British Journal of Psychology (2009), 100, 429–442
© 2009 The British Psychological Society

The British Psychological Society

www.bpsjournals.co.uk

Decomposing self-estimates of intelligence: Structure and sex differences across 12 nations

Sophie von Stumm[1], Tomas Chamorro-Premuzic[1]* and Adrian Furnham[2]

[1]Department of Psychology, Goldsmiths, University of London, London, UK
[2]Department of Psychology, University College London, London, UK

This study examines the structure of self-estimates of intelligence (SEI) across 12 nations (Australia, Austria, Brazil, France, Iran, Israel, Malaysia, South Africa, Spain, Turkey, UK and US). Participants rated themselves on general and specific abilities from three popular models of intelligence: Gardner's multiple intelligences, Sternberg's triarchic theory of intelligence, and Goleman's emotional intelligence. The results showed that (a) laypeople across nations have similar and invariant concepts of intelligence, (b) concepts of intelligence are cross-culturally closely related to academic notions of intellectual ability and (c) sex differences in general and specific SEI favouring men are consistent across countries. Male hubris and female humility in SEI seem independent of sex differences in actual cognitive ability and national levels of masculinity-femininity. Furthermore, international mean differences in general SEI could not be attributed to discrepancies in national intelligence quotient (IQ) levels or to cultural variations.

General intelligence *g* has been accredited the most important discovery in the field of individual differences (e.g. Deary, 2000), and researchers continue to debate its structure, definition and the scope of its impact (e.g. Carroll, 1993; Gottfredson, 2004; Johnson & Bouchard, 2005; Sternberg, 1985, 2003). So-called popular models of 'hot' intelligence (Mayer, Salovey, & Caruso, 2004) compete with academic models of cognitive ability to account for individual differences in performance outcomes, most prominently Sternberg's (1985) triarchic model of successful intelligence, Goleman's (1995) emotional intelligence and Gardner's (1983) theory of multiple intelligences.

'Hot' intelligences refer to an array of non-cognitive abilities (e.g. affective and interpersonal traits) which are seen in contrast to the 'cold' characteristics of intelligence (i.e. analytical and logical ability; Chamorro-Premuzic, 2007). Although empirical evidence falls short to validate popular ability models, they shape public attitudes to intelligence (Furnham, 2001). Indeed, lay concepts of intelligence have far

* *Correspondence should be addressed to Sophie von Stumm, Department of Psychology, Goldsmiths, New Cross, London SE146NW, UK. e-mail: psp01svs@gold.ac.uk*

DOI:10.1348/000712608X357876

reaching consequences because (1) people tend to evaluate others as well as themselves on the basis of what is considered 'intelligent' and such evaluations may turn into public beliefs with considerable social, educational, and occupational consequences (Ackerman & Wolman, 2007; Beyer & Bowden, 1999), and (2) lay conceptions of intelligence influence expectations and evaluations, which in turn affect performance outcomes reflecting self-fulfilling prophecies (Chamorro-Premuzic & Arteche, 2008; Chamorro-Premuzic & Furnham, 2006; Dweck, 1999; Pomerantz & Ruble, 1997).

Models of 'hot' intelligences attempt to 'demolish, replace or improve *g*' (Chamorro-Premuzic & Furnham, 2006, p. 255) contesting that psychometric intelligence or intelligence quotient (IQ) are too narrow to account for the full scope of intelligent characteristics. Lay concepts of intelligence have been found to be more multifaceted than corresponding academic notions (Furnham, 1988; Sternberg, Conway, Ketron, & Bernstein, 1981); the former may be more align to theories of 'hot' intelligences.

For example, Gardner (1983) identified seven intelligences, whereby he distinguished 'object-related' abilities, including logical (ability to reason logically), spatial (ability to navigate and to manipulate mental images) and bodily kinesthetic intelligence (ability to carry out motor movement and to express oneself through movement), from 'object-free' aspects of intelligence, referring to verbal (linguistic ability) and musical intelligence (ability to perceive and create pitch and rhythm patterns). Finally, two 'personal' aspects include interpersonal (ability to understand the behaviour, thoughts, and feelings of others) and intra-personal (ability to understand oneself and to develop a sense of identity) intelligence (Gardner, 1983). Only three of Gardner's (1983) abilities-notably verbal, spatial and logical-are frequently assessed in conventional intelligence tests.

Sternberg (1985) postulated a triarchic model of 'successful' intelligence with componential, experiential, and contextual as core elements. The componential aspect refers to learning ability, analytical thinking, and problem solving skills and is closely related to the concept of *g*. The experiential component refers to the ability to combine different experiences in unique ways through means of original thinking and creativity. Finally, the contextual aspect refers to the practical aspects of the environment and the ability to adapt to new and changing contexts by drawing on existing knowledge and skills. Sternberg (1997) popularized the terms of analytic (componential), creative (experiential), and practical (contextual) intelligence as composites of one's successful intelligence.

