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Sex differences in general knowledge, semantic memory and reasoning ability

Richard Lynn and Paul Irwing*
University of Ulster, UK

This paper has the three objectives of attempting to replicate a previous study in which it was found that males have substantially greater general knowledge in most fields or domains than females, and of determining how far sex differences in general knowledge are a function of differences in either Gf (fluid intelligence), or experience. The results confirmed the previous study to the effect that males have higher means in a general knowledge factor of approximately .50*d* (half a standard deviation). It was found further that there was no significant sex difference in Gf measured by Baddeley's Grammatical Reasoning Test, and only a low correlation between general knowledge and Gf. Analysis of covariance showed that differential experience as indicated by 'A'-level points and socio-economic status had only a marginal impact on the observed sex difference. The results are interpreted as showing that sex differences in general knowledge cannot be explained as a function of differences in either Gf or experience. It is proposed further that general knowledge should be regarded as a new second-order factor and designated as semantic memory.

In this paper we consider the issues of sex differences in general knowledge and the degree to which these are a function of differences in reasoning ability or experience. During the last half-century there has been an accumulation of evidence that males have greater average general knowledge than females. The first major data set to show this was the standardization sample of the Wechsler Adult Intelligence Scale (WAIS) published by Wechsler (1958). In this sample, males obtained a higher mean than females on the Information subtest (a test of general knowledge) of .18*d* (*d* = the difference between the male and female means divided by the standard deviation of the combined sample). Subsequent standardization samples of the Wechsler tests have confirmed the male advantage on the Information subtest. In the standardization sample of the WISC-R, males obtained an advantage of .37*d* (Jensen & Reynolds, 1983); in the standardization sample of the WAIS-R, the male advantage was .29*d* (Kaufman, McClean,

*Requests for reprints should be addressed to Paul Irwing, School of Psychology and Communication, University of Ulster at Coleraine, Cromore Road, Co. Londonderry, BT52 1SA, Northern Ireland, UK (e-mail: fp.irwing@ulst.ac.uk).

& Reynolds, 1988); in the Dutch standardization sample of the WISC-R, the male advantage was .30*d* (Born & Lynn, 1994); in the Scottish standardization of the WISC-R, the male advantage was .39*d* (Lynn & Mulhern, 1991); and in the Scottish standardization sample of the WAIS-R, the male advantage was .65*d* (Lynn, 1998). The average of these differences is a male advantage of .36*d*. This is a substantial sex difference exceeded only by the male advantage in certain spatial abilities reviewed by Kimura (1999).

A weakness of these results obtained from Wechsler standardization samples is that the Information subtest of the Wechsler tests is quite short. It is arguable that the general knowledge items in the tests could be biased in favour of males. The argument would be that males and females have different kinds of general knowledge and that the kinds appearing in the Wechsler tests happen to favour males. This is certainly an objection that needs to be taken seriously. Nevertheless, the evidence from the Wechsler standardization samples is corroborated by the results of a substantial study of sex differences of the general historical knowledge of 15-year-olds in 26 European countries, in which it was found that boys had higher average scores than girls in all of the countries (Wilberg & Lynn, 1999). The magnitude of the male advantage in the total sample consisting of approximately 30 000 adolescents was .28*d*. This is the same general order of magnitude as the male advantage on the Wechsler standardization samples. General historical knowledge seems unlikely to be biased in favour of males, suggesting that the male advantage on the Wechsler standardization samples does not arise from bias in the items. Despite this consistent and sizeable sex difference in general knowledge, the male advantage has not been noted in recent textbooks on sex differences in cognitive abilities by Kimura (1999) and Halpern (2000).

By the 1990s the state of knowledge on this issue was such that the evidence for a male advantage in general knowledge was suggestive, but not conclusive, and required further investigation. The major problem in resolving the issue of sex differences in general knowledge is that tests of general knowledge assess only a small sample of the huge amount of general knowledge that exists. It seems probable that males and females have different kinds of general knowledge. For instance, it seems probable that males may have more general knowledge of sport and science while females may have more general knowledge of fashion and literature. Thus, as noted above, short tests of general knowledge like the Information subtest of the Wechslers may be biased in favour of males because the type of general knowledge assessed favours males.

