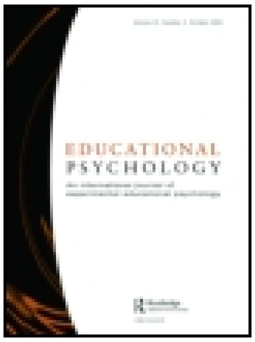

Educational Psychology

ISSN: 0144-3410 (Print) 1469-5820 (Online) Journal homepage: http://www.tandfonline.com/loi/cedp20

Sex Differences on the Dutch WISC-R: a comparison with the USA and Scotland

Marise ph. Born & Richard Lynn

To cite this article: Marise ph. Born & Richard Lynn (1994) Sex Differences on the Dutch WISC#R: a comparison with the USA and Scotland, Educational Psychology, 14:2, 249-254, DOI: 10.1080/0144341940140208

To link to this article: http://dx.doi.org/10.1080/0144341940140208

Published online: 29 Sep 2006.

Submit your article to this journal

Article views: 10

View related articles

Citing articles: 13 View citing articles

Full Terms & Conditions of access and use can be found at
http://www.tandfonline.com/action/journalInformation?journalCode=cedp20

Download by: [University of California, San Diego] **Date:** 29 June 2016, At: 12:48

Educational Psychology, Vol. 14, No. 2, 1994

INSTRUMENTAL NOTE

Sex Differences on the Dutch WISC-R: a comparison with the USA and Scotland

MARISE PH. BORN *Faculty of Psychology and Pedagogics, Free University of Amsterdam, The Netherlands*

RICHARD LYNN *Psychology Department, University of Ulster, Coleraine, Northern Ireland, UK*

Downloaded by [University of California, San Diego] at 12:48 29 June 2016

ABSTRACT *Sex differences in the Dutch standardisation sample of the WISC-R are analysed. The results correspond very closely to the sex differences in the Scottish and American standardisation samples. Boys scored significantly higher on the general intelligence factor and on the verbal and visuospatial factors. Girls scored higher on the perceptual speed/memory factor. There was no effect of age on sex differences. One of the causes for the higher scores for boys on the general and verbal factors is the relatively substantial sex difference on the Information subtest.*

Recently, Lynn and Mulhern (1991) analysed sex differences in the Scottish standardisation sample of the WISC-R and were able to compare these with sex differences in the American standardisation sample published by Jensen and Reynolds in 1983. The remarkable finding was that the two data sets showed nearly identical results: in both samples girls obtained significantly higher means than boys on Coding and Digit Span, whereas boys obtained significantly higher means on nearly all of the other subtests as well as on the Verbal and the Full Scale IQs.

While the female advantage on Coding and Digit Span (two Perceptual Speed/Memory tests) and the male advantage on the tests representing visuospatial abilities conform to the general findings in the literature, the male advantage on the verbal tests and on the Full Scale and Verbal IQ do not. Research literature typically demonstrates no sex difference for general intelligence and a small female advantage for verbal intelligence (meta-analyses of Hyde, 1981; Hyde & Linn, 1986; Born *et al.*, 1987).

The confirmation of the higher American male Verbal and Full Scale IQ in the

Scottish standardisation sample made Lynn and Mulhern conclude that the sex differences in the American WISC-R could not be due to the possibility of anomalities in the American standardisation sample. They wondered whether the fact that significant sex differences were absent in the initial WISC, as reported by Kaufman (1975), might imply that the increase in mean intelligence levels during the last decades is greater in boys than in girls.

To investigate whether the resemblance of sex differences on the WISC-R in Scotland and the USA would be generalisable to other countries, it was decided to examine the Dutch WISC-R for sex differences. The results of this study are reported.

Method

The Dutch WISC-R was standardised in 1982 on 2027 children aged 6 to 16 years as a result of drawing a nationally representative target sample of 2200 children. The test content is not very different from the American WISC-R, save several modified or new items mainly regarding the verbal subtests to make them more suitable for Dutch children. Also, several changes in time limits and scoring procedures have been made (see Pijl, 1982, and Van Haasen, 1976, for details).

