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Self-estimates of intelligence: culture and gender difference in self and other estimates of both general (g) and multiple intelligences

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Abstract

This review paper examines two related areas of research: studies dating back over 50 years on lay theories of the nature and measurement of intelligence, and more recent research on sex and culture differences on self-estimated intelligence. The latter focus is on the nearly 20 published papers on estimated intelligence. Studies have shown consistent sex differences with males rating themselves higher than females. There are also consistent generational effects with adult participants believing around a half standard deviation difference in intelligence with their grandparents being least intelligent and children most. Self-estimated and psychometric intelligence only correlates weakly. Studies looking at self and other estimates of multiple intelligence indicated that participants seemed to believe that intelligence was male normative in that it was specifically those types of intelligence (mathematical and spatial) that most differentiated between the sexes that were themselves more predictive of general overall intelligence. Implications of these findings for intelligence testing are considered.

Keywords: Culture; Gender; Intelligence; Sex differences; IQ testing

1. Introduction

The definition and measurement of intelligence have always been academically controversial (Eysenck, 1998). However, even more than the topic of the heritability of IQ and environmental effects on IQ, it has been group differences in IQ (especially sex and race) that have produced considerable academic (Flynn, 1987; Lynn, 1998, 1999; MacIntosh 1998; Rodgers, 1999) and popular debate (Herrnstein & Murray, 1994). Hence there are now a number of popular books aimed at explaining various theories of intelligence to the layman (Gardner, 1999; Sternberg, 1997).

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Issues incite considerable passion and even academic writers seem disposed to biting criticisms of their opponents. Thus, in one chapter Eysenck (1998) attacks Gardner (1983): "No wonder he gained high academic acclaim and a strongly partisan following — you only have to attack the IQ to become famous and popular; however nonsensical the attack, and however weak the alleged evidence for your system!" (p. 109); and Goleman (1996) "So the whole theory is built on quicksand; there is no sound scientific basis" (1996, p. 109).

The fact that academics write popular books about intelligence and lay people have long been interested in the topic suggests that they may be relatively well informed about it. Books on how to assess ones own IQ have been very popular (Eysenck, 1981) and it is now possible to find books aimed at parents which gives one an accurate estimate of their children's IQ as well as how to improve it (Eysenck & Evans, 1996; Schoenthaler, 1991). Newspapers often print "brain teaser" type questions and it is therefore likely that the average person has been well exposed to IQ tests of one sort or another.

This paper examines two features of intelligence — first lay theories and beliefs about intelligence and secondly recent studies on self- and other-estimates of intelligence. This is a non-trivial area of research for various reasons (Beyer, 1998; Beyer & Bowden, 1999). First, public beliefs and opinions can have significant social and educational consequences. Thus, if people believe intelligence and related ability tests are seriously biased or flawed they can put pressure on business and educational institutions who use them in selection, streaming or training to stop using them. It is equally true, but possibly rarer, for some people to campaign for the use of tests to prove their ability. The internationally well-known organization MENSA seems to cater for people eager to get some comparative metric on their intelligence (Serebriakoff, 1985). A second reason why lay theories of intelligence of the self and others matter is that these can affect expectations and evaluations which, through various processes, can affect performance (Pomerantz & Ruble, 1997). As Beyer (1999) who has studied gender differences in self-perceptions of exam success has noted: "Self-perceptions that are out of touch with reality not only reveal a lack of self-knowledge, but may also impede effective self-regulation and goal setting in academic, professional and interpersonal situations" (p. 280). Thus, if one group of individuals in society erroneously believe they are generally or specifically less intelligent than others (the norm) they may confirm this hypothesis through their behaviour. On the other hand erroneous beliefs about superior intelligences may lead to arrogance and complacency.

Both of the above reasons suggest it is important to have a well informed and critical public when it comes to the concept and measurement of intelligence. This review will focus first on studies of lay theories of intelligence which have been done for over 50 years but secondly on the more recent research on group differences (sex, nationality) on the self and other perception of intelligence. The latter studies also throw light on lay theories of more recent concepts of intelligence like emotional intelligence (Goleman, 1996) and multiple intelligence (Gardner, 1983, 1999).

2. Lay theories, models and metaphors of intelligence

Studies on implicit studies of intelligence span over 50 years (Flugel, 1947; Shafer, 1999). Goodnow (1980) specified various ways in which one could investigate how lay people defined intelligence: by asking them, analysing local proverbs, checking the connotations of a term by

way of the semantic differential, or analysing the differences between test answers regarded as "good" or "not-so-good" in one culture.

Academic research on the definitive nature of intelligence long predates that (Sternberg, 1990). Sternberg (1990) distinguished between *explicit* theories defined as "constructions of psychologists or other scientists that are based on, or at least tested, on data collected from people performing tasks presumed to measure intellectual functioning" (p. 53) and *implicit* theories which are "constructions of people (psychologists or lay persons or others) that reside in the minds of these individuals, whether as definition or otherwise" (p. 54). He argues that understanding implicit theories is important because they drive the way most people evaluate their own and others' intelligence. He also points to examining the difference between implicit and explicit theories and the role the latter can have in modifying the former.

Flugel (1947), in a paper entitled 'An inquiry as to popular views on intelligence and related topics', reported a 16-item questionnaire study of 302 persons. He summarised his findings thus:

1. The layman distinguishes less clearly than the psychologist between intelligence on the one hand and knowledge or experience on the other, this affecting his views with regard to the influence of education and environment generally upon intelligence.
2. He distinguishes less clearly between intelligence and achievement.
3. He distinguishes less clearly between intelligence and the genetic factors that enter into character and temperament.
4. He overrates the importance of knowledge in intelligence tests.
5. He is largely ignorant of the existence of non-verbal tests.
6. He is inclined to over-rate the value of tests for vocational purposes as compared with their value for measuring general intelligence.
7. He is inadequately informed concerning the wide use of tests for purposes of pure research.
8. Though inclined on the whole to the 'monarchic' view of intelligence, he is yet apt to over-rate in some respects the importance of group or specific factors and does not realise fully the implication of the tendency for most forms of ability to correlate positively with one another.
9. He is unduly inclined to believe in the inheritance of acquired characteristics and at the same time ignorant or neglectful of the evidence pointing to the inheritability of intelligence as such.
10. He is largely ignorant concerning the findings pointing to the cessation of the growth of intelligence after adolescence.
11. He is inadequately informed concerning the relative constancy of the IQ. On the other hand the layman is, on the whole, in agreement with most psychologists believing that:
    Tests can to some extent measure intelligence apart from the effect of education.
    Tests are better than examinations for measuring intelligence.
    Superior intelligence is desirable or necessary for higher education.
    There is not appreciable sex difference as regards intelligence (though he is often inclined to think there may be some relevant qualitative difference, while men are more liable than women to think that the male sex is the more intelligent one) (p. 152).

Twenty-five years later Shipstone and Burt (1973) replicated Flugel's 1947 study using 575 British adults. They compared results statistically on each of the 16 questions and found 12

significant differences. They argue that over this period, lay and professional views have moved closer to question a one-factor view of intelligence; men and women are seen to be of equal intelligence; lay people recognise more the environmental influence on test scores; there is increased doubt about the validity of intelligence tests and the high (positive) correlation between tests and occupational performance.

