subtest	Sex	Mean ± SD	VR	*d*	t
Full Scale IQ	M	99.36 ± 15.12	1.01	-0.09	-0.70
	F	100.69 ± 14.91			
Verbal Comprehension Index	M	98.96 ± 14.91	0.96	-0.14	-1.15
	F	101.14 ± 15.36			
Visual Spatial Index	M	100.80 ± 14.30	1.01	0.09	0.68
	F	99.58 ± 14.13			
Working Memory Index	M	98.70 ± 14.67	1.07	-0.31	-2.45*
	F	103.09 ± 13.76			
Receptive Vocabulary	M	9.73 ± 2.93	0.95	-0.10	-0.79
	F	10.03 ± 3.07			
Information	M	9.75 ± 2.63	0.91	-0.15	-1.17
	F	10.16 ± 2.88			
Picture Naming	M	10.20 ± 2.89	0.92	0.03	0.25
	F	10.10 ± 3.15			

IQ/subtest	Sex	Mean ± SD	VR	*d*	t
Block Design	M	9.97 ± 2.57	0.99	-0.08	-0.68
	F	10.19 ± 2.60			
Object Assembly	M	10.27 ± 3.22	1.10	0.21	1.64
	F	9.63 ± 2.94			
Picture Memory	M	9.83 ± 3.23	1.09	-0.23	-1.83
	F	10.54 ± 2.96			
Zoo Location	M	9.73 ± 2.76	1.10	-0.29	-2.27*
	F	10.49 ± 2.51			
Matrix Reasoning	M	10.23 ± 3.17	1.03	0.23	1.87
	F	9.50 ± 3.07			

Table 2. *Sex differences for children 4:0 – 7:0 years old on the WPPSI-IV in Taiwan; *p < .05; ** p < .01*

IQ/subtest	Sex	Mean ± SD	VR	*d*	t
Full Scale IQ	M	100.73 ± 14.79	0.97	0.10	1.31
	F	99.21 ± 15.21			
Verbal Comprehension Index	M	101.39 ± 15.27	1.05	0.19	2.48*
	F	98.53 ± 14.57			
Visual Spatial Index	M	100.93 ± 15.48	1.03	0.14	1.77
	F	98.84 ± 15.05			
Fluid Reasoning Index	M	100.45 ± 14.64	0.95	0.06	0.79
	F	99.54 ± 15.42			
Working Memory Index	M	99.77 ± 14.87	0.95	0.01	0.11f
	F	99.64 ± 15.62			
Processing Speed Index	M	99.64 ± 14.89	0.98	-0.05	-0.64
	F	100.39 ± 15.14			
Similarities	M	10.06 ± 3.06	1.04	0.04	0.57f
	F	9.93 ± 2.93			
Information	M	10.44 ± 3.09	1.02	0.28	3.69**
	F	9.57 ± 3.02			
Vocabulary	M	10.45 ± 2.94	0.98	0.31	4.09**
	F	9.52 ± 2.99			
Comprehension	M	10.30 ± 2.84	0.91	0.21	2.73**
	F	9.68 ± 3.13			

IQ/subtest	Sex	Mean ± SD	VR	*d*	t
Receptive Vocabulary	M	10.30 ± 3.02	1.02	0.18	2.27*
	F	9.77 ± 2.96			
Picture Naming	M	10.35 ± 3.06	1.08	0.28	3.71**
	F	9.51 ± 2.84			
Block Design	M	10.22 ± 3.29	1.11	0.17	2.13*
	F	9.70 ± 2.96			
Object Assembly	M	10.12 ± 2.95	0.99	0.07	0.99
	F	9.90 ± 2.99			
Matrix Reasoning	M	10.10 ± 2.91	0.97	0.04	0.52
	F	9.98 ± 2.99			
Picture Concepts	M	10.10 ± 2.96	0.97	0.07	0.93
	F	9.89 ± 3.05			
Picture Memory	M	9.93 ± 2.93	0.98	-0.01	-0.06
	F	9.94 ± 2.98			
Zoo Location	M	9.99 ± 3.07	0.96	0.02	0.22
	F	9.94 ± 3.19			
Bug Search	M	9.85 ± 2.97	0.98	-0.10	-1.36
	F	10.16 ± 3.03			
Cancellation	M	10.02 ± 2.99	0.99	0.01	0.15
	F	9.98 ± 3.02			
Animal Coding	M	9.89 ± 2.92	0.95	-0.08	-1.03
	F	10.12 ± 3.08			

Discussion

There are seven points of interest in the results. First, at the age of 2:5-3:11 years, girls obtained a statistically non-significant higher average mean IQ than boys on the *Full Scale IQ* of 0.09*d* while at the age of 4.0-7.0 years boys obtained a statistically non-significant higher average mean IQ than girls of 0.10*d*.