Results

Table I presents the main findings. The first columns of Table I show the mean scaled scores and standard deviations for boys and girls on each subtest and on the Verbal, Performance and Full Scale IQs. The adjacent column contains the difference scores between the male and female means (M–F). Next, these differences are expressed in standard deviation units (Ds) along with the respective student's t values and significance levels. The last two columns give the American and Scottish sex differences in standard deviation units for comparison with the Dutch Ds.

The results indicate that the direction of the Dutch sex differences are all in favour of boys, apart from Digit Span and Coding. Boys got significantly higher means on the subtests of Information, Similarities, Arithmetic, Vocabulary, Picture Completion, Picture Arrangement, Block Design and Object Assembly. Girls got significantly higher means on the subtests of Digit Span and Coding. Boys obtained significantly higher means on the Verbal and Full Scale IQs, but not on the Performance IQ.

The Dutch findings show a direct resemblance to the Scottish and American findings. In all three samples the only sex differences in favour of girls are for Coding and Digit Span, of which especially the difference on Coding in every sample is considerable (Ds between -0.36 and -0.55). Also, in all three instances, the sex difference on the Information subtest favouring boys is substantial (Ds between 0.30 and 0.39).

Confirming the likeness between the three samples, the product–moment correlation between the Dutch and Scottish sets of Ds and between the Dutch and American sets of Ds both equal 0.97—a significant value ($N=14$ $p<0.001$). This value does not differ significantly from the value of 0.98, which Lynn and Mulhern found between the Scottish and American sets of Ds. The statistical significance of the difference in mean Ds between the Dutch, Scottish, and American groups was examined pairwise and appeared to be nonsignificant ($P>0.05$).

To substantiate further the similarity between the three groups, the difference in mean D for each of the subtests and on the Verbal, Performance and Full Scale IQs was

Downloaded by [University of California, San Diego] at 12:48 29 June 2016

Downloaded by [University of California, San Diego] at 12:48 29 June 2016

TABLE I. Scaled scores of WISC-R subtests and verbal, performance and FSIQ for males and femals (all ages): Dutch sample

	Males			Females							
	N	Mean	SD	*N*	Mean	SD	M − F	Ds	*t*	US Ds	Scottish Ds
Information	1013	10.45	3.18	1014	9.55	2.74	0.90	0.30	6.81***	0.37	0.39
Similarities	1013	10.13	3.03	1014	9.87	2.97	0.25	0.08	1.90*	0.07	0.08
Arithmetic	1013	10.14	3.08	1014	9.86	2.92	0.28	0.09	2.13*	0.06	0.12
Vocabularly	1013	10.21	3.05	1014	9.79	2.94	0.43	0.14	3.21***	0.14	0.28
Comprehension	1013	10.05	3.00	1014	9.95	3.01	0.11	0.04	0.79	0.09	0.11
Digit Span	1013	9.76	2.97	1014	10.24	3.01	− 0.49	− 0.16	3.68***	− 0.10	− 0.15
Picture Completion	1013	10.21	3.05	1014	9.79	2.94	0.42	0.14	3.16***	0.15	0.19
Picture Arrangment	1013	10.15	3.05	1014	9.85	2.95	0.31	0.10	2.30*	0.11	0.06
Block Design	1013	10.18	2.99	1014	9.82	3.00	0.35	0.12	2.63**	0.15	0.16
Object Assembly	1013	10.25	2.86	1014	9.75	3.11	0.50	0.17	3.77***	0.18	0.21
Coding	1013	9.47	2.85	1014	10.53	3.04	− 1.07	− 0.36	8.16***	− 0.53	− 0.55
Verbal IQ	1013	100.82	15.10	1014	99.18	14.64	1.64	0.11	2.47**	0.19	0.22
Performance IQ	1013	100.38	14.82	1014	99.62	15.04	0.76	0.05	1.15	0.01	0.01
Full Scale IQ	1013	100.71	15.09	1014	99.29	14.79	1.41	0.09	2.12*	0.12	0.13

Asterisks 1–3 denote statistical significance at *5, **1, and ***0.1% levels, respectively.

For *Mazes* the results are the following: N, mean, SD for males: 1013; 10.11; 2.89; N, mean, SD for females: 1014; 9.89; 3.10; M − F: 0.21; D: 0.07; *t*: 1.61.

