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Sex differences on Verbal and Non-Verbal Abilities among Primary School Children in Malta

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Professor Richard Lynn, Professor Emeritus, University of Ulster worked as lecturer in psychology at the University of Exeter, professor of psychology at the Economic and Social Research Institute, Dublin, and at the University of Ulster. Most of his work has been on different aspects of intelligence; the Flynn Effect, brain size, gender and race differences in intelligence and how this may contribute to national differences in wealth and economic growth. He has published widely and has authored several books on the subject.

Abstract:

Sex differences on verbal abilities assessed with tests of reading, verbal comprehension, spelling and foreign language ability, and of non-verbal ability assessed with the Coloured Progressive Matrices were examined in a longitudinal study on a sample of 136 children between the time they were 5 years old to the time they were 9 years old in Malta. Girls obtained significantly higher means on the verbal abilities, and a non-significantly higher mean on the Coloured Progressive Matrices (d =.15). The results are generally consistent with studies in the United States and Britain.

Introduction

For approximately a century it has been consistently asserted that, there is no sex difference in general intelligence, whether this is defined as the IQ obtained from tests like the Stanford-Binet and the Wechsler or as Spearman's *g*. In the first half of the twentieth century, this conclusion was advanced by Terman (1916) and Spearman (1923). In the second half of the twentieth century this conclusion was reaffirmed by 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". If one considers this model

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of mental ability, one finds that there are only small differences between the sexes. Brody (1992, p.323): "gender differences in general intelligence are small and virtually non-existent"; Jensen (1998, p.531): "no evidence was found for sex differences in the mean level of *g*"; Mackintosh (1998, p.567): "there is no sex difference in general intelligence worth speaking of"; Lubinski (2000, p.416): "most investigators concur on the conclusion that the sexes manifest comparable means on general intelligence"; and Halpern (2000, p.218): "sex differences have not been found in general intelligence".

Whilst one can argue that on the other hand any possible sex differences may have been balanced out in tests, these were never significant even before any balancing out was practised in the early days of test construction (Loehlin, 2000).

Notwithstanding, it has become well established that there are sex differences in a number of specific abilities such that males obtain higher mean scores on some cognitive abilities while females obtain higher mean scores on others. There is a large research literature on this subject including books by Caplan, Crawford, Hyde and Richardson (1997), Kimura (1999) and Halpern (2000) as well as numerous review papers and meta-analyses. Kimura (1999) lists five abilities on which males obtain higher means on average than females: spatial orientation, visualization, line orientation, mathematical reasoning, and throwing accuracy; and five abilities on which females obtain higher means on average than males: object location memory, perceptual speed, verbal memory, numerical calculation, and manual dexterity. Nevertheless, these differences ostensibly underlie variations in the achievement levels of the male and female cohorts and one need only consider the recently published report on the 2004 Secondary Education Certificate Examination results for a total cohort of 5,533 Maltese sixteen year-olds to identify clear gender differences with significantly more females than males obtaining the highest scores in language subjects at age 16 years.

The present paper makes a contribution to this debate by reporting sex differences on non-verbal reasoning ability, reading, verbal comprehension, spelling and foreign language ability among younger primary school children in Malta. The general interest of the data to be reported is that they examine whether the sex differences typically found in Britain, the United States and some other countries are also currently present in Malta. This assumes particular importance in view of the fact that no major ability measure used internationally has ever been standardised on a representative Maltese population. Whilst in itself, this does not invalidate reported results, it does mean that numerous studies adopting varying methodological approaches need to be conducted to throw light on this issue and triangulate results. Studies by Borg (1994, 1996), Borg and Falzon (1995) and Sammut, Borg and Falzon (1995) support the existence of these differences across the primary and secondary schools spectrum. Whereas these studies focus on older primary and secondary school children, the present study focuses on the first four years of primary school, providing evidence that the differences described by the above are also evident in the early years of education and extend all the way to secondary schooling.

Method

The children in this study initially comprised 71 boys and 65 girls attending the kindergarten classes of state primary schools. They attended seven schools that were chosen on the basis of the schools having obtained an average score on the primary schools' "league tables", which are based on the annual results of national tests taken by children in Years 4, 5 and 6 (ages 8, 9 and 10 years). The children were born in the first three months of the year 1989. They all came form socio-economic classes 3 to 7 of the Office for National Statistics' Socio-economic Classification (2004). All children born in that period were included in the study with the exception of a few who opted out or found the assessment stressful. The children were tested at a mean age of 5.2 years with the Coloured Progressive Matrices (Raven, Court, and Raven, 1998), considered to be a good test of non-verbal reasoning (Mackintosh, 1998). This measure was also used because of its ease of administration, particularly when young children were being tested, because of its inherently low cultural bias and the ease with which the scores of children in different countries and cultures who were taking this measure could be compared. The authors are aware that other models of mental abilities like the Cognitive Assessment System based on Naglieri's PASS model (Naglieri, Das, Stevens and Ledbetter, 1991) could have provided a richer database of information about children's cognitive abilities but one has to consider the issue of test fatigue in young test takers, the cultural bias and the increased error term that these could have introduced to the assessment process.