In the last 2 years attempts to overcome this problem have been made independently by Rolfhus and Ackerman (1999) and Bowen, Baier, and Ackerman (2000) and by the authors (Irwing, Cammock and Lynn, 2001; Lynn, Irwing and Cammock, 2002). Both research groups have employed the same strategy of constructing tests for the measurement of all the major areas or domains of what is normally understood by general knowledge, obtaining data for them, factor analysing the results and examining the sex differences; and both have arrived at broadly similar conclusions. Rolfhus and Ackerman (1999) have constructed tests of 20 domains of general knowledge, from which they obtained four first-order factors of knowledge, which were designated as Humanities (American literature, art, geography, music, world literature); Science (biology, business/management, chemistry, economics, physics, psychology, statistics, technology); Civics (American government, American history, law, western civilization); and Mechanical subjects (astronomy, electronics, tools/shop). These four factors yielded a second-order factor identifiable as general knowledge. Examination of sex differences in three samples has shown that females consistently outperformed males in the domain of art, while males consistently outperformed females in the domains of law, business/management, American history, American government, western civilization, geography, economics, technology, physics, electronics, chemistry, biology, and astronomy. There were mixed results across the three samples in the domains of world literature, American literature, and psychology (Bowen *et al.*, 2000). They have not presented an estimate of the overall sex difference in general knowledge but it is evident from their results that males have more general knowledge in many more of the domains than females, and hence have greater overall general knowledge.

In the work of the present authors, tests were constructed of 19 domains of general knowledge and factored to produce six first-order factors. These consisted of Physical Health and Recreation (games, biology and sport); Current Affairs (politics, history, geography, exploration, finance); Family (cookery and medicine); Science (general science and history of science); Fashion (clothes fashion, film, pop music); and Arts (classical music, visual art, jazz and literature). These first-order factors yielded a general factor. The sex differences were that males significantly outperformed females on all the domains of the Physical Health and Recreation factor (biology, games and sport); on all the domains of the Current Affairs factor (politics, finance, history, exploration, geography); and on all the domains of the Science factor (general science, history of science). Females significantly outperformed males on both domains of the Family factor (medicine and cookery). There were no statistically significant differences on the domains of the Fashion factor (clothes fashion, popular music, film). On the Arts factor, males significantly outperformed females on the domains of literature and jazz, while there were no statistically significant differences on visual art or classical music. As in the Ackerman studies, males outperformed females on the majority of the tests. The sex difference on the entire battery of tests was .51d favouring males. This difference is even greater than the differences normally found on the Weschler standardization samples. It is so large that it requires replication and this is the first objective of the study reported here.

The second objective of this study concerns the explanation of the sex difference in general knowledge in terms of contemporary hierarchical models of intelligence. The general contemporary consensus has been presented by Carroll (1993). It has its origin in Cattell's (1971) Gf–Gc theory which conceptualizes Gf (fluid ability) as the basic ability and Gc (crystallized ability) as the development of this ability in a number of areas determined by motivation, education, interests and so on. Gf is general reasoning ability. General knowledge is a component of Gc (general crystallized ability), together with vocabulary, reading comprehension, spelling ability and foreign language ability. In terms of this model, there are two possibilities with regard to sex differences. The first is that males have higher average reasoning ability and that this is expressed in higher average 'general knowledge ability', in which case the male advantage on the two abilities should be the same. The second is that males possess, on average, an advantage on general knowledge ability that is *sui generis* and not explicable in terms of their higher Gf. It is also possible that both factors may be involved, i.e. some fraction of the male advantage in general knowledge may be explicable in terms of higher Gf and the remainder explicable in terms of a higher specific general knowledge ability. There are therefore three possible theories of the relationship between Gf and general knowledge ability.

