

Thinking about intelligence

FEW topics in psychology engender as much popular attention and conjecture as intelligence and intelligence testing. Academics have lost their jobs and their reputations for holding unpopular views on the topic, and related issues are seldom out of the media.

Indeed, 50 of the world's experts were led to write to the *Wall Street Journal* (15 December 1994) in reaction to Herrnstein and Murray's *The Bell Curve* (1994). They covered topics such as the meaning and measurement of intelligence, group differences, practical importance of IQ tests, and the source and stability of within-group and between-groups differences.

In the *Wall Street Journal* the 50 experts unanimously and unequivocally stated that intelligence tests are not culturally biased and that there are indeed race differences in scores. They maintained that intelligence is of great practical and social importance, and that genetics plays a bigger role than does environment in creating IQ differences among individuals.

There have been many other semi-popular books written about intelligence



ADRIAN FURNHAM looks at research on lay theories of intelligence and sex differences in estimated intelligence.

(e.g. Gardner, 1999; Sternberg, 1997). The fact that academics write popular books about intelligence and that lay people have long been interested in the topic suggests that people in general may be relatively well informed about it. Books on how to assess one's own IQ have been very popular (e.g. Eysenck, 1981); there are also books aimed at parents that attempt to assess their children's IQ (Eysenck & Evans, 1996); newspapers often print 'brain teaser' type questions. It is therefore likely that the average person has often been exposed to IQ tests of one sort or another. There are also many members of MENSAs who nearly all proselytise for IQ tests (Serebriakoff, 1985). All this suggests that lay people should, at least compared to other topics in psychology, have a reasonable insight into the concept of intelligence and their own personal ability.

Studies on popular views

Studies on implicit beliefs about what intelligence is span over 50 years (e.g. from Flugel, 1947). Goodnow (1980) specified various ways in which one could investigate how lay people defined intelligence: by simply asking them; by analysing local proverbs (e.g. 'Second thoughts are best', 'Thinkers are not doers'); with rating scales (e.g. 'on a seven point scale, rate to what extent a) common sense, b) good judgement, and c) good memory are part of intelligence'); or by analysing the differences between test answers regarded as 'good' or 'not so good' in one culture. Most studies in this area have relied on attitude statements (e.g. 'IQ tests measure intelligence fairly well', 'Intelligence is primarily inherited').

Shipstone and Burt (1973) replicated Flugel's 1947 study using 575 British adults. They compared results statistically on each of 16 questions (e.g. 'Do you think a measure of "general intelligence" would help find the right man for the job?' — Flugel 75 per cent yes, Shipstone & Burt 58 per cent yes; 'Are rich people on the whole a bit more intelligent than poor people?' — Flugel 44 per cent yes, Shipstone & Burt 30 per cent yes). They found several significant differences over this period: that lay and professional views have moved closer to thinking there is more than one type of intelligence; that men and women are increasingly seen to be of equal intelligence; that lay people recognise the environmental influence on test scores more than they used to; and that there is increased doubt about the validity of intelligence tests and about the high (positive) correlation between tests and occupational performance.

Studies in the area of lay beliefs about intelligence have investigated and found differences between the views of adults and children, parents and teachers, and in people from Africa, America, Asia and Europe (Furnham, in press-a). There seems consistent evidence that lay people include many practical skills and even temperamental factors in their definition of intelligence, a definition that is certainly shaped by cultural factors.

Sternberg (1985, 1990) has taken a particular interest in lay theories of intelligence. He, like many others, argues that such theories overlap with, but also go beyond, skills measured by tests. Lay people think the intelligent person solves problems well, reasons clearly, thinks

WEBLINKS

American Psychological Association Task Force:
www.apa.org/releases/intell.html

Theorists and practitioners:
www.igs.net/~cmorris/spectrum.html

'The general intelligence factor' by Linda S. Gottfredson (*Scientific American*):
www.sciam.com/specialissues/1198intelligence/1198gottfred.html

History of influences in the development of intelligence theory and testing:
www.indiana.edu/~intell/index.html

MENSAs: www.mensa.org

The MEGA Society: www.angelfire.com/ms/mega

Uncommonly difficult IQ tests:
www.eskimo.com/~miyaguch

logically, and has a good store of information; further, that they are also able to balance information and show intelligence in worldly, as well as academic, contexts.

