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Intelligence, gender, and assessment method affect the accuracy of self-estimated intelligence

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Self-estimates of intelligence (SEI), which influence to what extent people engage in and how well they perform at a task, are subject to distortion. Here, the distortion effects of individual differences in intelligence (IQ), gender, and proximal (with reference to test performance) and distal (with reference to IQ score distributions) assessments of SEI were tested in a sample of 200 British adults. The results showed that (1) people with lower IQ misestimated their SEI to a greater extent than people with high IQ; (2) this effect was more pronounced in distal than proximal measures of SEI; (3) SEI means did not differ significantly across gender but the IQ-related level of SEI distortion did; (4) this effect was greater for distal than proximal measurement; and (5) proximal SEI were on average less distorted than distal SEI scores and also correlated more closely with IQ. Overall, the findings suggest that the distal SEI assessment method resulted in greater gender- and IQ-related distortions of SEI.

Self-estimates of the ability to perform in a given task influence people's decision to engage in that task and their level of perseverance (Bipp, Steinmayr, & Spinath, 2012; Dweck & Leggett, 1988). Accordingly, self-estimates of intelligence (SEI) inform people's academic and professional choices, as well as their achievements in these domains. Misjudging one's intelligence has consequences (Moore & Healy, 2008). People, who overestimate their intelligence, are likely to fail because they overcharged themselves with their task choice. Conversely, people, who underestimate their intelligence, fall short of achieving their potential because they shy from tasks that would suit their level of ability (Dweck & Leggett, 1988). SEI are thought to derive from past experiences and social comparison processes (Freund & Kasten, 2012; Holling & Preckel, 2005) but their accuracy also depends on individual differences in intelligence and gender (e.g., Kruger & Dunning, 1999; Rammstedt & Rammsayer, 2002; Visser, Ashton, & Vernon, 2008), as well as on their assessment method (Dunning, Meyerowitz, & Holzberg, 1989; Holling & Preckel, 2005). The influences of intelligence, gender, and assessment method on the accuracy of SEI have not yet been jointly studied and thus, it is unknown if the interplay of these factors increases or

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decreases distortion effects. In addition, most previous research in this area tested school and university students (e.g., Dunning, Johnson, Ehrlinger, & Kruger, 2003; Furnham, 2001), who have a restricted range of both intelligence and SEI, while comparable data from representative adult samples are missing.

Intelligence and SEI

Intelligence (IQ) test scores are indicators of individual differences in maximum performance; that is, they specify what a person *can* do (Ackerman, 1996). By comparison, SEI signify differences in typical performance because they refer to what a person thinks he or she can do and hence, *will* do (Freund & Kasten, 2012). Two meta-analyses reported that IQ scores correlated at about .30 with SEI (Freund & Kasten, 2012; Mabe & West, 1982), suggesting that people have some insight into the rank-order of their IQ score compared with others. At the same time, however, people generally overestimate their IQ with SEI scores being typically 1 Standard Deviation (*SD*; i.e., 115) above people's actual IQ test scores (i.e., 100; Kaufman, 2012). The *above-average-effect* is thought to result from people's need to maintain optimistic self-judgements to lead a productive, happy life in a sometimes uncaring world (Dunning *et al.*, 1989). However, non-motivational factors may also contribute to enhancement biases when people make social comparisons (e.g., Chambers & Windschitl, 2004; Kruger, 1999). The above-average-effect tends to be greater for people of low ability, who may be either unable (i.e., lack of insight) or unwilling (i.e., embarrassment) to acknowledge their mental deficits (e.g., Bailey & Lazar, 1976; Chambers & Windschitl, 2004; Dunning *et al.*, 2003; Kruger & Dunning, 1999). For example, college students with exam scores in the 10th percentile estimated their scores to be in the 60th percentile (Dunning *et al.*, 2003). By comparison, students who scored in the 90th percentile also estimated their scores to be in the 90th percentile (Dunning *et al.*, 2003). While this observation holds across multiple skill domains (e.g., writing ability or humour; Kruger & Dunning, 1999), it has not been explicitly tested with reference to SEI.