TABLE II. First principal component and three rotated varimax factors representing, respectively, a general index for intelligence, a verbal factor, a visuospatial factor and a memory factor (from Pijl, 1982)

Test	First principal component	Varimax factors 1	2	3
Information	76	75	27	16
Similarities	71	77	19	14
Arithmetic	71	53	26	48
Vocabulary	79	83	24	15
Comprehension	70	78	15	13
Digit Span	50	33	04	63
Picture Completion	54	31	64	− 14
Picture Arrangement	62	33	61	07
Block Design	70	24	70	33
Object Assembly	60	15	78	12
Coding	41	07	13	74

Note: Loadings of *mazes*, an optional subtest of the WISC-R, are 49, and 01, 57, 40, respectively.

studied pairwise and was found to be nonsignificant (alpha of 5%, using the Bonferroni criterion for chance correction) in all cases except one. The only significant difference was observed for Coding where the Dutch sex difference, though sizable, is significantly smaller ($p < 0.01$) than in the American and Scottish samples.

When investigating sex differences, two additional factors are commonly looked into: differences in score variability between the sexes and the influence of age on sex differences.

Firstly, regarding the variability question, several studies have found greater male variability in intelligence test scores. Therefore, F-ratios were calculated to test whether the male scores were more heterogeneous than the female scores in the Dutch sample. For Information ($p < 0.01$) and Arithmetic ($p < 0.05$) the variance of males is significantly higher. For Object Assembly ($p < 0.01$) and Coding ($p < 0.05$) the variance of females is significantly higher. None of the other 10 differences is statistically significant. This finding of no significant sex differences in variability confirms the result in the Scottish group, where the vast majority of F-ratios was nonsignificant too, although in both Dutch and Scottish groups there was a slight tendency for boys to show greater variability.

Secondly, the effect of age was investigated by computing the two-way interaction between sex and age (6 to 16 years) through an ANOVA. The only significant two-way interactions between sex and age were observed for Information ($p < 0.001$), where the difference in favour of boys became larger with increasing age; for Object Assembly ($p < 0.01$), where the difference in favour of boys on the contrary diminished with increasing age; and for Coding ($p < 0.05$), where the difference favouring girls seemed to increase somewhat from 8 to 16 years of age. This general absence of an age effect supports the findings in the Scottish and American samples, where no age influence was found

Next to Wechsler's WISC-R division into verbal and a performance factors, factor analyses (Kaufman, 1975; Jensen & Reynolds, 1983; Lynn & Mulhern, 1991) have

Downloaded by [University of California, San Diego] at 12:48 29 June 2016

demonstrated the presence of three factors, namely a verbal factor, a visuospatial factor and a 'freedom from distractability' factor. The verbal factor contains the verbal tests save Digit Span; the visuospatial factor consists of the performance tests excluding Coding; the 'freedom from distractability' factor involves Digit Span and Coding. This factor can be interpreted as a perceptual speed/memory factor. It was decided to inspect whether this factor structure would be recognisable in the Dutch WISC-R, to be able to compare sex differences with former findings.

The principal component analysis (unrotated factors) of the Dutch WISC-R showed a first factor which can be defined as a general intelligence factor accounting for 41% of the variance (Pijl, 1982; see Table II, first column). As in the Scottish and American samples (see Lynn & Mulhern), the highest loadings are for Information and Vocabulary, whereas the lowest are for Coding and Digit Span. The varimax rotation resulted in the same three factors as mentioned above (Pijl, 1982; see Table II, last three columns).

Downloaded by [University of California, San Diego] at 12:48 29 June 2016

Sex differences on the three factors were computed by weighting the Ds by the factor loadings for the five verbal tests, the four visuospatial tests and the two perceptual speed/memory tests. For the verbal factor this resulted in a D of 0.13 ($t = 2.97$; $p < 0.01$) in favour of boys. For the visuospatial factor a D was computed of 0.14 ($t = 3.03$; $p < 0.01$) in favour of boys. For the perceptual speed/memory factor a D was obtained of 0.25 ($t = 5.62$; $p < 0.001$) in favour of girls. These results are compatible with the sex differences reported by Lynn and Mulhern for the Scottish sample: for neither of the three factors did the Dutch D differ significantly from the Scottish D ($p > 0.05$). Sex differences on the general intelligence index were computed in the same way and resulted in a D of 0.08 ($t = 1.87$; $p < 0.05$). This value does not differ significantly ($p > 0.05$) from the Scottish D of 0.11 for the general intelligence index.