Sternberg believes there are several reasons why the study of lay theories of intelligence, creativity and wisdom is worth pursuing:

The terms are frequently used in everyday discourse as well as in psychological discourse with no minimal definition, and it is useful to know what people mean when they use these terms. People evaluate the intelligence, creativity, and wisdom of themselves and others with some regularity, and it is worthwhile to know the psychological bases on which these evaluations are made. As people make these judgements, it is helpful to know to what extent they are correlated with measures derived from explicit theories, such as psychometric tests. The implicit theories may eventually help broaden and change our explicit theories, as we come to realise those aspects of cognition or affect which the current explicit theories of intelligence, creativity, and wisdom do not encompass, but possibly, should encompass. Thus, the study of implicit theories is not merely an easy substitute for the information and study of explicit theories of psychological constructs. Implicit theories deserve to be studied in their own right, and each study is complementary to the study of explicit theories. (Sternberg, 1985, p.625)

Sternberg (1990) identified seven academic metaphors of intelligence (see box below), their central questions, and typical theorists taking this position. He argued that specific models or metaphors generate specific questions about intelligence that theories and research seek to address. Scientists may be unaware of these metaphors, which can serve to both limit and expand views on intelligence.

Sternberg (1990) does an excellent critical and taxonomic job on academic theories and research in the field of intelligence. However, the question remains whether lay people think in such metaphors. Studies on metaphors of health have shown lay people think in terms quite different from experts.

These various interesting but piecemeal studies do give some indication of lay theories of intelligence, but there is still a lot we do not know. We know that such

theories get more sophisticated with age, and we know they may be relatively culture- and group-specific. We know that compared to most academic theories lay theories tend to be 'over inclusive'. But we do not know if people today are better informed about academic thinking than they used to be, though it would be surprising if they are not. We do not know how lay theories relate to attitudes towards, and personal experience of, a wide range of ability and intelligence tests. It may be that results on IQ tests are the best predictors of people's attitudes to them. We do not know where lay people stand on *The Bell Curve* controversy, and more importantly what factors lead them to holding different opinions, often with passion.

However, the studies on self-estimates of intelligence carried out over the 1990s do give an interesting and important insight into lay theories of intelligence, particularly those that examine multiple theories of intelligence. They also confront the 'hot' topic of sex differences in intelligence.

Self-estimated intelligence

From a comparatively young age people are encouraged to evaluate their own and others' intelligence. Hence they derive implicit or lay theories about the cause and structure of human intelligence. Furthermore, these theories may have important implications for whether they seek out or avoid intelligence and academic performance tests; and even for how they do on such tests, owing to the self-fulfilling nature of self-evaluation of ability.

Beyer (1999) has demonstrated sex

differences in expectations, accuracy and self-evaluations of ability by asking male and female students to estimate their grades for a series of examinations over a semester. Sex differences in self-evaluations affect expectancies of success and failure, and ultimately performance on those tasks. She had earlier noted:

Because of the serious implications of under-estimations for self-confidence and psychological health, more attention should be devoted to the investigation of gender differences in the accuracy of self-evaluations. Such research will not only elucidate the underlying processes of self-evaluation biases and therefore be of theoretical interest but will also be of practical value by suggesting ways of eliminating women's under-estimation of performance. (Beyer, 1990, p.968)

Writing in *The Psychologist*, Halla Beloff (1992) provoked a great deal of interest in sex differences in self-estimated intelligence. She found, among her Scottish undergraduates, a six-point difference with males estimating their score significantly higher than females. She noted:

The young women students see themselves as intellectually inferior compared with the young men. ... Women see equality with their mothers, men with their fathers. Women see themselves as inferior to their fathers and men superior to their mothers. Mothers therefore come out as inferior to fathers. The pattern has been

THE SEVEN ACADEMIC METAPHORS OF INTELLIGENCE

Geographic: seeks to map the mind and understand the structure of intelligence.