Finally, emotional intelligence refers to the ability to perceive, assess and manage one's own and others' emotions (Payne, 1985; Salovey & Mayer, 1990), and was popularized by Goleman (1995), who identified emotional competencies including self-awareness, control over one's emotions and understanding other's emotions. In contrast to other researchers (e.g. Petrides & Furnham, 2000, 2001), Goleman (1995) conceptualizes emotional intelligence as intellectual ability (rather than a personality trait) that is malleable and can be advanced through experience and learning. Recent research employed Gardner's, Sternberg's and Goleman's theoretical frameworks to evaluate self-estimates of intelligence (SEI) with regard to cross-cultural and sex differences (e.g. Bennett, 1996; Petrides, Furnham & Martin, 2004).

Sex differences in self-estimates

Sex differences in SEI have been frequently reported but their causes remain a matter of speculation (e.g. Beloff, 1992; Furnham & Rawles, 1999; Hogan, 1978). Furnham and Rawles (1999) proposed that males' higher estimates are simply an accurate reflection of their superior ability levels, particularly in spatial and reasoning abilities (e.g. Halpern,

2004). Accordingly, Rammstedt and Rammsayer (2000) found significant sex differences for self-estimates of mathematical, spatial and reasoning abilities but not for general SEI, and Petrides *et al.* (2004) concluded that sex differences are most pronounced in estimates of mathematical-logical and spatial abilities.

In addition, there are cultural differences regarding male hubris and female humility in SEI (Furnham, Hosoe, & Tang, 2002). Sex differences were consistently observed in Western Europe and the United States but not in Africa and Eastern Europe (Furnham & Baguma, 1999; Furnham, Rakow, Sarmany-Schiller, & De Fruyt, 1999). Moreover, there are substantial variations in mean levels of SEI across nations; Furnham and Baguma (1999) found that Americans awarded themselves the highest self-estimates on overall, numerical and cultural intelligence, whereas African students rated themselves as highest on verbal intelligence. British students on the other hand awarded themselves higher overall SEI than American and Asian students (Furnham *et al.*, 1999). Nevertheless, sex × culture interactions were rarely observed (Furnham, 2001).

Some studies attempted to investigate the structure of overall SEI by regressing types of self-estimates from models of 'hot' intelligences (e.g. Furnham, Tang, Lester, O'Connor, & Montgomery, 2002; Furnham, Wytykowska, & Petrides, 2005) or by applying principal components analysis (PCA) to a set of self-estimates (e.g. Bennett, 1996, 1997; Furnham & Baguma, 1999; Furnham *et al.*, 1999; Petrides & Furnham, 2000). However, these studies failed to attend to issues of multicollinearity and measurement invariance across countries.

This study aims to explore national differences in lay conceptions of intelligence by evaluating self-estimates from several models of 'hot' intelligences. It is predicted that (a) nations vary in mean levels of self-estimated general intelligence, (b) the compositional structure of general intelligence estimates differs across nations, (c) men will consistently award themselves higher overall SEI than women and (d) such sex differences will be most pronounced in countries with male-normative intelligence concepts. That is, male hubris and female humility in self-estimates will be particularly evident in countries that endorse estimates of spatial and logical abilities as core components of one's overall intelligence. For countries who stress other abilities (such as personal and emotional intelligences) to a greater extent, sex differences in SEI will be smaller or even trivial.

Methods

Sample

In all, 2,441 participants from 13 countries including Australia, Austria, Brazil, France, Iran, Israel, Malaysia, New Zealand, South Africa, Spain, Turkey, UK and US took part in this study. The sample consisted of 847 males and 1,577 females (17 subjects did not indicate their sex). Age data in years were available for 2,425 participants, ranging from 15 to 78 years (mean = 24.55, $SD = 8.09$), and 2,417 participants provided information on their educational background and qualifications: 41.2% of the subjects reported to be educated up to primary and secondary school level, 52.3% up to undergraduate university level, and 6.5% up to postgraduate university level. Across nations, participants educated up to secondary and undergraduate level constituted the majority of testees; however, nations did slightly differ with regard to sample proportions of educational training levels. Overall, the sample comprised university students from various subject areas (science, arts and humanities), as well as of other community members without specific university affiliation.

Measures

SEI Questionnaire (Furnham & Gasson, 1998). The questionnaire presented a copy of the IQ bell curve spanning six standard deviations (−3 to +3) and brief descriptions of the anchor scores (e.g. 55 is 'mild retardation', 100 is 'average' and 145 is 'gifted'). Participants were asked to rate themselves on general intelligence, Gardner's seven intelligences (verbal, logical, spatial, musical, kinesthetic, interpersonal and intrapersonal), emotional intelligence, and finally Sternberg's practical and creative intelligence[1]. Each type of intelligence was presented with a brief description; for example, logical intelligence was defined as 'the ability to reason logically, to solve a number of problems' and practical intelligence was referred to as 'the ability to find the best fit between themselves and the demands of the environment'.