It has been argued that the existing research evidence suggests that there is no sex difference in Gf (Kimura, 1999; Mackintosh, 1998) and if this is so the male advantage in general knowledge ability cannot be explained in terms of a Gf advantage. An alternative interpretation of the existing research evidence has been proposed by Lynn (1999) who argues that a distinction needs to be made between children and adults and that among adults the male advantage in Gf is appreciable. If this is so, it is possible that among adults the whole of the male advantage in general knowledge ability or a significant fraction of it could be explicable in terms of an advantage in Gf. What is required to test these three alternative theories is a study of sex differences in Gf and general knowledge in a single sample. This is the second objective of the study reported here.

A further explanation of the sex difference in general knowledge, which merits attention, is in terms of differential experience[1]. Potentially, such an explanation could take a number of forms. Lynn *et al.* (2002) argued that the data conform to an explanation in terms of interests. This paper considered two further possibilities based on socio-economic status and experience of 'A' level studies. Irrespective of cognitive abilities, it is possible that exposure to general knowledge varies across different socio-economic groups. For this to provide an explanation for the observed sex difference in general knowledge, it would be necessary that socio-economic status affected girls differently from boys. For example, this would occur if the access of girls to general knowledge were more restricted than for boys in some socio-economic groups. Such a difference in exposure could explain the male advantage in general knowledge. Similarly, school courses are an important source of general knowledge. Although it is not generally the case (Mulhern, Morgan, & Rae, 1996), if boys in the present sample were advantaged in acquiring knowledge at school, this could be a source of the sex difference in general knowledge. In order to test these possibilities, the study included measures of socio-economic status and 'A'-level performance.

Method

Participants

The sample comprised 1047 undergraduate students (594 women and 453 men) from the Faculties of Science; Informatics; Engineering, Arts; and Health, Social Sciences and Education, at the University of Ulster, who ranged in age from 17 to 48 years ($M = 20.5$, SD = 3.3). The sex composition of the sample was representative of the student body. While there was a significant male advantage with respect to total 'A'-level points attained (female mean = 14.7, male mean = 16.9, $t(721) = 4.7$, $p < .001$), men and women did not differ significantly with respect to age (female mean = 20.4, male mean = 20.6, $t(1037) = 0.88$, $p > .05$), scores on Baddeley's Grammatical Reasoning Test (female mean = 30.7, male mean = 29.7, $t(1046) = 1.2$, $p > .05$) or socio-economic status as indicated by father's education ($\chi^2(3) = 0.9, p > .05$) and occupation ($\chi^2(2) = 1.6, p > .05$; see Table 1). As indicated by these data, the University of Ulster recruits a very high proportion of its students from groups of lower socio-economic status compared with most UK universities.

[1] *We are indebted to an anonymous reviewer, who suggested these points.*

Table 1. Socio-economic status (SES) as indicated by father's education and occupation for men and women

	Sex	
Indicator of SES	Men (%)	Women (%)
Father's occupation		
1. Professional/managerial	42.5	46.4
2. White collar/service	14.5	13.0
3. Skilled/semi-skilled	43.0	40.7
Father's education		
1. Secondary school to age 16	63.7	62.6
2. Secondary school to age 18	13.8	13.9
3. Non-university higher education	8.1	7.2
4. University	14.4	16.3

Measures

General knowledge

This was measured using a short form of the General Knowledge Test (GKT) described in Irwing *et al.* (2001). Confirmatory factor analysis has shown that the full test comprises six first-order factors (Current Affairs, Fashion, Family, Arts, Science, Physical Health and Recreation) and one second-order factor, with an overall internal consistency of .91 (Irwing *et al*., 2001). The shortened form of the General Knowledge Test was devised by choosing one domain of general knowledge to represent each of the first-order factors. The domains chosen were Finance, Medicine, Games, Fashion, Literature and General Science, respectively. With the exception of Games, the domains chosen had the highest factor loading on their respective first-order factors. The exception, Games, was chosen because of its greater conceptual coherence with the first-order factor of Physical Health and Recreation, as compared with Biology, which had the highest loading. The test comprised a total of 72 free response items. Each domain was measured by 10 items (see Irwing *et al*., 2001; Table 1), with each correct answer being awarded a score of 1. Example items are shown in Table 2. In six cases, there were two answers deemed to be equally acceptable, e.g. 100°C or 212°F as the boiling point of water. For a further five items (17, 38, 40, 47 and 88),[2] half marks were awarded for a partial answer, e.g. either hydrogen or oxygen in response to the question 'What are the chemical constituents of water?' The internal consistency of the revised measure was estimated at .76, using the formula devised by Werts, Rock, Linn, and Jöreskog (1978).