Nicholls, Patashnick and Mettetal (1986) interviewed 6–22 year olds about the nature of the skills required by various intelligence tests. Younger children construed the issue in terms of subjective judgements of difficulty; the intermediary group construed the skills in terms of the amount of information that must be acquired through memorization; the oldest group saw abstract thinking skills as indicating problem solving ability and thinking while verbal skills were seen to reflect the content of memory. The oldest group also thought fluid superior to crystallized intelligence. Finally, ability was seen to be linked to effort while intelligence was not, suggesting the two are thought of as conceptually distinct. More recently, Pomerantz and Ruble (1997) asked 236 second–fifth grade school children to indicate the extent to which they conceived of ability as uncontrollable, as constant and as capacity. Results showed that each of the three dimensions represented a different conception of reality. Girls were less likely to conceive ability as a constant, as capacity and as uncontrollable as boys. The authors note that if children conceive ability as uncontrollable and as capacity they may feel that effort is both futile and signals incompetence.

Snellman and Raty (1995) found that social representations of intelligence tend to revolve around three issues: the puzzle of the development of intelligence, the definition of intelligence and suspicion around both the concept and measurement of intelligence. Faria and Fontaine (1997) developed a 26-item questionnaire about "personal conceptions of intelligence" which was administered to 1500 fifth–eleventh grade Portuguese children. A factor analysis revealed two clear factors labelled static and dynamic referring to whether intelligence is a fixed entity or whether it is changeable and incremental. They also investigate sex, grade and socio-economic predictors of the two factor scores. Considering static intelligence they found two main effects and two interactions. Higher rather than lower social class and higher school grades were associated with lower endorsing the static factor and there was a SES×grade interaction. Whilst there was no main effect for sex, there was a grade×sex interaction. There were no main effects for the dynamic scale but a significant grade×sex interaction. Previous research had shown girls more likely to endorse a "static" and hence fatalistic conceptions of intelligence but this was not the case in this study. The authors believe in a "uniformizing effect" of the school context which selects rather than socializes students with a dynamic conception of intelligence.

Studies on lay concepts of intelligence have not been confined to English-speaking whites, nor to studies of adults. Ruisel (1993, 1996) investigated implicit theories of intelligence in Slovakian adolescents. Wober (1972, 1973) examined East African (specifically Ugandan) attitudes concerning intelligence. He found, for instance, that ideas about intelligence and quickness are not systematically related; indeed they are built into different factors. An earlier study by Keehn and Prothero (1958) in Lebanon showed that teachers' judgements of intelligence covaried with judgements of conscientiousness, thoughtfulness, persistence and emotional stability, but that they were relatively independent of judgements of cyclothymia (rapid mood change) and friendliness. They argue, however, that their results are fairly comparable with those found in America. Serpell (1976) found Zambian village children had criteria for judgements of intelligence quite unrelated

to western notions. Various other studies done in Africa came to the same conclusion (Irvine, 1966, 1969).

Other studies have been done in Asia (Gill & Keats, 1980; Keats, 1982). Nevo and Khader (1995) found subtle differences between Chinese, Indian and Malayan Singaporean mothers' conceptions of their childrens' intelligence. However, they clearly distinguished between three factors: cognitive and academic ability, appropriate behaviour and socially interactive behaviour.

A Japanese study by Azuma and Kashiwagi (1987) required male and female college students, and mothers of the college students, to rate 67 descriptors of intelligence. Some characteristics, such as *quick thinker*, *good memory* and *quick judgement*, were common to all groups. Furthermore, compared with American studies highly rated qualities (descriptors) related to receptive social competence tended to be associated with high intelligence, particularly when the person described was a woman being thought of as more sociable, sympathetic, dextrous and cheerful. They note: "The overview of our results presents a picture of the Japanese concept of intelligence which has relatively universal core and culturally defined marginals of which sex stereotyping is an example" (p. 25). This study was in fact replicated in Finland by Raty and Snellman (1992) who found cognitive ability (problem-solving skills) is seen as the essential element of intelligence. Further, they found male pupils were seen to be superior in cognitive skills and females superior at social skills. They also found that males could be considered intelligent without having any social skills and that parents tend not to expect, even intelligent girls, to do as well as boys in mathematics. More recently, Yang and Sternberg (1997) looked at Tiawanese conceptions of intelligence to see if they were then informed by the Confucian or Taoist tradition. Two studies suggested five factors labelled general cognitive ability, interpersonal intelligence, intrapersonal intelligence, intellectual self-promotion and intellectual self-effacement. The authors point out that these data show that in order to be thought of as intelligent in Tiawan, an individual needs to be flexible with regard to knowing when to use what kind of abilities.

Inevitably studies on implicit theories of intelligence have examined theories about the intellectual development of children (Siegler & Richards, 1982) as well as the theories of children themselves (Crocker & Cheeseman, 1988; Dweck & Elliot, 1983; Yussen & Kane, 1985). Siegler and Richards (1982) found intelligence in babies (6 months) and toddlers (12 months) was largely conceived of in perceptual motor terms but became more cognitive as children got older. Fry (1984) found teachers of primary school pupils stressed social variables (popularity, interest in the environment); secondary school pupil teachers emphasized verbal variables; while those who taught tertiary level students tended to emphasize cognitive variables like reasoning ability and broad knowledge.

In one of the few studies of children's conceptions of intelligence Yussen and Kane (1985) found, not unsurprisingly, that older children tend to have a more differentiated conception, less global view and to stress less overt signs of intelligence. Chen, Holman, Francis-Jones and Burmester (1988) compared primary school, high school and college students' beliefs about intelligence. Each participant rated 26 intelligence test items from four well known tests as to whether they were seen as relevant for measuring intelligence behaviour. These factored neatly into three abilities: non-verbal reasoning, verbal reasoning and retrieval of information. Results showed primary school children rated the verbal reasoning skill as most relevant to measuring intelligence, while high school students considered all three abilities equally relevant. University students rated the non-verbal reasoning skill as most relevant.

Stipek and Gralinski (1996) found grade 3–6 children believed that intelligence is relatively fixed and global in its effects on performance. Further, and more importantly, these ability-performance beliefs were systematically and causally related to actual performance.

In the 1980s a number of studies appeared which looked at adult lay theories of intelligence. In a fairly large study Sternberg, Conway, Ketron, and Bernstein (1981) asked nearly 500 laypeople and about 150 psychologists specialising in intelligence to list behaviours they thought characteristic of *intelligence*, *academic intelligence*, *everyday intelligence* and *unintelligence*. They found such characteristics as *reasons logically*, *widely read*, *open minded* and *displays common sense* were quoted, but that there was a great diversity of often idiosyncratic responses. These characteristics were then rated on a seven-point scale and factor analysed. For both groups three quite clear factors emerged, and although they were similar they were not exactly the same.