Procedure

Participants were predominantly approached in school and university settings in their respective country. Students volunteered to complete the survey in either paper-and-pencil or electronic (e-mail attachment) mode after obtaining parental approval where necessary. Furthermore, parents, siblings, relatives and friends of initially interviewed students were tested and thus, the samples considerably augmented. In all countries both electronic and printed versions were used, and participants remained anonymous.

Data Preparation

Participants with missing data on sex and estimates of intelligence were omitted from the sample. Furthermore, SEI scores on all scales were restricted to a range from 50 to 150 points, and outliers were also excluded from the analyses. A total of 435 omitted cases did not significantly differ from the sample included with regard to sex distributions, age, nationality and educational background. Thus, the final sample consisted of overall 2,006 cases (687 males and 1,319 females). Australia and New Zealand had very low participant numbers and thus, both population samples were collapsed into one, which will herein be referred to as Australia. A series of ANOVA tests did not show any significant differences between both samples on measures of SEI ($p > .05$ in all cases). As such, the included nations were representative of six continents (Africa, Asia, Australia, Europe, North-America, and South-America).

Analysis

A general linear model was applied to test for mean differences in general SEI across nations and sexes. In a second step, popular models of intelligence were compared regarding the amount of variance explained to identify national concepts of intelligence. Subsequently, PCA was applied to test for invariance of component structure of SEI types across nations. In addition, correlations were used to assess SEI types' overlap with estimates of general intelligence. Finally, sex differences in SEI were investigated with reference to national differences in general SEI correlates and sex differences in specific ability estimates.

[1] *Gardner's logical intelligence was also used as measure of Sternberg's analytic intelligence.*

Results

A univariate general linear model was fitted to investigate mean differences in the general SEI across nations and between sexes within nations (see Table 1 for descriptive statistics). There was a significant main effect of mean difference across nations [F (11, 1982) = 25.57, $p < .001$, $\eta p2 = .12$], as well as a significant main effect of sex [F (1, 1982) = 109.20, $p < .001$, $\eta p2 = .05$]. *Post-hoc* analyses (Games-Howell, as equal variances could not be assumed) showed significant effects for 39 out of 66 (59.1%) multiple comparisons between nations. A significant interaction effect of sex by nation was observed [F(11, 1982) = 4.94, $p < .001$, $\eta p2 = .03$]. However, the interaction effect was largely due to extreme scores in France and the UK and thus, independent sample t tests were conducted to examine sex differences in general SEI within nations. The results showed that sex differences in the general SEI were significant for Brazil, France, South Africa, UK and US with the greatest mean differences in France, UK and US.

Table 1. Mean levels of self-estimate of general intelligence across nations and sexes

	Males			Females			Cohen's *d*
	N	*Mean (SD)*		*N*	*Mean (SD)*		
Australia	31	114.19	(10.81)	101	111.21	(10.35)	.24
Austria	90	113.30	(12.18)	110	110.25	(9.47)	.30
Brazil	30	112.37	(10.38)	151	104.63	(10.34)	.56*
France	66	129.71	(6.27)	78	114.68	(11.66)	1.57*
Iran	169	119.65	(14.11)	77	116.79	(12.87)	.25
Israel	28	112.61	(8.54)	121	109.07	(9.11)	.31
Malaysia	58	108.84	(13.88)	105	104.89	(8.98)	.43
South Africa	21	119.48	(8.89)	103	111.91	(9.95)	.80*
Spain	15	109.47	(7.56)	115	104.13	(7.43)	.46
Turkey	96	115.91	(11.18)	174	113.56	(11.49)	.20
UK	52	122.19	(9.02)	104	111.95	(10.65)	.96*
US	31	114.29	(12.95)	80	104.59	(8.39)	.89*

*$p < .001$.

Note. For Austria, France and Malaysia the assumption of homogeneity was violated ($p < .001$). Cohen's *d* refers to the effect size of mean sex differences in SEI within each nation.

In separate regression models within countries, the general SEI was regressed on to Gardner's seven intelligences, Sternberg's triachic intelligence model and emotional intelligence. Table 2 shows adjusted R^2 values[2]. Gardner's intelligences accounted in all countries for the greatest amount of variance in general SEI ranging from 29.2% (Israel) up to 62.1% (UK). To examine the triarchic model of intelligence, the self-estimate of logical intelligence was used as proxy of Sternberg's concept of analytic intelligence.