There is a slight tendency for the Scottish Ds to be somewhat larger than the US Ds and for the Dutch Ds to be somewhat smaller than the US Ds. The differences however are not significant.

Referring to Cohen (1992), the *sizes* of the Ds may be interpreted as small but not trivial. For the sake of illustration, to have an idea of the practical importance of the size of the sex difference of D = -0.25 for perceptual speed/memory ability, one might convert it to the BESD (Binomial Effect Size Display of Rosenthal, 1984). If perceptual speed/memory ability is categorised as above and below the median level, a D of -0.25 would be associated with percentages of males and females performing above the median equalling 44 and 56% respectively.

Discussion

The American and Scottish sex differences on the WISC-R can be generalised to the Dutch standardisation group: the findings show a high correspondence. As in the American and Scottish groups, females score higher on Coding and Digit Span, whereas males score higher on the other subtests.

One of the largest differences in favour of males concerns the verbal subtest Information, where the Ds vary from 0.30 to 0.39. A possible cause for this relatively large and consistent sex difference might be sought in the sex differences typically found in interests and interest inventories, leading to discrepancies in general knowledge. The same cause might operate partially in the sex difference favouring boys in the verbal Vocabulary subtest: here too, a general knowledge difference might be an underlying reason. The Dutch finding that the sex difference on Information becomes significantly larger from 6 to 16 years of age confirms the notion that differences in developing interests of boys and girls play a role. To a substantial extent, the sex difference on Information contributes to the difference favouring boys on the verbal and general intelligence factors (Table II). As to the sex differences on the visuospatial and perceptual speed/memory factors, these confirm the traditional literature findings (e.g. Hyde, 1981; Hyde & Linn, 1986), where males are found to be better in spatial ability and females in perceptual speed and memory abilities.

Acknowledgement

We would like to express our appreciation to Ysbrand Pijell of the Dutch Research Institute for Education in the North (RION) for making the data reported in this paper available to us.

Correspondence: Richard Lynn, Department of Psychology, University of Ulster, Coleraine, Northern Ireland BT52 1SA, UK.

REFERENCES

BORN, M.PH., BLEICHRODT, N. & FLIER H. VAN DER (1987) Cross-cultural comparison of sex-related differences on intelligence tests: a meta-analysis, *Journal of Cross-Cultural Psychology*, 18, pp. 283–314.

COHEN, J. (1992) A power primer, *Psychological Bulletin*, 112, pp. 155–159.

HYDE, J.S. (1981) How large are cognitive gender differences? A meta-analysis using w2 and d, *American Psychologist*, 36, pp. 892–901.

HYDE, J.S. & LINN, M.C. (Eds) (1986) *The Psychology of Gender: advances through meta-analysis* (Baltimore, MD, Johns Hopkins University Press).

JENSEN, A.R. & REYNOLDS, C.R. (1983) Sex difference on the WISC-R, *Personality and Individual Differences*, 4, pp. 223–226.

KAUFMAN, A. (1975) Factor analysis of the WISC-R at 11 age levels between $6\frac{1}{2}$ and $16\frac{1}{2}$ years, *Journal of Consulting and Clinical Psychology*, 43, pp. 135–147.

LYNN, R. & MULHERN, G. (1991) A comparison of sex differences on the Scottish and American standardisation samples of the WISC-R, *Personality and Individual Differences*, 12, pp. 1179–1182.

PIJL, Y.J. (1982). *Revisie en Normering van de Nederlandse WISC-R* (Haren, Research Instituut voor het Onderwijs in het Noorden).

ROSENTHAL, R. (1984) *Meta-analytic Procedures for Social Research*, 1st edn. (Newbury Park, CA, Sage).

VAN HAASEN, P.P. (1976) *WISC-R: Nederlandstalige Handleiding* (Amsterdam/Lisse, Swets & Zeitlinger).

Downloaded by [University of California, San Diego] at 12:48 29 June 2016