Sternberg (1982) noted:

> On the whole, the informal theories of intelligence that laymen carry around in their heads — without even realising that their ideas constitute theories — conform fairly closely to the most widely accepted formal theories of intelligence that scientists have constructed. That is, what psychologists study as intelligence seems to correspond, in general, to what people untrained in psychology mean by intelligence. On the other hand, what psychologists study corresponds to only part of what people mean by intelligence in our society, which includes a lot more than IQ test measures. (p. 35).

In reviewing the 1981 study later, Sternberg (1990) noted that lay people seem to weigh cognitive factors more and to clearly take into account negative as well as positive information. In a second series of studies Sternberg (1985) looked at implicit or lay theories of intelligence, creativity and wisdom. When rating attributes of all three qualities, he found that both academic *and* lay people believe intelligence and wisdom the most similar, and creativitiy and wisdom the least similar, of three possible pairs of attributes.

In one study Berg and Sternberg (1985) looked at the implicit theories of individuals aged 20–83 years. They found older individuals view everyday competence as a good differentiator between the average and the exceptionally intelligent. Further, middle aged (50 years) and older (70 years) participants tended to make less of a distinction between fluid (problem solving) and crystalized (knowledge-based) intelligence. Everyday competence is perceived to increase in its importance to intelligence both as a function of the age of the rater and ratee. In a later study Berg and Sternberg (1992) found intelligence was perceived to consist of interest and ability to deal with novelty, everyday competence and verbal competence. As people got older their crystallized and practical intelligence was rated as more relevant than fluid academic intelligence valued in the young. Interestingly over 90% of these American adults believed that intelligence was modifiable both with potential increases and decreases.

Sternberg argues that lay people's theories overlap with, but also go beyond, skills measured by tests. That is, the intelligent person is believed to solve problems well, reason clearly, think logically, and have a good store of information, but is also able to balance information and show intelligence in worldly as well as academic contexts. Lay theories of creativity overlap with those of intelligence but tend to downplay analytic abilities, stressing rather unconventional ways of

thinking and acting. Also, aesthetic taste, imagination, inquisitiveness, and intuitiveness are part of lay theories, most of which go way beyond conventional psychological tests of creativity.

Sternberg (1985) believed that, while lay theories are precursors of academic theories, they are worth studying in their own right. He listed four reasons why the study of lay theories of intelligence, creativity and wisdom are worth pursuing: "(a) the terms — intelligence, creativity, and wisdom — 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; (b) 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; (c) 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; (d) 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 studies in their own right, and each study is complementary to the study of explicit theories" (p. 625).

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

1. *Geographic* which seeks to map the mind and understand the structure of intelligence.
2. *Computational* which seeks to understand information-processing programmes and processes underlying intelligence.
3. *Biological* which attempts to understand how the anatomy, physiology and chemistry of the brain and CNS accounts for intelligent thought through hemispheric localization and neural transmission.
4. *Epistemological* which attempts to answer the fundamental question of what are the structures of the mind through which all knowledge and mental processes are organized.
5. *Anthropological* which asks what form intelligence takes as a cultural invention and may be comparative and relativistic.
6. *Sociological* which examines how social pressure (mediated learning experiences) in development are internalized.
7. *Systems* which is concerned with how we understand the mind as a system which cross cuts metaphors.

As Sternberg (1990) notes: "It is important to understand the metaphor or metaphors underlying one's theory so as to understand the questions one is likely to ask and why one is likely to ask them" (p. 18).

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

from experts. Thus, some have mechanical models and others invasion models while still others emphasize hereditary proneness (Vincent & Furnham, 1997). It remains an empirical question as to what metaphors lay people explicity or implicitly hold and use. It would not be surprising if people today do not think in terms of computer analogies like hard and software, though others may prefer older mechanical models or even Dickensian models of empty vessels filled up with education and experience.

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 lay theories of intelligence get more sophisticated with age and we know they may be relatively culture- and group-specific. We know that compared with academic theories lay theories tend to be over inclusive. We know that there are significant behavioural consequences (if effort is put into exams) as a function of specific aspects of lay theories of intelligence particularly its changeability and controllability. But we do not know if people today are better informed about academic thinking than they used to be. We do not know how lay theories relate to personal experience of, or attitudes to, a wide range of ability and intelligence tests. We do not know if there is more convergence or divergence in academic and lay theories though that may be impossible to ascertain because of wide divergences within each group.

However the relatively recent studies on self-estimates of intelligence done over the decade 1990–2000 do give an interesting and important insight into lay theories of intelligence, particularly those that examine multiple theories of intelligence.

3. Self-estimates of overall intelligence

It is not until comparatively recently that studies have examined ordinary people's estimates of sex differences in IQ. It should be noted that the majority of these studies have been done on students which leads to questions of their generalizability. Hogan (1978) reported on 11 different studies which all made use of American college students. In some studies, subjects were asked to estimate their IQs while in others they were also asked to estimate their parents' IQs and yet in others the IQs of males and females in general. Compared with the males, the females underestimated their estimated scores (50% of the time significantly so) and nearly all believed their fathers had higher IQs than their mothers.

Beloff (1992) replicated this study on Scottish students and found similar results. She noted:

> The young women students see themselves as intellectually inferior compared to 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 consistent each year (p. 310).

This finding, however, was challenged by Campion (1992).

Byrd and Stacey (1993) replicated and extended this study in New Zealand by getting students to estimate the IQs of brothers and sisters. Although there were no sex differences in self IQ estimates, the Beloff (1992) finding was largely replicated. Further, males thought they had higher IQs than their sisters while females believed themselves and their sisters equivalent, though their estimates of their fathers' scores were higher than their mothers', brothers', and sisters'.

Reilly and Mulhern (1995) asked male and female students to complete the Digit Symbol and Vocabulary tests from the WAIS and then estimate their IQ. Males' estimates were overall higher than females'. Male self-estimates were significantly higher than their measured IQs while females were lower but not significantly.

Furnham and Rawles (1995) questioned over 200 English undergraduates and also found a significant sex difference with males giving a self-estimate three points over, and females three points less, than one standard deviation above the norm. The study also looked at estimates of parents, grandparents and other professionals which will be discussed later. A study on a similar population also revealed a significant sex difference with males again awarding themselves higher estimated scores (Furnham & Rawles, 1999).

At least three other studies have provided data on adults' self-estimated overall intelligence. Furnham and Gasson (1998) found a random population of British adults also showed a significant sex difference with males giving themselves a four IQ points higher score than females. Furnham, Reeves, and Budhani (2001) examined a similar population of British adults and found similar results with the difference this time being just over five IQ points.

Table 1 shows the results of eight studies done in the 1990s that examined sex differences in overall General IQ (g). Seven of the eight revealed a significant sex difference with points ranging from 3.9 to 8.6 IQ points. Three things are apparent from Table 2. First student samples, particularly those of Beloff (1992) and Furnham and Rawles (1999) award themselves fairly high scores in the first instance around 1.5 standard deviation above the mean. On the other hand a random selection of (British) adults award themselves scores less than one half a standard deviation above normal. This may be a true reflection of the difference between students and non-students though there remain something of the "lake Wobegon" effect in which people appear to believe that their skills and abilties are above average (Kruger, 1999).