[2] *The adjusted* R^2 *corrects for the fixed denominator of* R^2 *by adjusting numerator and denominator by their respective degrees of freedom. Unlike* R^2*, the Adjusted* R^2 *can decline in value if the contribution to the explained deviation by the additional variable is less than the impact on the degrees of freedom. This means that the equation with the smallest standard error of the estimate will have the highest adjusted* R^2*. In other words,* R^2 *serves as a valid index to compare models with differing numbers of predictor variables (Field, 2005). However, the adjusted* R^2 *cannot be applied to cross-country comparisons due to significant differences in the variance of overall SEI.*

Table 2. Adjusted R^2 values for separate regression models on to general SEI

	Gardner's seven intelligences	Emotional intelligence	Sternberg's model
Australia	.465	.088	.395
Austria	.523	.163	.427
Brazil	.356	.182	.321
France	.353	.001	.290
Iran	.507	.157	.433
Israel	.292	.057	.238
Malaysia	.558	.187	.458
South Africa	.374	.063	.287
Spain	.401	.168	.381
Turkey	.430	.174	.341
UK	.621	.169	.444
US	.493	.075	.354

Note. Adjusted R^2 values cannot be compared across countries due to differences in variance of general SEI. However, within each nation Adjusted R^2 constitutes a valid statistical indicator to compare the amount of variance accounted for by different models of 'hot' intelligences (i.e. Gardner's intelligences, emotional intelligence and Sternberg's model).

Although Sternberg's model accounted for similar percentages of variance ranging from 23.8% (Israel) to 45.8% (Malaysia), its explanatory power fell behind Gardner's set of intelligences in each country. Finally, emotional intelligence accounted for the least amount of variance in general SEI with as little as 0.1% (France).

To investigate the relationship amongst specific SEI types within nations, the latter were subjected to PCA. The first unrotated principal components accounted for at least one third of the total variance in SEI types (South Africa) up to more than 50% (Iran). Using factor congruence coefficients (Table 3), components were found to be consistent if not identical across countries ($r_{CC} \geq .91$) with the only exception of France ($r_{CC} = .81$). Overall, specific SEI types entail one underlying dimension which may be may be interpreted analogously to psychometric *g*. In a next step, the extracted Bartlett's regression component scores were correlated with general SEI in each country (Table 3, bottom row). Although correlation coefficients indicated a substantial association in all cases, there were national differences regarding the strength of association. For example, general SEI and the first component were correlated at .73 in the UK sharing 53.3% of the variance, whereas in Israel the coefficient was at .45 (20.3% shared variance). Albeit specific self-estimates were similarly intercorrelated, countries differed in the extent of overlap of the extracted component and general SEI.

The prior analyses do not enable to examine national differences in weight of specific SEI with regard to the general intelligence estimate. Due to multicollinearity[3], it is not advisable to investigate differences in effects of specific SEI on general intelligence estimates by examining regression coefficients.

Instead, Pearson's product correlation moments were computed for general and specific SEI across countries. To rank order the coefficients, we selected the three

[3] *Multicollinearity is does not affect the accuracy of a regression model with regard to overall adjusted* R^2 *results but distorts how various predictor variables relate to then outcome (i.e. regression coefficients are inaccurate).*

Table 3. Principal component loadings of SEI types across nations on first unrotated component

SEI Type	Australia	Austria	Brazil	France	Iran	Israel	Malaysia	SA	Spain	Turkey	UK	US
Verbal	.64	.54	.63	.86	.69	.60	.69	.53	.53	.68	.71	.69
Logical	.53	.59	.52	.88	.65	.34	.65	.47	.41	.65	.67	.40
Spatial	.64	.49	.45	.91	.70	.33	.76	.49	.40	.63	.71	.68
Musical	.32	.42	.48	.54	.58	.41	.53	.36	.32	.52	.48	.58
Kinesthetic	.59	.45	.55	.49	.71	.52	.64	.56	.54	.70	.56	.68
Inter-personal	.78	.73	.70	−.18	.78	.77	.71	.67	.73	.80	.73	.73
Intra-personal	.77	.69	.70	−.10	.76	.59	.79	.58	.70	.67	.64	.73
Emotional	.75	.72	.74	.12	.72	.75	.66	.71	.75	.76	.69	.62
Creative	.69	.65	.63	.59	.82	.62	.75	.69	.66	.68	.71	.71
Practical	.68	.67	.67	.91	.72	.56	.78	.69	.69	.79	.68	.70
Eigenvalue	4.26	3.65	3.79	4.11	5.12	3.22	4.91	3.43	3.50	4.80	4.40	4.34
r_{CC}	.97	.97	.97	.81	.91	.96	.95	.95	.97	.97	.98	.95
r_{GC}	.54	.64	.59	.57	.69	.45	.71	.53	.57	.61	.73	.59

Note. r_{CC} refers to the average factor congruence coefficient across all countries. A coefficient of .90 and above indicates that factors are identical. r_{GC} refers to the Pearson product moment coefficient of general SEI and the principal component extracted from all SEI types within a given country.

highest correlation coefficients within each country[4]. Table 4 shows that general SEI was strongly related to verbal and logical intelligence in each nation with the exceptions of France, Israel and Spain. Thus, self-estimates of 'cold' intelligences—i.e. logical and verbal ability—are reflected in general SEI across nations. Spatial intelligence was only in France highly associated with the general estimate suggesting that people generally do not consider this ability as relevant indicator or aspect of one's intelligence.