Gf

This was measured by Baddeley's (1968) Grammatical Reasoning Test. This is a 3-minute test of grammatical transformations. Participants are required to respond 'true' or 'false' to statements such as 'A precedes B' accompanied by an arrangement of the letters (either 'AB' or 'BA'). The statements consisted of all possible combinations of five

[2] *Item numbers refer to the full version of the General Knowledge Test, which is available from the authors.*

Table 2. Example items for each domain of general knowledge

Literature	
75.	Who wrote "The Republic"?
81.	Who wrote "The Magic Mountain"?
General Science	
91.	What is the hardest substance?
93.	What metal is liquid at normal room temperature?
Medicine	
128.	What disease consists of inflammation of the joints?
124.	What organ is impaired by glaucoma?
Games	
133.	In what game can a pawn become a queen?
140.	In what game is the best score 21?
Fashion	
182.	What is the leading American maker of trainers?
187.	Who is the leading black British model?
Finance	
193.	What is the currency of Japan?
201.	What is the currency of Greece?

Note: Numbers denote the item order in the full version of the general knowledge test.

grammatical transformations: (1) active vs. passive voice, (2) true vs. false, (3) positive vs. negative, (4) use of the verb 'precedes' vs. 'follows', and (5) A vs. B as subject. The test consists of 64 items, by combining all possible combinations of grammatical transformation with the two possible arrangements of the letters 'AB'. Carter, Kennedy, and Bittner (1981) administered a 1-minute version of the test to 23 participants on 15 consecutive workdays. For days 4 to 14 the mean test–rest reliability was .82. Using the Spearman-Brown formula, this would provide an estimated test–retest reliability of .93 for the full test. In support of the construct validity of the test, Kyllonen and Christal (1990) showed, using confirmatory factor analyses in two separate samples ($N = 399$ and $N = 414$) of tests derived from the Armed Services Vocational Aptitude Battery or other standard sources (e.g. Carroll, 1989), that a computerized version loaded .64 and .62 on a factor identified as reasoning ability or Gf. Thus, Baddeley's Grammatical Reasoning Test provides a construct valid and highly reliable measure of Gf.

Socio-economic status

Two items worded, 'What was your father's education', and 'How would you describe your father's occupation', were used to assess socio-economic status. Response categories were as detailed in Table 1. Since their scores were unexpectedly weakly correlated (Spearman's $\rho = .09$, $p < .01$), the two items served as separate indicators.

Procedure

During a single session, subjects were administered the General Knowledge and Grammatical Reasoning Tests together with a number of demographic items, in groups ranging in size from 5 to 40. A strict protocol was followed in all testing sessions; including the use of a standardized set of instructions and 20-minute time limit to complete the short form of the GKT.

Results

We have shown that the General Knowledge Test conforms to a hierarchical model containing six first-order factors and one general second-order factor identifiable as general knowledge ability (Irwing *et al.*, 2001). It was anticipated that the shorter version of the test used in the present study would conform to the same structure and provide a measure of the general factor on which all the tests would be loaded. In the present analysis, the combined effects of Gf and sex on the first-order factor model based on the shortened test of general knowledge were estimated to form a MIMIC model (see Figure 1). The term MIMIC stands for multiple indicators and multiple causes (Jöreskog & Sörbom, 1993, p. 172). In this case, sex and Gf conformed to the 'multiple causes', while the first-order general knowledge factor had multiple indicators at the domain levels of general knowledge. In conformity with the findings of Lynn *et al.* (2002), effects of sex on Family and Fashion were allowed, in addition to the effect on the global general knowledge factor.