Computational: seeks to understand information-processing programmes and processes underlying intelligence.

Biological: asks how the anatomy, physiology and chemistry of the brain and CNS accounts for intelligent thought through hemispheric localisation and neural transmission.

Epistemological: asks what are the structures of the mind through which all knowledge and mental processes are organised.

Anthropological: asks what form intelligence takes as a cultural invention, may be comparative and relativistic. For example, why does one culture believe certain behaviours are part of intelligence while another does not?

Sociological: examines how social pressures (mediated learning experiences) in development are internalised. Metaphors focus on different types of intelligence (i.e. multiple intelligences) and how they relate to one another.

Systems: is concerned with how we understand the mind as a system, which cross-cuts metaphors.

consistent each year. (p.310)

She argued that the modesty training girls receive in socialisation accounts for this data. Soon others attempted to replicate this effect. I reported on eight studies, all but one of which showed significant sex differences in self-rated overall IQ ranging from 3.9 to 8.6 points (Furnham, in press-a). Student groups tend to believe their IQ is around 120: about one to one-and-a-half standard deviations above the mean (Furnham *et al.*, 1999a). Non-student British adults believe they are around half a standard deviation above the norm (Furnham, in press-b). It is indeed rare to find individuals who feel their overall score is below 100, whereas, by definition, half the population must have IQs of less than this. This is evidence of the above-average or 'Lake Wobegon' effect (Kruger, 1999).

Further, a number of these studies following Beloff (1992) looked at estimates of the intelligence of relatives (Furnham *et al.*, 1999b). Those results were particularly interesting, as they show that people believed there are clear generational effects in IQ. They tend to believe they are a little brighter than their mothers, but certainly much brighter than their grandparents. Parents also tend to believe their children are brighter than they are themselves. Clearly what is required is a much bigger representative sample, but there does seem to be a trend that people believe there is a half standard deviation (6–8 points) difference in IQ between the generations.

However, results so far suggest that the perceived sex difference in estimates of the intelligence of others occurs at all stages, even with parents estimating the intelligence of their own children. Thus people believe their grandfathers brighter than their grandmothers, their fathers brighter than their mothers; their brothers brighter than their sisters; and their sons brighter than their daughters.

Interestingly for parents estimating

the intelligence of their children, the sex differences were stronger for firstborns compared with those born later, indicating a possible parallel with the principle of male primogeniture.

Furthermore, these results have been shown to be cross-culturally robust. The sex difference effect has been demonstrated in Asia (Japan, Hong Kong), Africa (Uganda, South Africa), Europe (Belgium, Britain, but not Slovakia) and America (Furnham *et al.*, in press). When participants are asked to rate overall intelligence there is a clear, consistent sex difference: males rate themselves and their male relations higher than females rate themselves and their female relations. It is also worth noting that it is very rare for people to rate the scores of relations as below average, just as it is with their own.

Multiple intelligences

Over the last decade there have been many attempts to redefine intelligence and split it into different facets. Thus we talk of emotional intelligence as well as practical intelligence; but perhaps the idea that has appealed most to lay people (but certainly not academics) is the theory of multiple intelligences (Gardner, 1999).

Research has shown that males still rate their emotional quotient as higher than females (Petrides & Furnham, 2000) as well as on other forms of practical or successful intelligence (Furnham, in press-a). However, most studies in this area have examined sex differences on Gardner's seven multiple intelligences.

Gardner (1999) initially argued that there were seven types of intelligence (see box opposite). He suggested the first two were those valued at school, the next three valuable in the arts, and the last two a sort of early emotional intelligence concept. Various studies have looked at sex differences in estimates of the seven multiple intelligences.

The results of self-estimates of these

multiple intelligences separately have been surprisingly consistent, and give an important clue for understanding sex differences in self-estimates of overall intelligence. First, most people rate their own interpersonal and intrapersonal intelligence as very high (about 1 SD above the mean). They also rate their musical and body kinetic intelligence as strictly average, around 100.

However, in a recent study I undertook, consistent sex differences in self-estimates of multiple intelligence were found in only two types — mathematical and spatial. In particular, female self-estimates of spatial intelligence were typically 6–10 points lower than male self-estimates. There were no sex differences on the verbal score (Furnham, in press-a).