The next most frequent correlates with general SEI were Stenberg's creative and practical intelligences across five and six countries, respectively. In contrast, musical, kinesthetic and emotional intelligence were in no country amongst the strongest correlates.

As a final test, we examined mean sex differences in specific SEI across nations. French and Iranian women gave significantly higher estimates of interpersonal and emotional intelligence, respectively, than their male counterparts ($p < .01$). The majority of significant sex differences in SEI, however, favoured men and were most pronounced in estimates of verbal, logical, spatial and practical intelligence across nations. In particular, France and UK showed a high frequency of significant sex differences in SEI types, each with eight significant differences out of 10 estimates.

Discussion

Concepts of Intelligence

When comparing Gardner's (1983) multiple intelligences, Sternberg's (1985) triarchic model and Goleman's (1995) emotional intelligence in separate regression models, Gardner's framework clearly accounted for the greatest amount of variance in the estimate of general intelligence in each country, closely followed by Sternberg's triplet. Emotional intelligence only explained a fraction of the given variance (which is akin to interpretations of emotional intelligence as a personality rather than an ability construct; Petrides & Furnham, 2001). Gardner's and Sternberg's models include intelligences, which correspond to factors of psychometrically demonstrated components cognitive ability. Specifically, logical, verbal and spatial ability are core elements in academic intelligence concepts and assessments of individual aptitude (e.g. Carroll, 1993). Therefore, popular models of intelligence which entail 'cold' as well as 'hot' intelligences best reflect people's assessment of their general intelligence. However, none of the above frameworks accounted for more than 50% of the variance in general SEI suggesting the latter reflects more than the sum of specific intelligence estimates within a given framework. Generally, verbal and logical SEI were among the highest correlates with overall SEI in each nation confirming previous research (e.g. Furnham *et al.*, 2002; Furnham *et al.*, 2005). Although psychometric research emphasises the importance of visual-spatial ability in human cognition (e.g. Carroll, 1993; Johnson & Bouchard, 2005), spatial intelligence was strongly associated with general SEI only in France. From the list of 'hot' intelligences, Sternberg's creative intelligence was of relevance in Iran, Israel, Spain, UK and US, whereas practical intelligence was a strong correlate in Australia, Austria, Brazil, France, South Africa and Spain. In contrast, musical, kinaesthetic and emotional intelligence were in neither country amongst

[4] *The number of selected correlation coefficients is arbitrary; the primary purpose was to identify similar patterns in the relationship of specific and general SEI across countries without directly comparing coefficients' magnitude. The latter is affected by sample variances which were not homogenous in the present study.*

Table 4. Pearson's product moment correlation coefficients of general and specific SEI across countries

	Australia	Austria	Brazil	France	Iran	Israel	Malaysia	SA	Spain	Turkey	UK	US
Verbal	**.51**	**.44**	**.52**	**.56**	**.59**	.30	**.59**	**.57**	.39	**.54**	**.69**	**.59**
Logical	**.58**	**.62**	**.44**	.50	**.57**	**.45**	**.60**	**.40**	**.52**	**.53**	**.58**	**.44**
Spatial	.38	.43	.19	**.59**	.53	.18	.49	.23	.20	.32	.45	.39
Musical	.09	.21	.30	.19	.40	.31	.44	.13	.08	.30	.33	.28
Kinesthetic	.18	.18	.24	.24	.41	.18	.42	.14	.15	.41	.40	.28
Inter-personal	.31	.36	.28	−.11	.47	**.33**	.48	.24	.34	**.49**	.46	.42
Intra-personal	.39	.40	.34	.00	.47	.16	**.57**	.28	.40	.31	.51	.34
Emotional	.31	.41	.43	.09	.40	.25	.44	.27	.42	.42	.42	.29
Creative	.36	.37	.38	.26	**.55**	**.32**	.48	.39	**.43**	.42	**.55**	**.48**
Practical	**.40**	**.45**	**.47**	**.54**	.52	.17	.50	**.42**	**.43**	.47	.46	.40

Note. The highest three coefficients for each country are in bold ($p < .001$ in all cases).

the highest correlates. That said, one may conclude that (a) laypeople's concept of intelligence encompasses facets of individual ability beyond the academic notion and (b) these facets tend to represent one's ability to adapt to the environment (i.e. practical) and to develop one's thinking and potential (i.e. creative) rather than selective individual gifts (e.g. musical or kinaesthetic ability).

National differences in self-estimates

The current results confirmed national differences in the mean levels of self-estimated general intelligence. Moreover, a sex × nationality interaction effect was observed, due to extreme scores from France and the UK. In this context, Furnham (2001) reported mean sex differences in overall SEI of up to 8.6 IQ points in British samples which is slightly below the current findings of 10.2 IQ points. To date, there are no reports on French self-estimates but their high overall SEI of 129.7 IQ points, as well as an extreme sex difference of 15 IQ points, warrant future investigation.