At the mean age of 6.3 years, the children were administered four verbal tests. These tests were given in Maltese, the first language normally spoken in the home in Malta. The tests comprised Mechanical Reading (a single word reading test for which understanding of the meaning of the words is not required), Reading Comprehension (children joined stimulus pictures to one of three similarly spelled words, with the remaining two words acting as distracters), Spelling (simple dictation exercise), and Sentence Completion (a series of words e.g. *The dog*… were presented and the children were asked to complete the sentence). This last task was scored for the number of words and meaningfulness of the written sentence; spelling was not taken into consideration in this specific exercise as long as individual words could be deciphered.

At the mean age of 9.5 years, these same children were administered four further tests, two in Maltese and two in English. These consisted of (1) Reading comprehension in Maltese (in which children were asked to fill in the blanks in a passage of prose by selecting the correct word or phrase from a number of presented alternatives); (2) Writing ability in Maltese, in which the children completed various language exercises, answered written comprehension questions and wrote short compositions that were scored for orthographic, semantic and syntactic correctness; (3) reading comprehension in English (the test was in the same format as that for Maltese) and (4) writing ability in English, assessed in the same way as writing in Maltese. These were paper and pencil measures administered as part of a national yearly assessment in all state schools in Malta. None of these measures were specifically item analysed to reduce sex bias but were drawn from a larger item bank of age appropriate test items. It is to be noted that in Malta the English language is taught largely as a second language but in reality its use lies somewhere between being a second and a foreign language.

Results

The results are shown in Table 1. This gives the means and standard deviations of the boys and the girls for each of the tests. This is followed by the *d*s values (the differences between the means divided by the pooled standard deviations) for the differences between the mean scores of the boys and girls. The final column on the right gives the t-values for the statistical significance of the differences between the boys and girls. In calculating the values of t, Levene's test for equality of variance was run and showed that the variances were not significantly different for any of the tests; the assumption of equality of variances was justified.

Table 1. Sex differences on verbal and non-verbal tests in Malta

Age	Test	Sex	N	Mean	SD	*d*	T
5.2	Coloured Progressive Matrices	Boys	71	14.01	3.73	.15	0.88
		Girls	65	14.52	2.89		
6.3	Maltese Single Word Reading	Boys	69	16.39	11.04	.49	2.80**
	Measure	Girls	64	22.53	14.12		
6.3	Maltese Reading Comprehension	Boys	68	20.99	6.10	.51	2.89**
	Measure	Girls	64	23.83	5.14		
6.3	Maltese Spelling Measure	Boys	68	11.31	9.52	.58	3.35***
		Girls	64	16.64	8.74		
6.3	Maltese Sentence Completion	Boys	68	24.65	18.74	.55	3.17**
	Measure	Girls	64	34.67	17.57		
9.5	Maltese Reading Measure	Boys	67	13.24	3.20	.51	3.16**
	(National Assessment)	Girls	60	14.62	1.17		
9.5	Maltese Written Measure	Boys	67	50.07	24.36	.83	4.39***
	(National Assessment)	Girls	60	67.18	12.89		
9.5	English Reading Measure	Boys	66	11.73	3.11	.78	4.33***
	(National Assessment)	Girls	60	13.67	1.47		
9.5	English Written Measure	Boys	67	46.99	22.21	.90	4.86***
	(National Assessment)	Girls	60	62.12	16.31		

Table 2. Sex differences on verbal abilities in Malta and six other countries

Country	Age	N	Mechanical Reading	Verbal Comprehension	Spelling	Foreign Language	Reference
Malta	6	132-133	.49	.51	.58	-	This study
Malta	9	127	.51	.51	-	.83	This study
Canada	10	1747	.16	.32	-	-	Randhawa, 1991
England	10	3200	-	.06	-	-	Pidgeon, 1960
Ireland	9	600	-	.25	.45	.64	Lynn & Wilson, 1993
Israel	10	3367	-	.09	-	-	Cahan & Ganor, 1995
Sweden	12	2250	-	.03	-	.27	Ljung, 1965
Sweden	10	1544	-	.29	-	-	Fagerlind, 1975
USA	8	-	-	.05	-	-	Hyde et al., 1988
USA	8	1562	-	.21	.35	-	Martin & Hoover, 1987
USA	6	801	-	.11	-	-	Naglieri & Rojahn 2001