What has been particularly interesting is the instance where participants have estimated their overall score first, followed by their scores on the seven specific multiple intelligences. This has made it possible to regress simultaneously the seven multiple intelligence scores on to the overall intelligence estimate.

Studies appear to show that what people believe really contributes to a high overall IQ score is logical, then spatial, then verbal intelligence. This has allowed for the testing of the hypothesis that lay conceptions of intelligence are male normative, in the sense that those abilities that men tend to do better at are those that most people consider to be the essence of intelligence.

Thus lay people conflate mathematical, spatial and overall intelligence, thereby explaining the consistent sex differences in overall score and the relative lack of sex differences when measuring multiple intelligence. It may be that the often observed and debated spatial difference in IQ between the sexes accounts for the overall IQ difference score (Lynn, 1999).

Self-estimates and test scores

If it is assumed that intelligence tests are indeed valid measures of IQ, an obvious question concerns the statistical relationship between self-estimates and test scores. Some psychologists have even suggested that if the scores are reasonably highly correlated, self-estimates may serve as useful measures at a fraction of time, money and administrative costs.

Various studies have found that the correlations are around $r = .30$, and that self-reports will therefore not serve as proxy measures at all well (Paulus *et al.*, 1998). One study, however, inspected the problem of outliers in the analysis and

SEVEN TYPES OF INTELLIGENCE

Verbal or linguistic intelligence: the ability to use words.

Logical or mathematical intelligence: the ability to reason logically, solve number problems.

Spatial intelligence: the ability to find your way around the environment, and form mental images.

Musical intelligence: the ability to perceive and create pitch and rhythm.

Body-kinetic intelligence: the ability to carry out motor movement, e.g. being a surgeon or a dancer.

Interpersonal intelligence: the ability to understand other people.

Intrapersonal intelligence: the ability to understand yourself and develop a sense of your own identity.

concluded that if they are removed, most raters exhibit 90–100 per cent reliability (Reilly & Mulhern, 1995).

Some researchers have tried to understand (and improve) the size of the correlation between self-estimates and test scores by using more tests on bigger populations. Yet the size of the correlations remains the same around the $r = .30$ mark. These correlations do obscure the fact that whilst some people are clearly accurate estimators of their score, others are not. It may prove very useful to obtain subsamples of highly accurate and inaccurate estimators and see on what other criteria they differ (self-esteem, experience of IQ tests, etc.).

Certainly results do show a tendency for males to overestimate and females to underestimate their scores, but this in part is related to the actual IQ test used. There may well be important motivational factors at play in the self-estimation of intelligence that may lead to serious distortions in the scores. For example, there may be a need to convince interviewers of one's overall intelligence or to enhance sex-role stereotypes. Thus a close examination of the conditions and instructions under which participants make self-estimations of intelligence may give a clue as to how they make them. If social norms and conventions in part dictate how people respond, then under particular circumstances (i.e. anonymously) it may be that the effects of these perceived requirements are reduced.

Explanation for the findings

The fact that there are robust sex differences in self-estimated IQ warrants an explanation. This is particularly the case for two reasons. First, the issue is so frequently discussed, with an academic consensus for many years to the effect that actual differences between the sexes are minimal. Secondly, since the 1930s test constructors have been careful to construct their tests so as not to show any differences.

There are basically three positions on the sex difference on estimates issue — 'feminist', biological and psychometric.

The 'feminist' position is in essence an environmental and attributional account that suggests that there are no actual significant differences in IQ between men and women. Differences in self-estimates are seen as a function of socialising and sociological variables that can be, and need to be, changed.

This argument was clearly articulated

by Beloff (1992), who suggested that the self-estimate differences are erroneous and simply due to attribution errors. Men deny negative feedback while women do not. 'On the whole, women are more rational, men more rationalising.' (Beloff, 1992, p.310.) She believes men are more ambitious. 'Modesty-training is given to girls. Modesty and humility are likely to be connected to the lower estimates of women and for women.' (p.310.) She also notes that, as IQ is correlated with occupational grade and that men tend to occupy these more than women (for political rather than ability reasons), females tend to believe (erroneously) that they are less intelligent than males.