Gender and SEI

Across multiple cultures, men tend to report higher SEI than women – a phenomenon which is known as the 'male hubris – female humility' bias (e.g., Kaufman, 2012; von Stumm, Chamorro-Premuzic, & Furnham, 2009; Szymanowicz & Furnham, 2011). Also, children rate their fathers as more intelligent than their mothers (i.e., 124 IQ points compared to 113 IQ points; Furnham, 2001), and parents think their sons are more intelligent than their daughters with (112 IQ points compared to 105 IQ points; Furnham & Gasson, 1998; Furnham, Reeves, & Budhani, 2002). That said, gender differences in SEI distortions are largely independent of actual intelligence or personality differences between men and women (Furnham, 2001; Stieger *et al.*, 2010; Visser *et al.*, 2008) but they seem to be related to gender stereotypes (Rammstedt & Rammsayer, 2000). No previous study addressed if gender differences are related to the assessment method of SEI. It is therefore possible that the gender differences in SEI means reflect gender differences in the approach to different self-assessment methods rather than in how high men and women rate their intelligence on average.

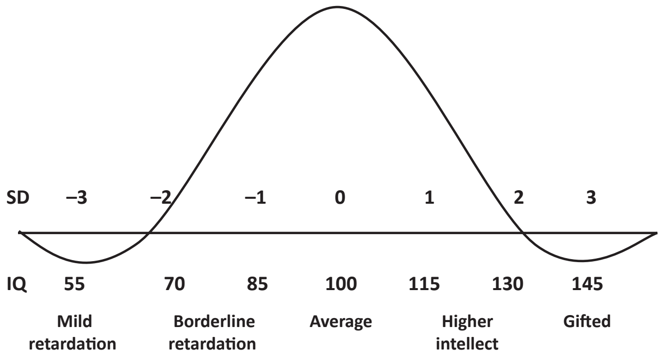

Figure 1. Distal self-estimates of intelligence measure. *Instructions*: The figure [above] shows the normal distribution of IQ scores, with a mean of 100 and a *SD* of 15. Approximately 66% of adults score between 85 and 115 points. A score of 130 indicates superior intelligence and a score of 70 signals borderline mental retardation.

Assessment method

Measurement conditions affect the accuracy of SEI: self-estimates are more distorted if they are based on distal, future task performance than when they refer to a clearly defined, past behaviour (Holling & Preckel, 2005; Mabe & West, 1982). In line with this, Dunning *et al.* (1989) reported that students rated themselves more favourably on a set of positive trait characteristics that were ambiguous (e.g., sophisticated) than they did for more specific characteristics (e.g., tall). Likewise, Chamorro-Premuzic, Furnham, and Moutafi (2004) found that participants' IQ test scores correlated up to .50 with their SEI scores, which they reported 3 months after taking the IQ tests. By comparison, intelligence self-estimates that are made without reference to a specific test performance typically correlate only .30 with IQ scores (Freund & Kasten, 2012; Mabe & West, 1982). Self-estimates of ambiguous traits are particularly prone to distortion, because people may pick and choose from a variety of criteria to derive their self-evaluation (Dunning *et al.*, 1989). Conversely, unambiguous traits have fewer but clearly defined evaluation criteria and thus, corresponding self-assessments tend to be more accurate (Dunning *et al.*, 1989).

In psychological research, SEI is typically assessed by showing participants a graph of an IQ score distribution with descriptive labels for each $\pm SD$ (e.g., 'gifted'). Participants then place themselves along a bell curve and report the corresponding IQ score value (Figure 1). In comparison to this type of distal assessment method, SEI can be more proximally measured by asking participants after they performed in a test or task how well they thought they did (e.g., Dunning *et al.*, 2003). Distal SEI assessments are more ambiguous than proximal SEI. As a consequence, distal SEI are likely to result in greater overestimations, because raters base their evaluation on a multitude of criteria allowing them to achieve a positive self-estimate. By contrast, proximal SEI measures are restricted to a specific test performance, reducing the possibility for favourable interpretations and overestimations. Distal and proximal assessment methods have not been directly compared before (cf. Mabe & West, 1982) but such comparisons are important as research in intelligence-estimates almost exclusively relies on distal SEI measures (Furnham, 2001).