The MIMIC model was tested with LISREL 8.30, using both maximum likelihood estimation and asymptotic distribution free procedures (ADF). ADF procedures appear

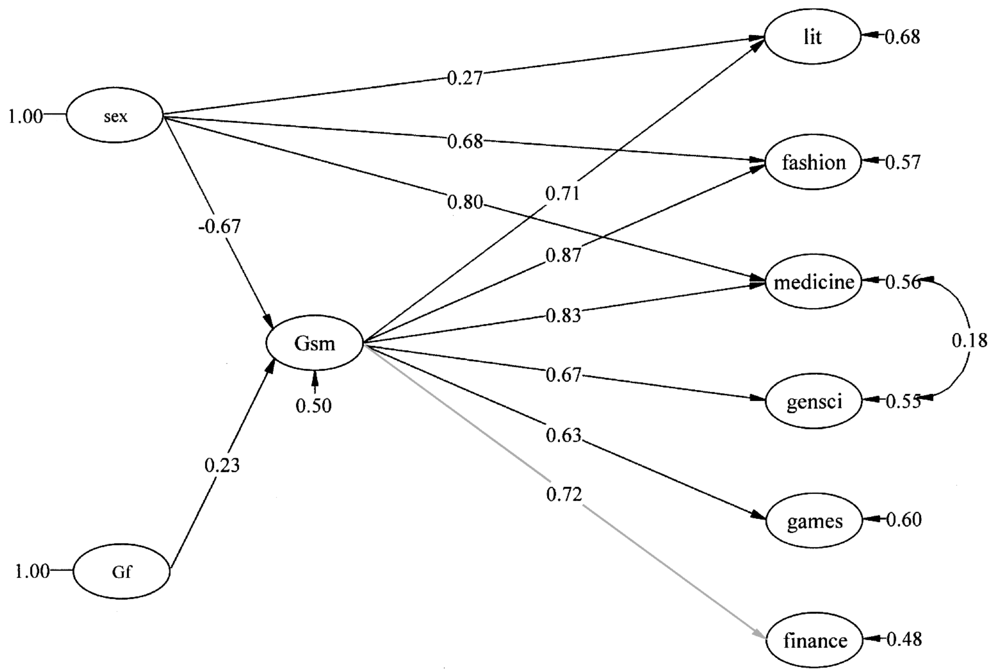

Figure 1. MIMIC model for the effect of sex and Gf on general knowledge (ovals enclose factors, long unidirectional arrows represent effects, and double-headed arrows depict correlated errors, grey and black signify free and fixed parameters, respectively; lit = literature, gensci = general science, Gsm = semantic memory. Observed variables were omitted for clarity. Since sex was coded male = 1 and female = 2, the negative path from sex to Gsm represents a male advantage).

to be technically correct in this instance, since one of the variables was ordinal (Jöreskog, 1993), and the sample size was adequate (Hoogland & Boomsma, 1998). However, solutions based on the two estimation procedures were highly similar, and because maximum likelihood estimation provides more accurate fit statistics than are obtained from ADF (Hu & Bentler, 1998), we report the former. The Gf and six general knowledge composites were normalized, prior to analysis, in order to produce correct parameter estimates and χ^2 values (Jöreskog, Sörbom, du Toit, & du Toit, 1999).

In conformity with the current consensus, multiple indicators were used to evaluate model fit (Bollen, 1989; Marsh, Balla, & Hau, 1996). Following recent advice (Hu & Bentler, 1998; Marsh *et al.*, 1996), we examined the standardized root-mean-square residual (SRMR, Jöreskog & Sörbom, 1981; Bentler, 1995), the non-normed fit index (NNFI; Bentler & Bonett, 1980), and the root mean square error of approximation (RMSEA; Browne & Cudeck, 1993). There is no definitive agreement on cut-off points to determine model fit (Gerbing & Anderson, 1993; Hu & Bentler, 1998; Marsh *et al.*, 1996). Nevertheless, an NNFI $\geq$ .90 is normally considered to be indicative of adequate fit (Bentler, 1983). For the SRMR, we adopted a cut-off of .05 as suggested by Spence (1997), somewhat more conservative than the .08 advocated by Hu and Bentler (1998), and we accepted the simulation finding that an RMSEA of close to .06 is associated with correctly recovered models.