Second, where possible (that is where standard deviations were provided) it was desirable to calculate the *d* statistic which is a measure of degree of difference between the means of two normal distributions expressed in standard deviation units. Cohen (1977) suggests that a *d* of 0.2 should be considered small, that of 0.5 medium and that of 0.8 large. In this study four *d* statistics for estimated IQ were over 0.60 and the results indicate, in Cohen's (1977) terms, a medium to large difference.

Third, and perhaps most obviously, nearly all of the sex differences are significant. Only one of the eight (Byrd & Stacey, 1993) is not. This study came from New Zealand while all the others originated from the UK. The idea that cultural differences may influence these judgements will be considered later.

4. Estimating relatives scores

Estimates of IQ studies have not only examined self-estimates but also relatives. Hence studies have looked at estimates of grand parental (Furnham & Rawles, 1995), parental (Byrd & Stacey, 1993; Furnham & Rawles, 1995; Furnham, Shahidi, & Baluch, under review; Rammstedt & Rammsayer, 2000) sibling (Byrd & Stacey, 1993; Furnham, Fong & Martin, 1999b; Furnham, Rakow, Sarmany-Schiller & de Fruyt, 1999c) and childrens' (Furnham & Gasson, 1998; Furnham, 2000; Furnham, Hosoe & Tang, in press; Furnham, Rakow & Mak, under review) IQ.

Table 1
Results of studies where participants made an overall IQ (g) rating on themselves and others

Study	Women	Men	Difference
Beloff (1992) Scotland	($n=502$)	($n=265$)	
Self	120.5	126.9	6.4
Mother	119.9	118.7	−1.2
Father	127.7	125.2	−2.5
Byrd and Stacey (1993) New Zealand	($n=105$)	($n=112$)	
Self	121.9	121.5	−0.4
Mother	114.5	106.5	−9.0
Father	127.9	122.3	−5.6
Sister	118.2	110.5	−7.7
Brother	114.1	116.0	1.9
Bennett (1996) Scotland	($n=96$)	($n=48$)	
Self	109.4	117.1	7.7
Reilly and Mulhern (1995) Ireland	($n=80$)	($n=45$)	
Self	105.3	113.9	8.6
Measured	106.9	106.1	−0.8
Furnham and Rawles (1995) England	($n=161$)	($n=84$)	
Self	123.31	118.48	6.17
Mother	108.7	109.42	0.72
Father	114.18	116.09	1.91
Furnham and Rawles (1999) England	($n=140$)	($n=53$)	
Self	116.64	120.50	3.9
Measured	4.47	6.94	
Furnham and Gasson (1998) England	($n=112$)	($n=72$)	
Self	103.84	107.99	4.15
Male child (1st child)	107.69	109.70	2.01
Female child (1st child)	102.57	102.36	−0.21
Furnham, Reeves, and Budhani (under review) England	($n=84$)	($n=72$)	
Self	104.84	110.15	5.31
Male child (1st son)	116.09	114.32	−1.77
Female child (1st daughter)	110.66	104.32	−6.34

Examining estimates of relative scores is interesting for many reasons. First, there is an interesting debate as to whether and why there has been a dramatic increase in intelligence over the past 50 years or so (Flynn, 1987; Lynn & Pagliari, 1994; MacIntosh, 1998). If that is true and indeed noticeable one may expect to see this reflected in differences in estimates of different generations in the family. This may be accentuated by education in many countries. Thus, because each generation is better (and longer) educated than the previous one it may certainly appear as if they are more intelligent.

Secondly, by getting males and females to estimate the intelligence of their parents and siblings it is possible to investigate whether the hubris-humility findings from self-estimates extend to others of the same sex and different sex or whether self estimates are some how different. If males

believe their fathers brighter than mothers, their brothers brighter than their sisters this may be seen as good evidence for gender stereotypes. It is particularly interesting to explore the perceptions of females to discover if their noted self-depreciation and humility in self-estimates extend to others.

Thirdly, it is particularly interesting to explore parents' estimates of the intelligence of their children because of the effect it may have on them. There is an extensive, if debatable literature on the Pygmalion effect and the nature of self-fulfilling prophecy. It has been suggested that students identified to their teachers as "intellectual bloomers" do better on achievement tests than do their counterparts who lack such a positive introduction. This issue remains hotly contested (MacIntosh, 1998).

Raty, Snellman and Vainikainen (1999) asked 938 Finnish parents to estimate their children's abilities. They found parents' theories of intellectual abilities were multi-dimensional and included cognitive, verbal, social and practical components. Parents thought their daughters had higher problem-solving skills, social skills and practical creativity than boys, and girls were also thought to be more prudent and school oriented. The parents' gender and education did affect their ratings; academic parents see cognitive ability as 'real' intelligence. The authors note that their results showed that the parents' estimations of girls' competences were more favourable then boys but that the well established poorer self-made power self assessment of girls could not therefore be attributed to parental behaviour.

Studies on parental estimates of their children's intelligence are of particular interest given that these may be in part self-fulfilling. A number of studies have recently addressed this precise issue. Furnham and Gasson (1998) asked 184 British parents to estimate their overall IQ and that of their children. Fathers rated their own IQ higher than mothers (108 vs. 104) and both parents rated their sons (first and second) higher than their daughters. The *d* statistic (the measure of degree of difference between two normal distributions) expressed in standard deviation units was 0.67 which according to Cohen (1977) is between medium and large. They also regressed the parents' sex and age, and child's sex and age onto the IQ estimates. For parental self-estimates both sex and age were equally powerful predictors of self-estimated g, accounting for 14% of the

Table 2
Estimated overall scores for parents, grandparents and self

	Male	Female	Overall	Mean
Grandfather[a]	108.14	104.37	106.29	102.79
Grandmother	97.37	100.20	99.29	
Father[b]	121.20	125.96	123.55	118.25
Mother	111.53	114.36	112.95	
Son[c]	112.01	111.89	111.95	108.34
Daughter	103.34	106.15	104.74	
Self A[d]	117.06	113.20	115.13	115.13
Self B[e]	109.07	104.34	106.70	106.70

[a] Furnham and Rawles (1995).

[b] Means of the data from Beloff (1992), Byrd and Stacey (1993) Furnham and Rawles (1995).

[c] Means based on data from estimate of the first child from Furnham and Gasson (1998) and Furnham, Reeves and Budhani (under review).

[d] Based on the mean of all studies reported — Table 1.

[e] Based on the means of the two studies looking at adult parents not students.

variance total. Yet for the estimates of the children, sex, much more than age, was the strongest predictor of their parentally estimated IQ. The beta for sex was nearly three times that of age for both first and second children. The authors note that if male children are believed to be more intelligent by their parents and this is explicitly reinforced during childhood, they may be more immune to negative (if accurate) feedback given later in life. Further, since men still occupy higher paid jobs in certain market sectors it is not difficult to see why both sexes believe females are less intelligent than males. They also note parental attentiveness and solicitousness are probably related to parental age, socioeconomic status, and IQ. "The socially and culturally mediated nature of parenting no doubt relates to the psychometric IQ and estimated intelligence of offspring" (p. 161).

