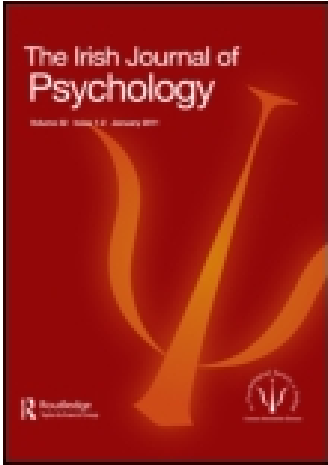


This article was downloaded by: [University of New Hampshire]
On: 18 February 2015, At: 18:11
Publisher: Routledge
Informa Ltd Registered in England and Wales Registered Number:
1072954 Registered office: Mortimer House, 37-41 Mortimer Street,
London W1T 3JH, UK



The Irish Journal of Psychology

Publication details, including instructions for authors and subscription information:
<http://www.tandfonline.com/loi/riri20>

Sex Differences in Cognitive Abilities among Irish Primary and Secondary School Children

Richard Lynn ^a & R. Graham Wilson ^a

^a University of Ulster at Coleraine
Published online: 13 Nov 2012.

To cite this article: Richard Lynn & R. Graham Wilson (1993) Sex Differences in Cognitive Abilities among Irish Primary and Secondary School Children, *The Irish Journal of Psychology*, 14:2, 293-300, DOI: [10.1080/03033910.1993.10557932](https://doi.org/10.1080/03033910.1993.10557932)

To link to this article: <http://dx.doi.org/10.1080/03033910.1993.10557932>

PLEASE SCROLL DOWN FOR ARTICLE

Taylor & Francis makes every effort to ensure the accuracy of all the information (the "Content") contained in the publications on our platform. However, Taylor & Francis, our agents, and our licensors make no representations or warranties whatsoever as to the accuracy, completeness, or suitability for any purpose of the Content. Any opinions and views expressed in this publication are the opinions and views of the authors, and are not the views of or endorsed by Taylor & Francis. The accuracy of the Content should not be relied upon and should be independently verified with primary sources of information. Taylor and Francis shall not be liable for any losses, actions, claims, proceedings, demands, costs, expenses, damages, and other liabilities whatsoever or howsoever caused arising directly or indirectly in connection with, in relation to or arising out of the use of the Content.

This article may be used for research, teaching, and private study purposes. Any substantial or systematic reproduction, redistribution, reselling, loan, sub-licensing, systematic supply, or distribution in any form to anyone is expressly forbidden. Terms & Conditions of access and use can be found at <http://www.tandfonline.com/page/terms-and-conditions>

Sex differences in cognitive abilities among Irish primary and secondary school children

Richard Lynn & R. Graham Wilson

University of Ulster at Coleraine

Sex differences among 1199 Irish primary and secondary school children (594 girls and 605 boys) were investigated for 13 cognitive abilities. Girls tended to obtain higher means than boys, except for spatial abilities. Girls scored substantially higher on Irish studied as a second language.

There has been a long standing interest in sex differences in cognitive abilities. These have been investigated in a number of countries, but not hitherto in Ireland. In this paper we report what we believe to be the first data on this question.

The classical study of sex differences in cognitive abilities is the review of a large number of investigations by Maccoby and Jacklin (1974). They concluded that females generally perform better on tests of verbal abilities, while males perform better on tests of quantitative and spatial abilities. Since this time reviews of this question have used the technique of meta-analysis. This consists of assembling all the studies on the issue, calculating the sex difference in d s (the difference between the two means divided by the standard deviation), weighting the studies by the sample sizes, and averaging the d s. This is a useful technique for quantifying into a single figure the results of a large number of studies.

There have been two major recent reviews of sex differences in cognitive abilities using meta-analysis. Hyde and Linn (1988) carried out a meta-analysis of American studies of verbal abilities. They concluded that there was an overall d of 0.04 favouring males (equivalent to 0.06 IQ points). Among the studies from which this figure was derived was one of nearly one million adolescents on the verbal comprehension scale of the Scholastic Aptitude Test (SAT), taken annually for college entrance by large numbers of young Americans. Males obtain higher averages than

Address for correspondence: Professor Richard Lynn, Department of Psychology, University of Ulster at Coleraine, County Londonderry, N. Ireland. BT52 1SA.

females on this test, and Hyde and Linn concluded that the very large numbers swamped the results of numerous other studies in which females obtained slightly higher means. They therefore excluded this study and proposed a d of 0.11 (equivalent to 1.6 IQ points) favouring females. This treatment of the results shows that the apparent objectivity of meta-analysis may need to be tempered by the exercise of judgement in interpreting the results. Nevertheless, Hyde and Linn suggest that both results show negligible sex differences, and that for practical purposes there are no sex differences in verbal abilities (contrary to the earlier conclusion reached by Maccoby & Jacklin).