Judged against these indicators, the initial model did not provide an adequate fit to the data (RMSEA = .10, SRMR = .058, NNFI = .85). Model re-specification was based on empirical criteria guided by theory (Anderson & Gerbing, 1988; Bollen, 1989). A large modification index (MI = 27.3) indicated a correlated error between the latent variables of Medicine and General Science. This made substantive sense in that it was possible that the shortened General Knowledge Test might not conform perfectly to a one-factor model. A second modification index (MI = 19.8) pointed to an effect of sex on Literature, suggesting that scores on literature were less associated with maleness than were overall scores on general knowledge. The revised MIMIC model shown in Figure 1, incorporating both these effects, provided an adequate fit according to all three fit indices (SRMR = .030, NNFI = .95, RMSEA = .062 (i.e. close to .06)), with all model parameters significant at the .001 level.

The new estimates of the coefficients linking sex to the different factors of general knowledge differ from those found by Lynn *et al.* (2002). The effect of sex on general knowledge (– .67) is larger than in the Lynn *et al.* study, though this is somewhat qualified by the large countervailing effects on Medicine (.80) and Fashion (.68) together with the somewhat smaller effect on Literature (.27), which indicate that females do better than predicted by the overall trend on these aspects of general knowledge (see Figure 1). All total effects were significant at the $p < .01$ level, and indicated that men score more highly than women on General Science (– .45), Games (– .41), Finance (– .48) and Literature (– .21), whereas women score more highly on Medicine (.24) and Fashion (.09). The magnitude of the effect of sex on general knowledge ability confirms the results obtained by Lynn *et al.* (2002), that males have a large advantage on general knowledge.

In contrast the effect of Gf on general knowledge (.23) is quite weak. It is smaller than would have been anticipated from previous reviews (Carroll, 1993; Jensen, 1998), but conforms quite closely the mean estimates for Baddeley's Test of Grammatical Reasoning, at .26, found by Kyllonen and Christal (1990). The smallness of this coefficient, in itself, means that Gf cannot have much impact on the large effects of sex on general knowledge. Nevertheless, for completeness, we estimated a model in which the effect of sex on general knowledge was mediated by Gf. As would be anticipated from the raw correlation between sex and Gf (.04), this model did not fit (NNFI = .62, RMSEA = .16, SRMR = .20), which was confirmed by a substantial increment in the likelihood ratio ($\chi^2(1) = 108.2$, $p < .001$) compared with the MIMIC model shown in Figure 1 (Jöreskog, 1993). Therefore, in conformity with prediction, we can probably exclude the possibility that the male advantage in general knowledge is explicable in terms of Gf.

In order to investigate the possibility that the male advantage in general knowledge is attributable to differential experience, as indicated by socio-economic status and 'A'-level performance, an analysis of covariance was performed with total general knowledge scores as the dependent variables. The independent variable was sex, while the covariates were total 'A'-level points, father's education and father's occupational status. Because many University of Ulster students study for secondary school qualifications other than 'A'-levels, the sample size was reduced to 705.

After adjustment for covariates, total general knowledge scores were significantly related to sex ($F(1) = 38.2$, $p < .001$). Two covariates: total 'A'-level points ($F(1) = 30.6$, $p < .001$) and father's education ($F(1) = 5.3$, $p < .05$) were also significantly associated with the dependent variable. However, these covariates had only a marginal effect on the sex difference in general knowledge, in that the percentage variance in general knowledge scores explicable in terms of sex dropped from 6.5% to 5.2% after adjustment, a difference of 1.3% It may be concluded that whilst differential experience, as measured by 'A'-level performance and socio-economic status, does have some effect on general knowledge scores, it accounts for only 20% of total variance of the observed male advantage.