Furnham (2000) also looked at parental beliefs but this time of their own and their children's multiple intelligences. As before fathers rated themselves more intelligent on mathematical and spatial intelligence than mothers rated themselves on these "intelligences". The perception of their children's specific intelligence lay also only in the areas of mathematical and spatial intelligence: mothers rated their children higher on this mathematical and spatial intelligence than did fathers, and both parents reckoned that their sons were more numerate than their daughters. Parents tended to believe their children were overall more intelligent than they were themselves. First born sons were thought of as more intelligent than daughters but for the second born the opposite was the case. When regressions were performed on each of the seven intelligences, the beta weight for the child's sex of parent was significant indicating mothers rated the spatial and interpersonal intelligence of their sons higher than did fathers.

Furnham (2000) speculated that his results may indicate that lay conceptions of intelligence were male normative — that is, it is those specific abilities like mathematical and logical intelligence that men are best at, that are considered the essence of intelligence. What is novel about Gardner's model is that he included intelligences (musical, inter-personal, etc.) which people do not really consider part of intelligence. Thus lay people conflate mathematical and spatial intelligence with overall intelligence so explaining the conflicting sex difference results in nearly all studies (see Tables 1 and 3).

In a second similar study Furnham et al. (2001) asked 156 adults to estimate their own and their children's overall and multiple intelligences. This allowed for the examination, by regression, of lay people's overall intelligence (g) and whether it is best predicted by three of Gardner's list of multiple intelligences namely verbal, mathematical and spatial intelligence. This hypothesis was confirmed. Also, as before, fathers' self-estimates were significantly higher than mothers' (110 vs. 104) and both parents judged sons to have significantly higher IQ than daughters. Both parents, however, rated female children as having significantly greater verbal and musical intelligence than their male counterparts. They also found that the higher parental self-estimates of IQ, the higher the estimates of the IQ of their children. They note that the socially and culturally mediated nature of parenting relates to both actual psychometric IQ but also the estimated intelligence of offspring. Also, the significantly higher self-and-other estimates for male standard IQ may be influenced by the societal or family environment which may create the erroneous belief that males are more intelligent than females.

More recently Furnham, Rakow and Mak (under review) asked 193 Hong Kong Chinese parents to estimate their own and their children's multiple IQ. Fathers estimated their own spatial and mathematical IQ higher than mothers and children were thought to be five IQ points higher

Table 3
Parents self-estimates and those of their first children*

	Furnham (2000)		Furnham et al. (2001)		Furnham (2000)				Furnham et al. (2001)			
	Father ($n=46$)	Mother ($n=66$)	Father ($n=72$)	Mother ($n=84$)	Father		Mother		Father		Mother	
					Son	Daughter	Son	Daughter	Son	Daughter	Son	Daughter
Verbal	113.91	109.12	108.97	106.61	113.68	109.76	115.97	116.57	108.00	99.77	111.09	108.10
Mathematical	110.54	102.66**	109.15	96.88**	113.20	106.90	119.58	107.01	110.27	97.95	109.69	103.97
Spatial	111.84	104.81	112.92	101.25**	108.60	102.14	117.64	108.93	110.68	100.00	110.01	103.10
Musical	93.80	98.33	100.72	96.52	107.32	107.62	107.31	107.40	107.57	101.36	104.84	103.34
Body-K	100.43	102.72	104.04	101.79	103.80	108.81	110.22	105.57	104.59	97.05	106.88	104.34
Interpersonal	112.82	112.42	113.40	112.18	106.40	110.00	113.33	110.33	108.51	99.77	108.59	107.76
Intrapersonal	110.21	109.89	111.74	111.99	108.40	103.81	112.08	106.00	106.38	100.23	105.63	105.5

*$P < 0.05$.
**$P < 0.01$.

than parents. There was, however, no sex difference in estimated IQ of the children. Regression analysis indicated that parents self-rated overall IQ and the child's age was the best predictor of the rated intelligence of the children.

However, the results of all these studies seem reliant on the simple fact that we still are not clear whether the disparity between male and female IQ estimates is a male overestimation, a female underestimation, a combination of both or an accurate reflection of reality.

5. Culture differences in estimated intelligence

As noted above studies on lay theories of intelligence suggest that there are subtle but important differences in the way in which (traditional) cultures define intelligence. A related question concerns how people from different cultures rate their own intelligence. Publicity following the publication of the Bell Curve (Herrnstein & Murray, 1994) centred around race differences and the work of Lynn, Rushton and others has excited interest in these differences (Lynn, 1994; Rushton, 1999). For instance, when the 50 world experts wrote to the *Wall Street Journal* in 1994 one of the points in their consensual summary was "The bell curve for whites is centred roughly around IQ 100; the bell curve for American blacks roughly around IQ 85; and those for different subgroups of Hispanics roughly midway between those for whites and blacks. The evidence is less definitive for exactly where above IQ 100 the bell curves for Jews and Asians are centred" (Furnham, 1999, p. 177).

Would this debate influence self-ratings or are they a function of different cultural factors? In his various studies Furnham and colleagues have collected data from four continents all based on university students: Africa (Uganda); America (USA); Asia (Hong Kong, Japan, Singapore), Europe (Britain, Belgium, Slovakia) and the Middle East (Iran). Most of the studies were exploratory but they revealed many significant differences. In a three country (and three-continent) comparison Furnham and Baguma (1999) found a significant national difference in the meaned score for estimates of Gardner's (1999) seven intelligences as well as on three factor scores: verbal (verbal, interpersonal, intrapersonal), numerical (mathematical, spatial) and cultural (musical, body kinesthetic). American students (over 90% white) rated themselves as more intelligent on overall summed, numerical and cultural IQ while the Africans awarded themselves the highest verbal IQ. Although there were cultural differences there were no sex×culture interactions.

In another study that looked at American and British but also Japanese students, Furnham et al. (in press) did a similar analysis on a different set of data. Again most American and British participants were ethnically white while all the Japanese were homogeneous Japanese. There were culture differences on all four scores: American participants gave themselves highest overall IQ ratings followed by the British and then the Japanese. On the other three factors (verbal, numerical, cultural) the British and Americans did not differ but both rated themselves higher than the Japanese.

A rather smaller scale study comparing Americans (but exclusively from the state of Hawaii) Britons and Singaporeans reveal some similarity in results. Furnham et al. (1999b) found British students awarded themselves higher overall, verbal and cultural intelligence scores than either of the other two groups. Once again there was evidence that Asians, this time Singaporeans (all of Chinese ethnic origins) tended to show humility in their self-estimations of the seven Gardner intelligences.

One intra-continental study showed some surprising findings. Furnham et al. (1999c) examined the self-estimates of comparable European groups (Belgian, British, Slovakian students). There were no significant nationality effects on the four factors but many sex×culture nearly all caused by Slovakian females who, unlike nearly all other groups, rated themselves higher on their overall and verbal intelligence. The authors suggest the apparent self-confidence of the Slovakian females may be due to years of socialist government where females took a more active role in society and were socialized differently.