PCA of ten types of SEI yielded one identical underlying dimension across nations, with the exception of France. Thus, SEI follow a similar structure as actual ability test scores do. Both show Spearman's positive manifold and can be represented by one component: psychometric and analogously self-estimated *g*.

National differences in the mean levels of general SEI may be a reflection of variations in 'measured' intelligence or national IQs. Research on national differences in intelligence triggers heated debates and thus, is subject to critical scrutiny and should be cautiously interpreted (e.g. Hunt & Sternberg, 2006; Hunt & Wittmann, 2008). That in mind, this study's national means of SEI were compared to Lynn and Vanhanen's (2002) report of national IQ scores (Figure 1). Overall, self-estimates were higher than national IQ scores but a consistent relationship could not be observed. As actual differences in ability are

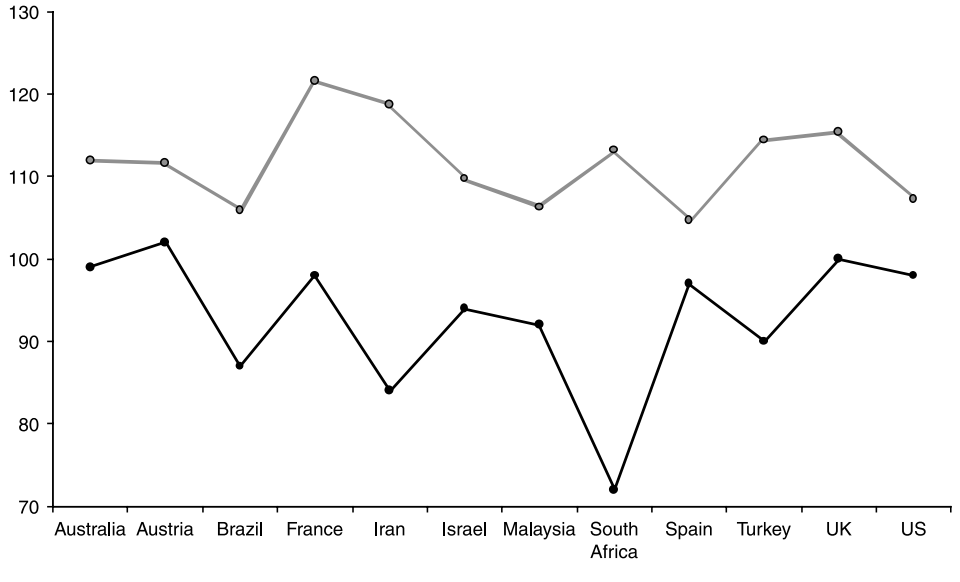

Figure 1. Self-estimates of intelligence and national IQ scores across nations.
Note. The grey line represents SEI, the black line represents national IQ scores as adapted from Lynn and Vanhanen (2002).

unlikely to cause national variations in self-estimates, one might suggest the latter depend on national culture. Individualistic societies, such as the UK and US, encourage individuals to pursue their ideas and goals, emphasise personal achievement, and contemn social order and obedience (Hofstede, 1991). Thus, nations who adhere to meritocratic principles are likely to emphasize intelligence to a greater extent than collectivistic nations; such accentuation may be reflected in higher national SEI. Indeed, collectivistic countries like Brazil and Malaysia reported low overall SEI, whereas individualistic France and the UK gave the highest self-estimates. However, highly individualistic cultures like Australia and the US did not have enhanced levels of SEI. Therefore, cultural dimensions do not sufficiently account for observed differences in SEI.

Sex differences in self-estimates

In line with previous research, this study found significant sex differences in favour of men in general SEI across nations. It was hypothesized that structural differences in SEI account for the magnitude of sex differences within nations. Countries, which endorsed a male-normative concept of intelligence stressing logical and spatial abilities, should show greater sex differences in general SEI. Brazil, France, South Africa, UK and US showed the largest sex differences in general SEI but no consistent discrepancies regarding the structure of SEI were detected. National variations in magnitude and frequency of sex differences in specific SEI did also not explain male hubris and female humility overall self-estimates.

It had been suggested that sex differences in self-estimates possibly results from an exaggerated reflection of men's actual superior ability (Furnham & Rawles, 1999; Rammstedt & Rammsayer, 2000). In the current study, however, men awarded themselves not only higher scores in male-normative abilities (spatial and logical reasoning), but also in verbal ability which women tend to exceed in (e.g. Halpern, 2004). In this context, it is noteworthy that previous research found sex differences in cognitive ability invariant across cultures (Deary, Irwing, Der, & Bates, 2007; van der Sluis *et al.*, 2008). Therefore, males' exorbitant SEI across nations are unlikely to be significantly related to sex differences in actual mental ability and thus, females' personal undervaluation may be due to cultural influences. The national culture dimension of masculinity–femininity refers to the distinctiveness of gender roles within a society (Hofstede, 1980). One might suspect that societies, who stress almost oppositional attributes for men (assertiveness, strength and success) and women (modesty, tenderness and care) for women, also show greater sex differences in SEI. However, nations with the largest sex differences in SEI are located at opposite ends of the masculinity dimension (the UK is masculine but France feminine). Therefore, the magnitude of sex differences in SEI cannot be satisfactorily accounted for by national cultures[5].