Whilst there seems no direct data to test Beloff's assumptions, they do look a little outdated, particularly in countries such as America where students still show the same sex difference pattern despite the emerging prominence of the principle of sex equality. However, unusual data from Slovakia may be used in evidence for the feminist argument. We (Furnham *et al.*, 1999c) found Slovakian females (as opposed to equivalent Belgian and British student groups) awarded themselves higher overall and verbal scores — a unique group of confident females. We commented:

It may well be that under the pressure of socialist governments of Eastern Europe the role of females in society was somewhat different from that in capitalist Western Europe, where they took a more active role in the economy and were socialised differently in school. Slovakia had a consistent effort to improve the position of women in society: there was a mandatory percentage of women in the parliament; the state propagated the employment of women in nontraditional occupations; women were encouraged to obtain educational qualifications. Overall, in Slovakian society education was held in high prestige. Another explanation lies in the fact that the Slovakian women had the most experience in taking intelligence tests and were therefore presumably more likely to be aware of the very small differences between the sexes. (p.137)

The second position on the issue of sex differences in self-estimates of intelligence may be called the biological approach. Various theoretical issues and applied issues have intensified this debate. Inevitably these include the definition of

general intelligence and the best tests to measure it, along with such issues as sex differences in brain size. This position is most clearly articulated by Lynn (1999), who cites both evidence and theory in support of his claim that males score 4–6 points higher on intelligence tests than females. It is argued that up to the age of around six years there are no sex differences, but that after this age the statistically and socially significant difference occurs. Lynn (1999) notes:

The adult male advantage of around four points obtained by averaging the verbal comprehension, reasoning and spatial abilities is not generally found in the full scale IQ of the Wechsler tests or in the overall IQ of similar tests because the spatial abilities are typically under-represented in these tests. The male advantage of around four IQ points among adults can be predicted from the larger average male brain size as follows: the male-female difference in brain size in SD units is 0.78; this should be multiplied by 0.35 (the correlation between brain size and IQ) = 0.27d = 4.05 IQ points. (p.2)

In many ways the self-report data support Lynn's position. I reviewed eight studies of sex differences in overall IQ estimation, with the total (N) well over 1000. The average difference in IQ score was 5.33 points, which is close to Lynn's estimate (Furnham, in press-a). Further, when calculating the d statistic — a measure of degree of difference between the means of two normal distributions expressed in standard deviation units (Cohen, 1977) — in four of the studies it was over .60, which is regarded as a medium to large difference.

Moreover, the data on multiple intelligences also support Lynn's work, in that the biggest and most consistent sex differences are on estimates of spatial intelligence. Lynn would be delighted to know that spatial and verbal IQ scores suggest that lay people believe these are the important or fundamental components of IQ (Furnham, in press-a).

The third position in this debate is essentially psychometric and revolves around the interpretation of the data. Thus there remains a debate about whether one should measure fluid or crystallised intelligence (or both), at what age, and about what other factors to take into account. Thus different writers are able to quote different and contradictory data sets that support their position. This leads some,

like Jensen (1998), to conclude that 'the sex difference in psychometric g is either totally non-existent or is of uncertain direction and inconsequential magnitude' (p.540). In contrast Lynn (1999) is able to produce a table showing 20 samples (one over a quarter of a million) from Europe, Asia, Africa and America using different measures that clearly shows male superiority of around four IQ points.

Conclusion

Most lay people have a wider conception of intelligence than most, but not all, psychologists working in the area. Issues

around sex and race differences in intelligence continue to excite considerable debate. Despite most tests having been devised so as not to show sex differences, and the 'received wisdom' for many decades being that differences are small, trivial and not worthy of explanation or research, studies on lay self-perceptions of IQ show consistent differences. Males think they are more intelligent than females and that their male relatives are more intelligent than their female relatives. However, this believed superiority lies primarily in spatial and mathematical areas — part, but only a part, of fundamental intelligence.

For some researchers this remains a shocking finding explicable only by sociological processes; for others it represents a reasonable grasp of reality.

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