Rammstedt and Rammsayer (2000) got 105 German students to estimate their own and their parents' IQ scores on Thurstone's seven primary mental abilities and four Gardner abilities. As before males rated their mathematical, logical and spatial abilities higher than females who, in turn, rated their musical and interpersonal intelligence as higher. There were also dramatic differences in estimating parents' IQ: fathers were rated significantly on mathematical, spatial, reasoning and overall intelligence and lower on verbal, musical and intra-personal intelligence than mothers. They also noted that when the effects of gender stereotypes were statistically controlled, sex-related differences were restricted to mathematical intelligence with males rating themselves higher and memory with women rating themselves higher.

More recently Furnham, Shahidi and Baluch (under review) compared British and Iranian student estimations of multiple intelligence. There were the often replicated effects of sex with males giving higher estimates on mathematical and spatial intelligence compared to females. However, there were more main effects for culture particularly for rating of parents. Compared with the British the Iranian students rated their mothers' IQ significantly lower on six of the seven scales but believed their fathers had higher inter- and intra-personal intelligence. Explanations for the cross-cultural differences were given terms of socio-political, historical and educational differences between the two very different societies.

Nearly all of these studies have been conducted on student populations which may render them relatively comparable but clearly unrepresentative of the population from which they are drawn. Hence more recent research is concentrating on examining whether these differences are noticeable in representative adult populations in different countries.

6. Estimates of other-and-multiple intelligence

As well as self and other estimates of overall intelligence various other studies have focused quite specifically on different types of intelligence. These include emotional intelligence (Petrides & Furnham, 2000); lay dimensions as discovered by Sternberg et al. (1981; Furnham, 1999) and many on Gardner's (1983, 1999) multiple intelligences (Bennett, 1996, 1997, 2000; Furnham et al., 1999a, b). Most of these studies were interested in further exploring the gender difference factor revealed by Beloff (1992).

Furnham (1999) asked 260 students to rate themselves on 12 items (e.g. speaks clearly and articulately; is knowledgeable about a particular field; accepts others for what they are) that made up the three types of intelligence noted by Sternberg et al. (1981). Factor analysis revealed three internally reliable scales and further analyses revealed a sex difference on two of the three factors. Males rated themselves as having higher verbal and practical intelligence but there was no difference on social intelligence. It was noted with surprise that men rate themselves higher on the verbal factor when much of the literature suggests the opposite is true (MacIntosh, 1998).

In a study looking at self-estimates of emotional intelligence Petrides and Furnham (2000) asked 260 undergraduates to estimate themselves on fifteen abilities which were taken from a content analysis of all EQ factors by Dulewicz and Higgs (1998). They found sex differences on three of the 15 items but that when they were factor analysed two factors emerged, (labelled empathy and self motivation) one yielding a significant sex difference. Males thought they were better at things like being effective under pressure, being able to accept responsibility, motivating oneself and overall being positive and optimistic. Participants also completed a self-report measure of EQ on which females scored higher then males. Regressional analysis demonstrated that those who awarded themselves higher scores on the two-estimated factors actually scored higher in the "actual" EQ test.

However, the most fecund line of research has been concerned with self-estimates in the multiple intelligences as defined by Gardner (1983, 1999). This approach was pioneered by Bennett (1996, 1997, 2000) but continued by Furnham in a programmatic series of studies set out below (Furnham, 2000; Furnham & Baguma, 1999; Furnham et al., 1999a, b). It should be pointed out that none of these studies set out to validate or support Gardner's theory as such. However, his multi-faceted classification of intelligence allowed for a more fine-grained analysis of where differences in lay self-estimates lay.

Bennett (1996, 1997) asked students to estimate their score on Gardner's (1983) six multiple intelligences (intra and interpersonal were combined into personal). These factored onto two clear factors which Bennett (1997) argued corresponded to western stereotypes about the sexes. Males rated themselves higher both on the factor score but also the three intelligences comprising that scale (logical-mathematical, spatial and kinesthetic). Bennett (2000) examined the hypothesis that males' higher self-estimates of intelligence (ability) would be limited to those abilities judged as masculine. First he asked participants to rate how masculine or feminine Gardner's six intelligences were. He found significant differences on three which were judged to be more masculine (kinesthetic, logical-mathematical and visuo-spatial) though all six were judged near the mid point of neither masculine nor feminine. In a second study student participants were required to provide population estimates for men and women over each of the sex ability-types. Men were perceived as superior with respect to logical-mathematical and visual spatial ability, while women are seen as superior with respect to personal, musical and linguistic ability. Interestingly on five of the six where there was a significant difference, the mean estimated difference was 13.23 IQ points between men and women "a disparity that would be unthinkable in the literature on actual gender differences" (p. 27). He further noted the existence of ingroup favouritism on dimensions relevant to participants gender identity. He argued the research does not answer the question of whether men over-estimate, women under-estimate or both or indeed in areas relevant to women's gender identity and where indeed they are generally perceived as superior to men, women do not make correspondingly self-enhancing estimates of their own ability.

Furnham et al. (1999a) was one of the first studies to look at sex differences in the seven Gardner multiple intelligences specified by Gardner (1999) and the factor analysis of the seven. Unlike Bennett (1997) they found a sex difference only on one factor: logical/mathematical. Further, when the seven were factor analysed they confirmed neither Gardner's (1983) a-priori classification nor Bennett's two factor structure. Instead they found a three factor structure that accounted for just over two-thirds of the variance. The two personal and verbal factors loaded on the first factor; musical and body-kinesthetic on the second; and mathematical and spatial on the

third. There was a sex difference on the third factor. They argue that replicable sex differences in self-estimated intelligence are restricted to mathematical and spatial intelligence which is in part supported by the literature on actual sex differences.

However, in a series of seven studies focusing on different features on self-estimated intelligence Furnham required participants to rate themselves on Gardner's (1993) multiple intelligences. However, in a more recent study he required participants to make estimates on the more recently considered 10 intelligences specified by Gardner (1999) though it should be recognized he admits only 8.5 to the official list.

Considering the data from the 13 different groups (11 of which were students) the pattern of results was fairly consistent. No studies revealed any sex differences in self-estimated verbal, musical, or intrapersonal intelligence. There was just one significant sex difference on each of musical and inter-personal intelligence less than one may be due to chance. However, where the differences seem to be fairly consistent was in mathematical and spatial intelligence with males receiving significantly higher scores.

Furnham and O'Connor (under review) who examined the three additional — one "confirmed" and two still "speculative" — intelligences found sex differences. In two of these studies participants were asked to make an overall (g) judgement before making the individual estimates. This allowed authors to do multiple regressions from the seven specific onto the overall estimate to see which of Gardner's specific intelligences was most g loaded. Indeed Furnham (2000) who did not request an overall judgement speculated that the concept of intelligence was male normative which was demonstrated by Furnham et al. (in press) who did request overall as well as specific judgements (Table 4).

Furnham and O'Connor (under review) asked 209 young people to make estimates of overall (g) intelligence as well as Gardner's (1999) new list of 10 multiple intelligences. They made these estimates (11 in all) for themselves, their partner and three well known figures: Prince Charles, Tony Blair and Bill Gates. Following previous research there were various sex differences in self-estimated IQ: males rated themselves higher on verbal, logical, spatial and spiritual IQ compared to females. Females rated their male partner as having lower verbal and spiritual, but higher spatial IQ than males rated their female partners. Regressions indicated that the best predictors of one's overall IQ estimates were logical, verbal, existential and spatial IQ. Factor analysis of the 10 self, and then eight, self-estimated scores did not confirm Gardner's classification of the multiple intelligences.

