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Mean Graduate Record Examination (GRE) score and gender distribution as function of academic discipline

Donald I. Templer *, Marie E. Tomeo

California School of Professional Psychology — Fresno, 5130 E. Clinton Way, Fresno, CA 93727-2014, USA

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Abstract

The correlation between the percentage of doctorates in a field obtained by males and the mean Verbal plus Quantitative plus Analytical Graduate Record Examination (GRE) score for that field was 0.76, d.f. = 44, $P < 0.001$. It was inferred that men tend to earn doctorates in more demanding fields. It was also maintained that the findings are very consistent with the previous literature showing males having higher means on a number of different cognitive and aptitude measures, including GRE Verbal and Quantitative and Analytical scores. © 2001 Elsevier Science Ltd. All rights reserved.

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The purpose of the present research was to determine the relationship between mean Graduate Record Examination (GRE) of field of study and the proportion of males in that field. This study was based upon the inspection of mean GRE scores as a function of field and upon the research showing males obtain higher academic achievement and higher mental ability scores. Although it is dogmatically stated in some psychology textbooks that males and females do not differ in IQ, the evidence from a number of different countries show that males have higher Verbal IQ and Performance IQ and that the typical difference in Full Scale IQ is about three or four points (Lynn, 1994). And, as has been pointed out by Eysenck (1995), the items of the major intelligence tests such as the Wechsler and Binet tests were chosen to minimize gender differences. These tests do not employ spatial rotation tasks upon which males usually score over a half a standard deviation higher (Linn & Peterson, 1986; Lynn, 1994). Perhaps one reason it is often stated that

* Corresponding author. Tel.: +1-559-456-2777; fax: +1-559-253-2267.
E-mail address: dtempler@mail.cspp.edu (D.I. Templer).

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male and female mean IQ's do not differ is that the brain size and mean IQ differences are smaller in childhood, but in adolescence the discrepancies in both become larger (Lynn, 1994). A very comprehensive review of the literature of Rushton and Ankney (1996) clearly shows that IQ correlates positively with brain size and that male brains are larger than female brains, even when body size is controlled for. The established relationship between brain size and intelligence takes on new importance with the recent findings of Wickett, Vernon, and Lee (2000) who reported that brain size correlated not only with a number of different psychometric measures of intelligence but with two reaction time measures of intelligence.

There is reason to believe that the gender differences may be greater at the exceptionally high levels of ability. Dorans and Livingston (1987) reported that 99% of persons with perfect scores of 800 on the SAT were males, that 90% with scores from 780 to 790 were males, and that 81% with scores from 750 to 770 were males. Eysenck (1995) calculated that if males have a 4 point higher mean IQ and that if there is a standard deviation of 15 for males and 14 for females, out of 10,000 randomly selected individuals there would be 55 males and five females with an IQ of 160 or above. Eysenck stated: "In the list of geniuses studied by Cox (1926), there are no women. There are no women among Roe's (1951a, b, 1953) eminent scientists, and very few in American Men of Science, or among members of the Royal Society; none in a list of the leading mathematicians (Bell, 1965)..."

1. Method

The data here employed are from the 46 fields that both have Verbal and Quantitative and Analytical GRE means available from the Educational Testing Service (1998) and the percentage of males who obtained doctorates in the fields in 1992–1993 listed in the National Center for Educational Statistics (1997). The GRE is unquestionably the test that is used most often for admission to graduate programs in the United States. The "General Test" provides Verbal, Quantitative and Analytical scores which can range from 200 to 800 and are ordinarily taken by all persons administered the GRE. The means for all (over 1.1 million) persons taking the General Test from 1994 to 1997 are 474 for Verbal, 558 for Quantitative and 547 for Analytical. The respective standard deviation are 114, 139 and 130. The "Subject Tests" pertain to discipline content, and these scores were not used in the present study because they are ordinarily taken only by persons who seek graduate school admission in that discipline and because the norms are discipline specific.

2. Results and discussion

Table 1 contains both the mean Verbal and Quantitative and Analytical GRE scores as a function of discipline, and the percentage of male doctoral recipients. The product-moment correlation coefficient between these two variables is 0.76, d.f. = 44, $P < .001$.