Finally, in order to provide a direct comparison, we calculated Cohen's measure of effect size (d) for the overall difference in general knowledge scores between men and women on the short form of the General Knowledge Test for our previous sample (Lynn *et al.*, 2002) and for the current sample. The values of d were .46 for our previous sample and .48 for the current sample and show virtual identity of the magnitude of the sex difference in general knowledge in the two samples.

Discussion

This study had three objectives. The first was to determine whether the large sex difference favouring males in general knowledge of .51d and in the components of general knowledge, obtained in our previous work (Lynn *et al.*, 2002), could be confirmed on a larger sample. The results corroborate our previous findings in two respects. First, it was found that the male advantage on the general factor of general knowledge is .48d and is virtually identical to our previous result. The present study used a shorter form of the general knowledge test than that used in our previous study. When the sample used in the previous study is scored for the shorter form of the test, the sex difference is .46d. This again is virtually identical to the difference of .48d obtained on the same shorter form of the test in the present study. Our results are also similar to those obtained in the USA by Bowen *et al.* (2000). Our first conclusion is therefore that the magnitude of the sex difference on the general factor of general knowledge of approximately .50d is a robust and replicable result.

With regard to the six specific factors of general knowledge representing the major domains of general knowledge, the results of the present study are broadly similar to those obtained in our previous study, although there are some minor differences. In both the previous and the present studies, males obtained higher average means than females in the domains of Literature, General Science, Games and Finance, while females obtained higher means in the domains of Medicine and Fashion. The major difference in the two studies is that in the present study females obtained a small but significant advantage on knowledge of Fashion, as opposed to a non-significant difference in the previous study.

The second objective of the study was to examine how far the sex difference in general knowledge is explicable in terms of Gf. The result indicating that there is no significant sex difference in Gf combined with a large difference in general knowledge, and the low correlation of only .23 between Gf and the general knowledge factor indicates that sex differences in Gf make virtually no contribution to sex differences in general knowledge. This suggests that general knowledge should be considered as a factor *sui generis*.

This conclusion is strengthened by the finding that the male advantage in general knowledge cannot be wholly attributable to differential experience as measured by 'A'-level points and socio-economic status. While men scored higher than women in terms of 'A'-level points, and both 'A'-level points (η^2 = 4.2%) and father's education (η^2 = 0.7%) were related to general knowledge scores, the reduction in the magnitude of the effect of sex on general knowledge after controlling for these factors was marginal. Moreover, 'A'-level points and general knowledge scores may be related because, to some degree, they reflect the same type of underlying ability. It can be concluded that the majority of the sex difference in general knowledge is not attributable to differential experience as measured here, and that experience may have little or no effect, if the observed association is explicable in terms of a common trait of ability.

More generally, our results suggest that general knowledge should be removed from its position in Carroll's hierarchical factor model of intelligence as one of a number of the first-order factors of which the second-order Gc (crystallized ability) is composed. General knowledge seems to be sufficiently important to be regarded as a second-order factor with its own six first-order factors representing the domains of general knowledge. The desirability of such a restructuring of Carroll's model is further supported by the large sex difference in general knowledge which shows that general knowledge must be a different kind of ability from the other components of Gc in Carroll's model on which sex differences are negligible (vocabulary, verbal comprehension) or on which females have higher average abilities than males (spelling, fluency, foreign language ability) (Halpern, 2000; Kimura, 1999). In the terminology of memory theorists such as Baddeley (1999), general knowledge is known as semantic memory. We propose that this would be the best term for the new second-order factor.

However, we must acknowledge certain limitations of our test, in addition to those noted by Irwing *et al.* (2001), in that it by no means reflects all features of semantic memory. For example, the structure of semantic memory is often evaluated by testing how quickly an English speaker can verify a sentence such as 'A cat is an animal'. There are many other aspects of semantic memory which are studied, including organization, priming and decay. Our test does not measure these components. Even as a test of the capacity of semantic memory, our questionnaire might not be considered to be fully inclusive. For example questions such as: 'how do you make bread?' or 'why are the cabins of aircraft pressurized?' might be considered to measure a different sort of general knowledge from that represented in our test. Future research could address whether this type of knowledge also loads on our general factor.

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