Conclusions

In summary, the results highlight the ubiquitous focus on traditional components of intelligence, notably logical and verbal abilities, across nations. Thus, lay concepts of intelligence are largely influenced by ratings of 'cold' academic abilities, whereas only

[5] *Hofstede's (1991) theory of cultural dimensions is not without substantial criticism (e.g. McSweeney, 2000). However, comparisons of national SEI levels and culture dimensions from Schwartz's (2006) and Inglehart (1997) also yielded similar results suggesting SEI scores as being rather independent of national culture.*

practical and creative from the list of 'hot' intelligences shared a substantial amount of variance with estimates of general intelligence. Cross-national variability in levels of SEI and mean sex differences could neither be attributed to national IQs, nor to sex differences in actual cognitive abilities, nor to dimensions of culture. Overall, concepts of intelligence appear to be as internationally invariant as male hubris and female humility in SEI. Future research must explore factors beyond culture and structures of ability estimates to explain this gaping sex difference.

Acknowledgements

The authors are extremely grateful to the following people who helped collect the data that was analysed in this study: Australia (Patrick Heaven: University of Wollongong); Austria (Martin Voracek, Tanja Haubner and Stefan Stieger: University of Vienna); Brazil (Angela Pinheiro: Federal University of Minas Gerias); France (Susan Zilka: University College London); Iran (Afrooz Kosari: University College London); Israel (Gidi Rubinstein: Netanya Acedemic College); Malaysia (Ismail Maakip, Danchayani Sinniah and Subash Pillai: University of Malaysia Sabah); South Africa (Johann Louw: University of Cape Town); Spain (Montserrat Goma Freixenet: Autonomous University of Barcelona); Turkey (Askin Keser: Kocaeli University); USA (Hank Tkachuk, Concordia College).

References

Ackerman, P. L., & Wolman, S. (2007). Determinants and validity of self-estimates of abilities and self-concept measures. *Journal of Experimental Psychology: Applied*, *13*, 57–78.

Beloff, H. (1992). Mother, father and me: Our IQ. *The Psychologist*, *5*, 309–311.

Bennett, M. (1996). Men's and women's self-estimates of intelligence. *Journal of Social Psychology*, *136*, 411–412.

Bennett, M. (1997). Self-estimates of ability in men and women. *Journal of Social Psychology*, *137*, 540–541.

Beyer, S., & Bowden, E. (1997). Gender differences in self-perceptions. *Personality and Social Psychology Bulletin*, *23*, 157–172.

Carroll, J. B. (1993). Human cognitive abilities: A survey of factor-analytic studies, Cambridge, MA: Cambridge University Press.

Chamorro-Premuzic, T. (2007). Personality and Individual Differences, London: Blackwell Publishing.

Chamorro-Premuzic, T., & Arteche, A. (2008). Intellectual competence and academic performance: Preliminary validation of a model. *Intelligence*, *36*, 564–573.

Chamorro-Premuzic, T., & Furnham, A. (2006). Intellectual competence and the intelligent personality: A third way in differential psychology. *Review of General Psychology*, *10*, 251–267.

Deary, I. J. (2000). *Looking down on human intelligence: From psychophysics to the brain*. Oxford: Oxford University Press.

Deary, I. J., Irwing, P., Der, G., & Bates, T. C. (2007). Brother–sister differences in the g factor in intelligence: analysis of full, opposite-sex siblings from the NLSY1979. *Intelligence*, *35*, 451–456.

Dweck, C. S. (1999). *Self-theories: Their role in motivation, personality and development*. Philadelphia, PA: Psychology Press.

Field, A. P. (2005). *Discovering statistics using SPSS* (second edition). London: Sage.

Furnham, A. (1988). *Lay theories: Everyday understandings of problems in the social sciences*. Oxford: Pergamon.

Furnham, A. (2001). Self-estimates of intelligence: Culture and sex difference in self and other estimates of both general (*g*) and multiple intelligences. *Personality and Individual Differences*, *31*, 1381–1405.

Furnham, A., & Baguma, P. (1999). A cross-cultural study from three countries of self-estimates of intelligence. *North American Journal of Psychology*, *1*, 69–78.

Furnham, A., & Gasson, L. (1998). Sex differences in parental estimates of their children's intelligence. *Sex Roles*, *38*, 151–162.

Furnham, A., Hosoe, T., & Tang, T. (2002). Male hubris and female humility? A cross-cultural study of ratings of self, parental and sibling multiple intelligences in America, Britain and Japan. *Intelligence*, *30*, 101–105.