Despite the popularity of the work of researchers who suggest that there are multiple, practical, or social intelligences it appears as if the public still believe the more traditional measures of verbal, mathematical and spatial intelligence are the best predictors of overall intelligence.

7. Correlations between self-estimated and psychometrically measured IQ

It has often struck applied psychologists that if self-ratings of intelligence or abilities are highly correlated with valid test scores they may as well substitute for them at a fraction of the administrative costs. A number of studies investigated this issue using a fairly diverse series of measures yet the results have been fairly consistent.

De Nisi and Shaw (1977) gave 114 students 10 different ability tests from different batteries measuring spatial, verbal and numerical ability. They were also asked to rate their ability on a

Table 4
A comparison of previous studies of estimates of multiple intelligences[a] A. Self Estimate studies showing scores for each of the seven categories

Author	Participants	Gender	*n*	V 1	MA 2	S 3	MU 4	BK 5	IE 6	IA 7	N	SI	E
Furnham (1999)	British Adults	M	46	113.9	110.5*	111.8*	93.8	100.4	112.8	110.2			
		F	66	109.1	102.6	104.8	98.3	102.7	112.4	109.8			
Furnham, Reeves and Budhani (2001)	British Adults	M	72	108.9	109.2*	112.9*	100.7	104.0	113.4	111.7			
		F	84	106.6	96.8	101.2	96.5	101.8	112.2	111.9			
Furnham, Clark and Bailey (1999a)	British Adults	M	89	109.2	112.1*	110.5	99.2	104.6	112.0	111.9			
		F	91	109.9	104.0	107.9	100.7	107.8	114.2	112.4			
Furnham and Baguma (1999)	African Students	M	51	107.6	104.2*	118.6*	92.9	100.0	124.8	122.8			
		F	55	107.7	96.1	111.1	98.7	105.2	121.9	122.3			
	American Students	M	31	118.1	110.7	119.1	102.6	111.2	119.4	114.8			
		F	50	113.7	111.5	112.3	106.8	110.8	121.9	118.4			
	British Students	M	35	109.6	110.7	113.7	106.3	106.7	117.3	114.4			
		F	62	108.8	103.3	107.4	102.7	104.3	116.3	113.8			
Furnham, Fong and Martin (1999b)	American Students	M	26	105.6	115.0*	105.8*	90.1	108.5*	107.1	108.1			
		F	27	103.5	107.2	100.7	96.1	100.0	109.4	108.3			
	British Students	M	94	110.6	112.4	113.0	102.9	104.9	117.3	113.4			
		F	133	110.6	105.2	106.7	101.8	104.1	115.4	112.6			
	Singaporean Students	M	37	107.2	112.5	111.2	98.6	106.5	111.8	107.0			
		F	51	106.6	106.3	104.5	102.9	101.1	110.5	109.1			
Furnham, Rakow, Sarmany-Schiller and De Fruyt (1999c)[b]	Belgium Students	M	37	113.4	115.51*	112.8*	104.3	103.91	115.7	115.68			
		F	103	107.3	103.00	104.1	99.2	103.40	112.4	111.2			
	Slovakian Students	M	64	105.5	107.32	111.5*	100.8	104.6	111.4*	111.74			
		F	113	109.4	103.85	106.3	99.7	109.0	119.33	113.5			
Furnham, Hosoe and Tang (in press)[b]	American Students	M	102	112.03	109.67*	116.29*	102.43	110.60	116.81	117.23			
		F	111	109.26	104.43	109.43	103.24	106.37	116.41	114.62			
	Japanese Students	M	62	101.63	106.81*	102.25*	98.80	99.62	100.85	104.42*			
		F	102	99.41	94.78	97.74	100.35	99.98	100.95	99.74			
Furnham and O'Connor (under review)	British Students	M	52	115.0	114.5	111.9	104.3	107.6	114.7	114.2	113.8	108.8	110.7
		F	151	110.5*	104.2*	107.0*	105.4	106.4	115.1	113.1	103.6*	103.4*	110.5
Rammstedt and Rammsayer, (2000)	German Students	M	54	119.3	119.1*	119.1*	94.9*	110.7	117.1*	115.1			
		F	51	117.9	104.5	104.5	105.5	107.8	122.2	118.5			

[a] V, verbal; N, naturalistic; MA, mathematical; SI, spiritual; S, spatial; E, existential; MC, musical; BK, body kinesthetic; IE, interpersonal; IA, intrapersonal.
[b] These studies also used the British group reported in Furnham, Fong and Martin (1996).
*This indicates a significant difference between sexes in that cell.

five point scale. With one exception all the correlations between the two scores were significant and positive with five being $> r = 0.30$. They investigated the possible moderating effects of social desirability, self-esteem, intelligence and gender but none had any effect on the relationship. They concluded self-reports of ability cannot substitute for validated measures.

Borkenau and Liebler (1993) looked at both the correlation between self and an acquaintance rating and a nine part German intelligence test that measures both verbal and non-verbal intelligences. Correlations for males and females, analysed separately, were almost identical and ranged from $r = 0.29$ to $r = 0.32$. Curiously they showed that when strangers rated the intelligence of people they saw relatively briefly on a video the correlation between other-estimate and actual score was $r = 0.43$. However, it was the aggregated score of six judges (strangers) that constituted the estimated score and this was inevitably more reliable than a single judge. Although they found stranger ratings of intelligence are not only related to self-reports and partner ratings but also actual performance on an intelligence test, the size of the correlations indicated they could not reliably be used as substitutes for actual test scores.

Reilly and Mulhern (1995) asked male and female students to complete the Digit Symbol Vocabulary Tests from the Wechsler Adult Intelligence Scale (WAIS) and then to estimate their IQs. The men's estimates were higher overall than those of the women (113.9 and 105.3, respectively), and the men's self-estimates were significantly higher than their measured IQs, whereas the women's self-estimates were lower, but not significantly so. A few outliers, however, significantly determine the sex differences in scores. Outliers are determined after a scattergram is plotted. They are easy to detect with the naked eye as participants who are markedly different from, or whose scores lie away from the scores of, the vast majority of the group. Given that one is asked to circle a specific number of outliers, most raters exhibit 90–100% reliability. The authors note that IQ-estimates research should not be based on the "assumption that gender differences at group level represent a generalised tendency on the part of either sex to either over-confidence or lack of confidence with regard to their own intelligence" (Reilly & Mulhern, p. 189).

Following up on this study Furnham and Rawles (1999) asked 53 male and 140 female British undergraduates to estimate their overall IQ (g). About 4 months later, they completed a spatial-intelligence (mental-rotation) test. The men estimated their scores signficantly higher (120) than the women did (116) and also obtained significantly higher test scores (6.94) than the women did (4.43). There was a very modest but significant correlation between self-estimated IQ and actual IQ score ($r = 0.16$). The correlation was significant for the men ($r = 0.27$, $n = 53$) but not for the women ($r = 0.09$, $n = 140$). Removal of a small number of outliers had no significant effect on the results. The observed sex differences specifically in spatial intelligence may account for the correlations being higher in men than women.