A meta analysis of sex differences in spatial abilities has been published by Linn and Petersen (1985). They propose the existence of three abilities designated visualisation, spatial perception and mental rotation, for which they calculate d s favouring males of 0.13, 0.44 and 0.73, respectively.

Nearly all the work on sex differences in cognitive abilities has been carried out in the United States. The question of whether the differences found in the United States are present in other countries and cultures is a matter of interest partly in its own right, and partly because it throws light on the issue of whether the differences are to some degree genetically determined or whether they are solely the result of cultural conditioning, expectations, training and the like. If the sex differences in the United States are not present in other countries and cultures, the genetic theory is falsified. If, on the other hand, the American differences are found elsewhere, the genetic theory survives an attempt at falsification and is corroborated and strengthened although not, of course, conclusively proved. For these reasons we have carried out a study of sex differences in a number of cognitive abilities among Irish school children, the details of which are now described.

METHOD

Subjects

The children were drawn from rural and small town primary and secondary schools in the West of Ireland. These schools serve virtually the whole child population. The primary school children were tested in grades 4, 5 and 6, were aged 8 to 11 years, and consisted of 327 boys and 273 girls. The secondary school children were tested in the first three grades, were aged 11-14, and consisted of 278 boys and 321 girls. All the children in the schools were tested and all spoke English as their first language and were taught Irish as a second language in school.

Tests

Cognitive tests were selected to represent the major primary abilities listed by Ekstrom, French, Harman and Derman (1976). These primaries are listed below and followed by the tests used to measure them.

1. Verbal Comprehension: Mill Hill Vocabulary Test.
2. Reasoning: The Standard Progressive Matrices.
3. Verbal Closure: Two minutes were given to complete 20 anagram problems consisting of 3 and 4 letters.
4. The Primary Mental Abilities Addition Test consisting of 20 addition sums (Thurstone, 1963).
5. Long Term Memory: A short story was read to the children prior to the administration of test 4. The story was read aloud by the tester and the children followed the story from a copy printed in the test booklets. They were asked to try and remember as much about the story as possible. When the sums were completed, the children were given a multiple-choice test on the story. Twelve questions were asked and the subjects were required to choose the correct answer from a number of alternatives. Two minutes were allowed for this test.
6. Ideational Fluency: The subjects were asked to write the names of as many animals as they could think of in two minutes.
7. Space Relations: The Primary Mental Ability Space Relations Test (Thurstone, 1963).
8. Flexibility of Closure: Hidden Patterns Test. The subjects were presented with 120 small diagrams and were asked to indicate whether or not each of the diagrams contained a given pattern.
9. Perceptual Speed: The Primary Mental Abilities Test (Thurstone, 1963).
10. Associative Memory: The subjects were asked to study a list of 10 first names and surnames and try to remember them. One minute was allowed for memorisation. The surnames were provided in the answer booklets and the subjects were given two minutes to insert the correct first name from memory.

11. **Word Fluency:** The subjects were asked to write as many words as they could think of in two minutes which ended "ay". This is a word fluency test taken from Ekstrom, French, Harman and Derman (1976).

12. **Spelling:** The Schonell Spelling Test. This consists of 40 words which are read out to the subjects, who write them down. The score consists of the number spelled correctly.

13. **Drumcondra Irish Test** (Education Research Centre, 1978): This consists of four tests of Vocabulary, Comprehension, Usage and Spelling, for which the scores are summed.

RESULTS

The results are shown in Table 1 and are given separately for the primary and secondary school children because a number of studies have shown that sex differences became greater after puberty, especially for spatial abilities (Maccoby & Jacklin, 1974). The table lists the abilities and gives the means and standard deviations for boys and girls, the sex differences expressed as *ds*, (positive signs indicating higher means by boys and negative signs higher means by girls) and the *t* value for the differences as a test of statistical significance. The last column on p.298 shows the *ds* for the secondary school children minus the *ds* for the primary school children to provide a measure of whether the differences at the primary stage become greater at the secondary stage. Positive signs indicate that the sex difference has become greater and negative signs that it has diminished. No figure is given for the two cases where the sex difference changes sign from primary to secondary school children.