The current study

The current study aimed to jointly investigate the effect of three factors – intelligence, gender, and assessment method (i.e., distal and proximal) – on the accuracy of SEI in a sample of British adults. First, participants completed three IQ tests and then estimated for each of them how well they thought they had done (proximal SEI). Later, they estimated their IQ using a bell curve IQ score distribution (distal SEI, Figure 1; Furnham, 2001). People with low intelligence test scores were hypothesized to overestimate their SEI to a greater extent than people with higher intelligence (see Dunning *et al.*, 2003). Men were anticipated to overestimate their intelligence to a greater extent than women. That said, the effects of intelligence on SEI were expected to remain significant after adjusting for gender, because gender differences in SEI have been shown to be independent of differences in intelligence (e.g., Furnham, 2001; Stieger *et al.*, 2010). Proximal SEI was predicted to be more closely correlated with IQ than distal SEI. No prediction was made about the relationship between gender and assessment method on SEI.

Methods

Sample

Two hundred British people (97 men and 103 women) were recruited with a mean age of 34.6 years (SD = 11.8) and a range of 18–69 years (with 69% aged 40 years and below). As highest obtained educational qualification, 14% had completed General Certificate of Secondary Education, 15% A-levels, 18% a vocational qualification or equivalent, 34% an undergraduate degree, and 19% a post-graduate degree. About half of the sample reported earning <£15.000 per annum, while about 8% declared earning >£35.000 per annum. Data from this sample have been previously reported elsewhere (von Stumm, 2012).

Measures

Intelligence (IQ)

(1) Raven's Progressive Matrices (Set E; Raven, 1968). Twelve items showed grids of 3 rows × 3 columns each with the lower right hand entry missing. Participants chose from eight alternatives the one that completed the 3 × 3 matrix figure. The test was timed at 4 min; (2) Lettersets (Ekstrom, French, & Harman, 1976): Participants identified the mismatching four-letter set, inferring a rule underlying the composition of four other four-letter sets. The test had 15 items and was timed at 6 min; (3) Nonsense syllogisms (Ekstrom *et al.*, 1976): Participants judged if a conclusion that followed two preceding statements (premises) showed good (correct) reasoning or not. The test had 15 items and was timed at 4 min. All IQ tests have been reported to have internal consistency values of .80 and above (Ekstrom *et al.*, 1976; Raven, 1968).

Proximal self-estimated intelligence (proximal SEI)

For each intelligence test, participants rated on a 1–5-point Likert scale from *very poor* to *very well* how well they thought they had done on the test.

Distal self-estimated intelligence (distal SEI)

A bell curve of IQ scores was shown with a mean of 100 and ±3 *SD* of 15 (Figure 1). Participants estimated their IQ with reference to it. An IQ of 55 was labelled as 'mild retardation', an IQ of 75 as 'borderline retardation', an IQ of 100 as 'average ability', an IQ of 115 as 'higher intellect', and an IQ of 145 as 'gifted ability'.

Procedure

Participants were recruited in the London area with online and flyer advertisement. No university students were registered or included in this study. Inclusion criteria were as follows: native English speakers, normal or corrected-to normal vision, hearing, and motor coordination, and having lived in the United Kingdom for at least 10 years. Participants were tested in 2-hr sessions in groups of up to 20 in designated research laboratories under supervision. They first completed the intelligence tests and the proximal SEI ratings. After completing a range of other measures (data not reported here), they completed the distal SEI measure. All participants received monetary compensation (£20 each).

Statistical analysis

A general factor was extracted from the three intelligence tests using principal axis factoring and its regression factor scores were transformed into IQ-like scores with a mean of 100 and a *SD* of 15. Likewise, a general factor of self-rated test performance (proximal SEI) was extracted from the corresponding items and transformed into IQ-like scores. The accuracy of proximal and distal SEI was computed by subtracting the respective SEI score from the IQ scores (cf. Holling & Preckel, 2005). Thus, SEI overestimates were indicated by negative scores, and SEI underestimates by positive scores. In a next step, gender differences in means and variances were estimated for IQ scores, proximal and distal SEI, and the SEI accuracies. Subsequently, the sample was split into IQ quartiles to test if IQ groups differed in their accuracy of proximal and distal SEI using ANOVA. This method was chosen instead of a regression model with an interaction terms because of the interdependence of the dependent and independent variables (i.e., the accuracy of SEI with SEI and IQ). Finally, proximal and distal SEI were adjusted for gender to test to what extent gender differences accounted for the moderation of SEI accuracy by IQ.