Furnham, A., Rakow, T., Sarmany-Schiller, I., & De Fruyt, F. (1999). European differences in self-perceived multiple intelligences. *European Psychologist*, *4*, 131–138.

Furnham, A., & Rawles, R. (1999). Correlations between self-estimated and psychometrically measured IQ. *Journal of Social Psychology*, *139*, 405–410.

Furnham, A., Tang, T., Lester, D., O'Connor, R., & Montgomery, R. (2002). Estimates of ten multiple intelligences. *European Psychologist*, *7*, 245–255.

Furnham, A., Wytykowska, A., & Petrides, K. V. (2005). Estimates of multiple intelligences: A study in Poland. *European Psychologist*, *10*, 51–59.

Gardner, H. (1983). *Frames of mind: The theory of multiple intelligences*. New York, NY: Basic Books.

Goleman, D. P. (1995). *Emotional Intelligence: Why it can matter more than IQ for character, health and lifelong achievement*. New York, NY: Bantam Books.

Gottfredson, L. (2004). Intelligence: Is it the epidemiologists' elusive fundamental cause' of social class inequalities in health? *Journal of Personality and Social Psychology*, *86*, 174–199.

Halpern, D. F. (2004). A cognitive-process taxonomy for sex differences in cognitive abilities. *Current Directions in Psychological Science*, *13*, 135–139.

Hofstede, G. (1980). *Culture's consequences: International differences in work-related values*. Beverly Hills: Sage.

Hofstede, G. (1991). *Cultures and organizations: Software of the mind*. London: McGraw-Hill.

Hogan, H. (1978). IQ self-estimates of males and females. *Journal of Social Psychology*, *106*, 137–138.

Hunt, E., & Sternberg, R. (2006). Sorry, wrong numbers: An analysis of a study of a correlation between skin color and IQ. *Intelligence*, *34*, 121–139.

Hunt, E., & Wittmann, W. (2008). National intelligence and national prosperity. *Intelligence*, *36*, 1–9.

Inglehart, R. (1997). *Modernization and postmodernization: Cultural, economic and political change in 43 societies*. Princeton, NJ: Princeton University Press.

Johnson, W., & Bouchard, T. J. (2005). The structure of human intelligence: It is verbal, perceptual, and image rotation (VPR), not fluid and crystallized. *Intelligence*, *33*, 393–436.

Lynn, R., & Vanhanen, T. (2002). *IQ and the wealth of nations*. Westport: Praeger.

Mayer, J. D., Salovey, P., & Caruso, D. R. (2004). Emotional intelligence: Theory, findings, and implications. *Psychological Inquiry*, *15*, 197–215.

McSweeney, B. (2000). Hofstede's model of national cultural differences and their consequences: A triumph of faith—a failure of analysis. *Human Relations*, *55*, 89–118.

Payne, W. (1985). *A study of emotion: Developing emotional intelligence.* Published Doctoral Thesis, The Union for Experimenting Colleges and Universities.

Petrides, K. V., & Furnham, A. (2000). Gender differences in measured and self-estimated trait emotional intelligence. *Sex Roles*, *42*, 449–461.

Petrides, K. V., & Furnham, A. (2001). Trait emotional intelligence: Psychometric investigators with reference to established trait taxonomies. *European Journal of Personality*, *15*, 425–448.

Petrides, K. V., Furnham, A., & Martin, G. N. (2004). Estimates of emotional and psychometric intelligence: Evidence for gender-based stereotypes. *Journal of Social Psychology*, *144*, 149–162.

Pomerantz, E. M., & Ruble, D. N. (1997). Distinguishing multiple dimensions of conceptions of ability: Implication for self-evaluation. *Child Development*, *68*, 1165–1180.

Rammstedt, B., & Rammsayer, T. (2000). Sex differences in self-estimates of different aspects of intelligence. *Personality and Individual Differences*, *29*, 56–63.

Salovey, P., & Mayer, J. D. (1990). Emotional intelligence. *Imagination, Cognition & Personality*, *9*, 185–211.

Schwartz, S. (2006). A theory of cultural value orientations: Explication and applications. *Comparative Sociology*, *5*, 136–182.

Sternberg, R. (1985). *Beyond IQ: A triarchic theory of human intelligence*. New York, NY: Cambridge University Press.

Sternberg, R. (2003). Our research program validating the triarchic theory of successful intelligence: Reply to Gottfredson. *Intelligence*, *31*, 399–413.

Sternberg, R. (1997). *Successful intelligence*. New York, NY: Plure.

Sternberg, R., Conway, B., Ketron, J., & Bernstein, M. (1981). People's conception of intelligence. *Journal of Personality and Social Psychology*, *42*, 37–55.

van der Sluis, S., Derom, C., Thiery, E., Bartels, M., Polderman, T. J. C., Verhulst, F. C., *et al*. (2008). Sex differences on the WISC-R in Belgium and the Netherlands. *Intelligence*, *36*, 48–67.

Received 15 February 2008; revised version received 9 August 2008