In a cross-cultural study comparing British and Singaporean students Furnham and Fong (2000) required 172 participants (68 male, 104 female: 84 British and 88 Singaporean) to complete the Raven's Standard Progressive Matrices and give their self-estimated IQ. Males scored lower on the psychometric measure of intelligence than females, though there were no cultural differences. The British had higher self-estimate scores than the Singaporeans though there were no cultural differences on the actual IQ test score. The correlation between estimated and measured IQ was $r = 0.19$ overall (British $r = 0.14$; Singaporeans $r = 0.26$) the highest correlation was for Singaporean females ($r = 0.51$) and lowest for British females ($r = 0.08$).

When Paulus, Lysy and Yik (1998) reviewed the salient literature they found that correlations between single-item self-reports of intelligence and IQ scores tended to rarely exceed $r = 0.30$ in college students. They believed this result could be improved by three different features: aggregated both estimates and tests to increase reliability and therefore validity; using a weighting procedure so that items before aggregation are weighted according to their individual diagnosticity; and using indirect rather than direct questions to measure self-estimates of intelligence to reduce self-presentational and social desirability effects.

In their study Paulus et al. (1998) used the Wonderlick (1990) test as the dependent measure and two large groups of undergraduates (Ns = 310, 326). However, the results using both direct and indirect measures showed correlations in the range 0.04–0.34 the majority being around 0.20. They concluded that the validity of self-report measures of IQ in student samples has a limit of 0.30. They found direct items asking for estimates of mental ability more valid than indirect items. They found their aggregation and weighting strategy only offered modest improvements and concluded "As a whole, our verdict is pessimistic about the utility of self-report as proxy measures of IQ in college samples" (p. 551).

Three observations from the above studies are important. First, some 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 $r = 0.30$ mark. Second, these correlations do obscure the fact that whilst some people are clearly accurate estimators of their score others are way out. It may prove very useful to obtain subsamples of highly accurate vs. inaccurate estimators and see on what other criteria they differ, e.g. self-esteem, experience of IQ tests, etc. Third, there may well be important motivational factors at play in the self-estimation of intelligence which may lead to serious distortions in the scores. Thus, a close examination of the conditions and instructions under which participants make self-estimates of intelligence may give a clue as to how they make their self-estimate.

8. Conclusion

The way in which popular books on intelligence (Gardner, 1983; 1999; Goleman, 1996; Herrnstein & Murray, 1994; Howe, 1997; Sternberg, 1997) are bought and debated indicates the extent to which the lay public remain interested in the concept of intelligence. The sorts of issues that interest people most were covered by the 25 point summary of the 50 world experts published in the Wall Street Journal (Furnham, 1998). They were the meaning and measurement of intelligence, group differences in IQ scores, the practical importance of intelligence, sources and stability of within and between group differences and implications for social policy.

The way in which people think about intelligence is both an "academic", but also a practical question. Psychologists are particularly interested in lay theories of various phenomena (Furnham, 1988) such as the aetiology and development of the theories, the function and consequences for the individual as well as their stability, consistency and change over time. They are also interested in the difference between academic and lay theories recognizing that there are considerable within group differences. Indeed one unexplored avenue of research is to see how popular conceptions of intelligence have changed as a function of the popularizing of various academic theories.

What the results of many studies shows is that lay beliefs about intelligence and intelligence testing are time- and culture-specific. Further, they nearly all go further than classic psychometricians to include ideas about social and practical intelligence (Gardner, 1999; Sternberg, 1997). Moreover, lay people believe that intelligence is important for "success in life" though many remain sceptical about the validity of IQ tests. Older studies show lay theories to be more "sexist" and more sceptical of testing. Certainly the cross-cultural studies have shown that all folk conceptions of intelligence are broader than even the broadest academic conceptions, but also that in certain cultures quite specific abilities and behaviours are believed to be part of intelligence. These are often related to the religious background and economic development of the area. Thus Wober (1973) found deliberation rather than urgency, and upholding tradition rather than change were part of the Ugandan conception of intelligence. This contrasts dramatically with the Tiawanese conceptions of intelligence where quick responses and creativity are thought to be core facets in intelligence.

Recent research of self-estimates of intelligence precipitated by Beloff (1992), has helped highlight some of the important issues in this area (Bennett, 2000; Furnham, 2000). The results demonstrate a widespread sex difference in self-estimates which extends to relatives particularly parents and children. The results also demonstrated cultural differences.

Perhaps the two most interesting findings from the more recent studies on self-estimated intelligence are those on the male-normativeness of IQ estimates and correlations between estimates and test scores. Furnham (2000) suggested that it is those abilities like spatial and mathematical and to some extent verbal intelligence that are considered the essence of intelligence. Furnham et al. (2001) indeed confirmed that of the seven multiple intelligences listed by Gardner (1983) it is those "traditional intelligences (verbal, spatial and mathematical) that are statistically closest to a self-estimate of overall general intelligence. This appears to be the case irrespective of a person's experience of tests. There may be various reasons for this finding. It could be the ideas of emotional, practical or social intelligence are either rejected by many western educated people as not really part of intelligence or else the ideas are too new to have taken hold in the popular imagination. Equally it could be that people have been told in educational settings that certain tasks reflect their IQ and these have not included the wider conceptions of intelligence. What is particularly interesting about theses findings is that they may explain the commonly observed sex difference because IQ tests are seen to be male normative."

Secondly the fact that self-estimates correlated positively but only modestly with test scores warrants further investigation. Paulus et al. (1998) seemed disappointed that self-estimates could not be held as "proxy measures" of IQ, though many would be surprised if they could. However, what is perhaps worth pursuing is to investigate under what circumstances the correlations increase or decrease. Individual differences in personality, motivation, ability, understanding and expertise no doubt account for the great variability in self-estimations which tend to be greater than the distribution of actual scores.

Finally the importance of studies of self-estimated intelligence lies not only in exploring lay theories of intelligence but also of understanding the possible self-fulfilling nature of self-evaluations of ability. In a series of programmatic studies Beyer (1990, 1998, 1999) has demonstrated sex differences in expectations, self-evaluations and performance on ability-related tasks. Her results support the male hubris, female humility results of these studies on self-estimated intelligence. Sex differences in self-evaluations affect expectancies of success and failure, and, ultimately performance

on those tasks. She notes: "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 use 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).

The relationship between self-perceptions of general ability, overall and specific intelligences and behavioural outcomes is both complex but of great significance. Thus, Mueller and Dweck (1998) demonstrated that children who are praised for being intelligent tend to be outcome, rather than process oriented, invest less effort and be less persistent than those who are praised for effort. Those children praised for intelligence tended to describe it as a fixed trait more than those children praised for hard work who were more likely to believe that it is possible to improve it. This finding, taken together with the above literature of self- and parental estimations of intelligence suggest paradoxically males may be disadvantaged by the flattery they receive and internalize.

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