DISCUSSION

There are a number of points of interest in the results. Firstly, the girls generally obtained higher means than the boys. Of the 26 comparisons, girls obtained significantly higher means on 20, while boys did not obtain a significantly higher mean on any of the tests. This is an unusual result to obtain from a battery of tests containing the major primary abilities which typically show that males obtain higher means in some tests balanced by females obtaining higher means on others. It may be that our results are genuinely characteristic of Irish children, or that they are a sampling oddity.

Table 1. Means, standard deviations, ds and t values for boys and girls in primary schools. 1, 2 and 3 astericks denote statistical significance at the 5, 1 and 0.1 per cent levels respectively.

Primary

<u>Test</u>	<u>Sex</u>	<u>Mean</u>	<u>SD</u>	<u>d</u>	<u>t value</u>
Verbal Comprehension	M	12.31	(4.60)	-.25	-3.04**
	F	12.99	(3.88)		
Reasoning	M	28.73	(9.08)	.06	0.72
	F	27.68	(8.87)		
Verbal Closure	M	8.28	(4.38)	-.30	-3.68***
	F	9.17	(4.55)		
Addition	M	21.71	(5.84)	-.21	-2.52*
	F	22.13	(5.21)		
Long Term Memory	M	8.27	(4.66)	-.38	-4.29***
	F	9.30	(4.71)		
Ideational Fluency	M	14.29	(5.40)	-.27	-3.05**
	F	15.20	(5.85)		
Space Relations	M	11.64	(4.51)	.13	1.45
	F	10.77	(4.45)		
Flexibility of closure	M	25.94	(13.03)	.06	0.02
	F	24.62	(14.79)		
Perceptual Speed	M	19.54	(7.88)	-.17	-1.94
	F	20.04	(8.00)		
Associative Memory	M	5.58	(2.82)	-.28	-3.27**
	F	6.09	(2.88)		
Word Fluency	M	7.94	(3.79)	-.09	-1.20
	F	8.11	(3.96)		
Spelling	M	16.00	(11.09)	-.45	-5.48***
	F	19.96	(10.43)		
Irish	M	59.39	(16.97)	-.64	-8.18***
	F	69.96	(19.88)		

Table 1 cont. Means, standard deviations, *ds* and *t* values for boys and girls in secondary schools. 1, 2 and 3 astericks denote statistical significance at the 5, 1 and 0.1 per cent levels respectively.

Secondary

<u>Test</u>	<u>Sex</u>	<u>Mean</u>	<u>SD</u>	<u>d</u>	<u>t value</u>	<u>ds-dp</u>
Verbal Comprehension	M	18.39	(4.95)	-.14	-2.05*	-.09
	F	18.98	(4.18)			
Reasoning	M	38.57	(8.68)	-.17	-2.30*	
	F	39.88	(8.25)			
Verbal Closure	M	13.39	(4.82)	-.41	-5.17***	.11*
	F	15.05	(4.17)			
Addition	M	26.38	(4.44)	-.23	-3.35**	.02
	F	27.41	(3.62)			
Long Term Memory	M	12.76	(3.77)	-.31	-3.78***	-.07
	F	13.77	(2.79)			
Ideational Fluency	M	20.76	(6.93)	-.23	-3.28**	-.04
	F	22.30	(6.59)			
Space Relations	M	17.09	(4.10)	.15	0.71	.02
	F	16.76	(4.09)			
Flexibility of closure	M	66.92	(84.10)	-.16	-2.17*	
	F	69.82	(78.91)			
Perceptual Speed	M	28.73	(7.44)	-.29	-3.62***	.12*
	F	30.67	(6.81)			
Associative Memory	M	6.54	(2.87)	-.49	-6.11***	.21*
	F	7.84	(2.37)			
Word Fluency	M	12.45	(5.43)	-.32	-4.39***	.23*
	F	14.11	(5.05)			
Spelling	M	13.02	(10.58)	-.44	-5.65***	-.01
	F	17.08	(8.97)			
Irish	M	351.47	(47.66)	-.64	-8.14***	.00
	F	383.00	(46.47)			

2. Girls generally performed significantly better on the verbal tests (verbal comprehension, verbal closure, addition, word fluency, spelling and Irish), in accordance with the conclusions reached by Maccoby and Jacklin (1974) and Hyde and Linn (1988) in the United States.