An inspection of Table 1 seems to indicate that the high male/high GRE occupations involve mathematics more than the high female/low GRE occupations. It is often said that girls and women lack confidence in their mathematical ability and are insufficiently encouraged to study mathematics and enter mathematic related fields. Such contentions may very well have good elements of

Table 1
Verbal + Quantitative + Analytic mean and percentage of males

Program	Mean	Percent male
Physics and Astronomy	1903	87.59
Material Engineering	1840	83.29
Mathematics	1835	78.13
Chemical Engineering	1820	84.44
Philosophy	1811	72.09
Economics	1795	75.95
Other Engineering	1786	89.70
Chemistry	1764	71.87
Computer and Information Technology	1762	84.57
Mechanical Engineering	1762	93.01
Electrical and Electronic Engineering	1760	90.54
Civil Engineering	1718	89.40
Earth, Atmosphere and Marine	1704	75.43
Biological Science	1688	59.33
Industrial Engineering	1676	84.98
Natural Science and Other	1666	59.56
English Language Literature	1665	35.53
Bank and Finance	1662	82.81
History	1659	62.77
Anthropology and Archaeology	1654	46.29
Political Science	1645	71.10
Arts — History, Theory and Criticism	1638	39.01
Secondary Education	1623	37.50
Architecture and Environmental Design	1622	80.00
Agriculture	1619	76.84
Foreign Language Literature	1612	29.94
Library and Archival Science	1574	31.11
Arts — Performance and Studio	1563	55.50
Curriculum and Instruction	1545	32.65
Psychology	1536	37.78
Sociology	1523	49.25
Health and Medical Science	1509	41.48
Education Evaluation and Research	1505	28.57
Communications	1505	51.04
Business Administration and Management	1480	74.93
Other Social Science	1477	54.43
Elementary Education	1475	20.88
Accounting	1466	53.97
Education — Other	1460	34.58
Public Administration	1443	66.22
Education Administration	1430	45.18
Special Education	1410	17.53
Student Counseling and Personnel Services	1405	35.44
Home Economics	1406	25.76
Social Work	1385	30.50
Early Childhood Education	1376	3.23

truth. In order to obtain further perspective, the present authors obtained the Verbal, Quantitative, and Analytical means for the 10 fields with the highest percentage of females and the 10 fields with the highest percentage of males. The respective means were 453.9, 492.4, and 528.1 for the high female fields and 478.8, 684.6 and 603.1 for the high male fields. The high male fields not only tend to be higher in Quantitative but higher in Verbal and Analytical as well. The fields are not only more demanding with respect to mathematics, but seem more demanding in general. Although philosophy is not a field greatly associated with mathematics, it ranks number 4 in Verbal plus Quantitative plus Analytical and had 72% male doctorates.

A plausible explanation for the higher concentration of males in the more demanding fields is that they tend to have more academic ability. In fact, males have higher means on the GRE. For 255,349 male and female US citizens taking the GRE in 1997–1998 (Educational Testing Service, 1999), the mean of the men was 496 (S.D. = 110) Verbal, 577 (S.D. = 131) Quantitative, and 552 (S.D. = 134) Analytical. The corresponding female means are 472 (SD = 106), 506 (SD = 121), and 529 (SD = 128). It should be borne in mind that the GRE is ordinarily taken before admission to graduate studies. Only the students with better scores are admitted to graduate school and only the better graduate students obtain their doctorates. One might think the GRE gender differences may be greater at the very high end of the distribution of scores since greater gender differences are commonly found in the extremely high end of other measures of academic talent. If normal distributions are assumed, on the basis of the above GRE means and standard deviations, there were 2.0 times as many males with a Verbal GRE of 700 or greater, 3.2 times as many males with a Quantatitive GRE of 700 or greater, and 1.5 times as many males with an Analytic GRE of 700 or better.

The male better performance on Verbal and Quantitative and Analytical is compatible with the theoretical formulations and literature review of Lynn (1999). Lynn, on the basis of Gustafsson's (1984) hierarchical model of intelligence, defined intelligence as the sum of verbal comprehension, reasoning, and spatial abilities. Lynn's Table 1 shows that, in a number of different countries, adult and late adolescent males score higher on General IQ, Verbal IQ, Performance IQ, General Reason, Verbal Reason, Quantitative Reason, and Spatial IQ. Lynn inferred that on the basis of adult males having a 0.78 standard deviation larger brain and the correlation between brain size and IQ of 0.30, males would be expected to have a mean IQ of about 4 points higher than females. This is what Lynn's Table 1 indicates.

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