Girls obtained higher mean scores on all the tests. It will be seen that the difference between the boys and girls on the Coloured Progressive Matrices is not statistically significant although girls obtained a slightly higher mean. On all the eight language tests taken at the ages of 6.3 and 9.5 years, higher mean scores obtained by the girls are all statistically significant. This may be due to the CPM being insensitive to cognitive differences between the sexes, like, for example, the planning processing differences between the sexes identified by Naglieri and Rojahn (2001). It is interesting to note that the boys' CPM scores obtained at age 5.2 years correlated significantly ($p \geq .05$) with all measures of language assessed at ages 6.3 years and 9.5 years. In the case of the girls, this significant correlation was only evident with reference to their scores on the English (foreign) language measures. There were no significant correlations between their CPM scores and their Maltese language scores at either of the two age levels except on one measure of Maltese assessed for at age 5.2, this being the Maltese Word Spelling measure (a simple dictation exercise). The authors would like to posit a view that in the context of this study the CPM may be insufficient for understanding differences in language related achievement even when administered within a relatively short time span of such language measures.

To put the results in an international context, we have carried out a literature search for sex differences among primary school children in other countries in mechanical reading, reading comprehension, foreign language ability and spelling and foreign language ability. The results are summarized in Table 2. All the sex differences are expressed as *ds*. In all the results girls obtained higher means than boys.

Discussion

The results contain three points of interest. First, there is no statistically significant sex difference on the non-verbal Coloured Progressive Matrices. This confirms results of four studies of 5-year-olds in Germany, Australia, Brazil and the United States, all of which found negligible sex differences on the CPM (Lynn and Irwing, 2004).

Second, on the verbal abilities in their first language the girls in the present study obtained consistently higher means in all the tests (*d*=.49, .51 and .58 at age 6, and .51 and .83 at age 9). This is consistent with the results in all the ten studies from six countries summarized in Table 2.

However, the advantages of the girls in Malta are rather larger than those in any of the other studies. The magnitude of the sex differences must be expected to vary between age groups, cultures, the precise nature of the tests and possibly the time of administration. For instance, in the meta-analysis of sex differences in verbal abilities in the United States by Hyde and Linn (1988) it was calculated that in pre-1973 studies females had an advantage of .23*d,* while in post -1973 studies it had dropped to .10*d.*

On spelling, the advantage of girls in Malta (.58*d*) is a little greater than that reported for children of approximately the same age in Ireland (.45*d*) and in the United States (.35*d*).

We have only been able to find two studies of sex differences in spelling among primary school children given in Table 2 and spelling is not normally listed among the abilities in which girls are better than boys. None of the books cited in the introduction contain any references to the existence of a female advantage in spelling.

The present result is also consistent with the advantage of females on spelling among adolescents in Britain and the United States reported in Lynn (1992).

Third, on foreign language ability the advantage of the girls is also somewhat greater in Malta at .84*d* (the average of .78*d* and .90*d* for reading and written English) than in the other two countries for which data are given in Table 2. However, it is not so much larger than the .64*d* advantage of girls of the same age of 9 years in Ireland, where English is virtually universally spoken as the first language, and where all children in state schools are required to learn Irish (Gaelic) as a foreign or second language. There are very few studies of sex differences in foreign or second language ability. None of the books cited in the introduction contains any references to the existence of a female advantage in the acquisition of a language. We have only been able to find the two studies of this question given in Table 2. We are not aware of any studies of sex differences in foreign language ability among primary school children in the United States or Britain. The confirmation of the superiority of girls in foreign language ability in the present study suggests that this is now sufficiently well established to be included among the sex differences in primary abilities.

Limitations

This study suffers from a number of limitations, these being primarily that the number of participants is relatively small, thus limiting the applicability of the findings. Moreover, the actual content of the assessment material that has been included in the study for comparison (see table 2) may differ substantially from that used in this study. This renders comparability difficult and tenuous at times. The study makes little allowance for the effect of the time lapse between the initial assessment on the Coloured Progressive Matrices and subsequent assessment on various language measures. This is particularly relevant in terms of the sources of variability that may have wielded an effect on the children's performance on the language measures between the age of five and nine in particular.

In view of the relative dearth of research comparing the ability and achievement levels of local populations of children with counterparts from other countries in different scholastic setups, one may consider as a first step the Maltese standardisation of certain measures of (English) literacy achievement commonly used in other English speaking countries. If this goal were to be achieved, the cross-cultural comparisons made between and among the different groups could retain their validity with fewer reservations than has been the case so far. As a second step, one may need to consider the standardisation and cultural modification of internationally used measures of ability so that cross-cultural studies can start including Maltese populations with little loss of validity as to the reported outcomes.

Although one may consider these aims as having largely research goals, in reality they would serve primarily to develop a database of locally standardized measures of achievement and ability that would benefit the local community of educational psychologists and other related communities in using valid measures in their work with children generally.

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