Second, on the *Verbal Comprehension Index* girls at the age of 2:5-3:11 years obtained a statistically non-significant higher average mean IQ than boys of 0.14*d* while at the age of 4:0-7:0 years boys obtained a statistically significant higher average mean IQ than girls of 0.19*d.*

Third, on the *Visual Spatial Index* boys at the age of 2:5-3:11 years obtained a statistically non-significant higher average mean IQ than girls of 0.09*d* and at the age of 4:0-7:0 years this advantage increased to 0.14*d.* The higher average mean VSI IQ of boys than of girls is consistent with numerous studies reporting

that males have higher average visual-spatial abilities than females, e.g., Voyer, Voyer and Bryden (1995).

Fourth, on the *Working Memory Index* girls at the age of 2:5-3:11 years obtained a statistically significant higher average mean IQ than boys of 0.31*d* while at the age of 4:0-7:0 years boys obtained a negligibly higher average mean IQ than girls of 0.01*d.*

Fifth, in five of the eight subtests, girls at the age of 2:5-3:11 years obtained higher average scores than boys and this advantage is statistically significant for *Zoo location*, while in the 15 subtests at the age of 4:0-7:0 years boys obtained higher average scores than girls in 13, and six of these were statistically significant.

Sixth, the general trend of the results is that at the age of 2:5-3:11 years girls have higher average cognitive abilities than boys and this advantage is not present at the age of 4:0-7:0 years consistent with the studies cited in the introduction that among young children girls have higher average cognitive abilities than boys.

Seventh, on the variance ratios, at the age of 2:5-3:11 years boys have higher VRs in 7 of the 12 measures and at the age of 4:0-7:0 years boys have higher VRs in 7 of the 21 measures. These results do not support the frequent assertion that males have greater variability of intelligence than females, e.g. “males have a slightly but consistently wider distribution than females at both ends of the range” (Deary, Penke & Johnson, 2010).

References

Buczyłowska, D., Ronniger, P., Melzer, J. & Petermann, F. (2019). Sex similarities and differences in intelligence in children aged two to eight: Analysis of SON-R 2–8 scores. *Journal of Intelligence* 7: 11-30.

Cattell, R.B. (1971). *Abilities: Their Structure, Growth and Action*. Boston: Houghton Mifflin.

Deary, I., Penke, L. & Johnson, W. (2010). The neuroscience of human intelligence differences. *Nature Reviews Neuroscience* 11: 201-211.

Halpern, D. & Kanaya, T. (2018). Group differences in intelligence: Complexities and controversies. In: R.J. Sternberg (ed.), *The Nature of Human Intelligence*. Cambridge: Cambridge Univ. Press.

McNemar, Q. (1942). *The Revision of the Stanford-Binet Scale*. Boston: Houghton-Mifflin.

Fraser Roberts, J.A. (1945, May 26). On the difference between the sexes in the dispersion of intelligence. *British Medical Journal* 1: 727-730.

Toivainen, T., Papageorgiou, K.A.,Tosto, M.G. & Kovas, Y. *(*2017). Sex differences in non-verbal and verbal abilities in childhood and adolescence. *Intelligence* 64: 81-88.

Voyer, D., Voyer, S. & Bryden, M.P. (1995). Magnitude of sex differences in spatial ability: A meta-analysis and consideration of critical variables. *Psychological Bulletin* 117: 250-270.

Warne, R.T. (2020) *In the Know: Debunking 35 Myths about Human Intelligence*. Cambridge: Cambridge Univ. Press.

Wechsler, D. (2012). *Wechsler Preschool and Primary Scale of Intelligence – Fourth Edition.* San Antonio, TX: NCS Pearson, Inc.

Wechsler, D. (2013). *Wechsler Preschool and Primary Scale of Intelligence – Fourth Edition* (Taiwan Manual). Taipei, Taiwan: Chinese Behavioral Science Corporation.