3. On reasoning tested by the Progressive Matrices, there was no sex difference among primary school children, but among secondary school children girls performed significantly better. This is contrary to the normative data for Britain where there is no sex difference (Raven, 1981).

4. On the two memory tests girls scored significantly higher. There is little literature on sex differences in memory, but the present result is consistent with the superior performance of females on the digit span test in the American and Scottish standard samples of the WISC-R (Jensen & Reynolds, 1983; Lynn & Mulhern, 1991).

5. The space relations test is the only test on which boys performed better at both the primary and secondary level than girls. Although the male advantage was not statistically significant, it is evident that the boys did relatively better on space relations, as compared with their significantly inferior performance on most of the other tests. This result is also consistent with the American Literature reviewed by Linn and Petersen (1985).

6. Girls showed some advantage on perceptual speed which was nonsignificant at the primary level but significant at the secondary level. This is consistent with the similar female advantage on the coding test in the American and Scottish standardisation samples of the WISC-R.

7. Girls showed a considerable advantage on spelling at both primary and secondary levels. This is consistent with the results obtained in the Differential Aptitude Test in the United States and Britain (Feingold, 1988; Lynn, 1992).

8. On the Irish test, girls showed a substantial superiority to males. There is little other evidence with which to compare this result because sex differences in aptitude for foreign languages have rarely been studied. This is largely because it is very unusual for all school children to learn a second language, especially at primary school. This is possibly a unique set of data for sex differences in second language aptitude obtained from the whole ability range at both primary and secondary school level. The overall female advantage of 0.64 was much greater than the female advantage on other verbal tests.

9. Regarding the possibility that sex differences may increase among post-pubescent as compared with pre-pubescent children, four of the tests (verbal closure, perceptual speed, associative memory and word fluency) showed the increase at a statistically significant level. The results suggest that this hypothesis only holds for some abilities and is not generally valid.

10. In general the pattern of sex differences in cognitive abilities in Ireland is similar to that typically found in the United States, with females showing their greatest advantage on verbal abilities and little or no advantage on non-verbal reasoning and spatial abilities. Although the absolute level of abilities in this sample is rather unusually tilted in favour of females, the pattern of sex differences is consistent with those found elsewhere. The consistency of sex differences in cognitive abilities in different cultures is generally considered to give some support to the thesis that these have a genetic basis.

REFERENCES

- Education Research Centre (1978). *Drumcondra Attainment Tests*. Dublin: St. Patrick's College.
- Ekstrom, R.B., French, J.W., Harman, H.H. & Derman, D. (1976). *Kit of Factor References Tests*. Princeton, NJ: Educational Testing Service.
- Feingold, A. (1988) Cognitive gender differences are disappearing. *American Psychologist*, 43, 95.
- Hyde, J.S. & Linn, M.C. (1988). Gender differences in verbal ability: a meta-analysis. *Psychological Bulletin*, 104, 53-69.
- Jensen, A.R. & Reynolds, C.R. (1983). Sex differences on the WISC-R. *Personality and Individual Differences*, 4, 223-226.
- Linn, M.C. & Petersen, A.C. (1985). Emergence and characterisation of sex differences in spatial ability: a meta-analysis. *Child Development*, 56, 1479-1498.
- Lynn, R. (1992). Sex differences on the Differential Aptitude Test in British and American adolescents. *Educational Psychologist*, 12, 101-106.
- Lynn, R. & Mulhern, G. (1991). A comparison of sex differences of the Scottish and American Standardisation samples of the WISC-R. *Personality and Individual Differences*, 12, 1179-1182.
- Maccoby, E.E. & Jacklin, C.N. (1974). *The Psychology of Sex Differences*. Stanford: Stanford University Press.
- Raven, J. (1981). *Manual for Raven's Progressive Matrices and Mill Hill Vocabulary Scales*. London: H.K. Lewis.
- Thurstone, L.L. (1963). *Primary Mental Abilities*. Chicago: Chicago University Press.

(Accepted for publication April, 1993)