Results

A general factor accounted for 60% of the variance in the intelligence tests with factor loadings of .80, .67, and .43 for Raven's matrices, lettersets, and nonsense syllogisms, respectively. Cronbach's alpha for the three tests was .66. Likewise, a general factor of self-rated test performance accounted for 60% of the variance with factor loadings of .73, .66, and .54 for self-rated Raven's matrices, lettersets, and nonsense syllogisms, respectively. The corresponding Cronbach's alpha value was .68. Table 1 shows the descriptives and correlations of all study variables. IQ correlated with proximal SEI at $r = .55$ and with distal SEI at $r = .34$; this difference was significant (Fisher's z for dependent correlations = 2.62; $p = .004$). In turn, proximal and distal SEI were inter-correlated at $r = .40$ ($p < .001$, in all cases). Due to the computation method of accuracies, the latter correlated strongly with IQ (positive) and their respective SEI (negative). The mean of distal SEI was

Table 1. Descriptives and correlations of IQ and SEI measures

		N	*M*	*SD*	1	2	3	4	5	6	7	8	9	10
1	Raven's	200	4.31	2.91										
2	Lettersets	200	7.64	4.07	.54									
3	Syllogisms	200	1.70	4.08	.34	.29								
4	IQ	200	100.00	12.88	.93	.78	.50							
5	Self Raven's	186	2.80	0.92	.49	.31	.17	.48						
6	Self lettersets	200	2.80	1.06	.44	.57	.24	.55	.48					
7	Self syllogisms	199	2.76	0.91	.18	.06	.09	.16	.40	.34				
8	DSEI	176	108.88	15.24	.29	.33	.19	.34	.31	.36	.26			
9	PSEI	186	100.08	12.57	.52	.43	.22	.55	.89	.77	.64	.40		
10	PSEI Acc	186	0.26	12.07	.45	.37	.28	.49	−.42	−.22	−.49	−.03	−.47	
11	DSEI Acc	176	−8.03	16.20	.47	.33	.21	.47	.10	.08	−.12	−.67	.05	.42

Note. Sample sizes vary between $N = 200$ and $N = 175$ after pairwise omission. Correlations above .16 are significant at $p < .05$. IQ = g-factor from three intelligence tests; DSEI = Distal Self-Estimated Intelligence; PSEI = Proximal Self-Estimate of Intelligence; Acc = Accuracy.

Table 2. Gender differences in IQ and SEI measures

	Men			Women				
	N	*M*	*SD*	*N*	*M*	*SD*	L	F
IQ	97	97.73	12.27	103	102.14	13.13	0.18	5.99*
PSEI	88	98.80	11.79	98	101.24	13.18	1.30	1.75
DSEI	84	108.82	16.48	92	108.93	14.10	1.28	0.00
PSEI Acc	88	−.71	12.69	98	1.13	11.48	0.36	1.09
DSEI Acc	84	−10.49	16.51	92	−5.79	15.65	0.20	3.77

Note. L refers to Leven's statistic (homogeneity of variance), and *F* refers to the *F* ratio. For a definition of abbreviations, please see Table 1.
*$p < .05$.

on average 8 points higher than participants' actual IQ scores and their proximal SEI scores, both of which had been normed to have a mean of 100 and a *SD* of 15.

Table 2 shows the gender differences in means and variances for IQ, proximal and distal SEI, and their respective accuracies. Women scored on average significantly higher on IQ than men did ($p < .001$; Table 2). There were no significant gender differences in distal and proximal SEI. Because of the gender differences in actual IQ, men's distal SEI was more inaccurate than women's: the former overestimated their intelligence by almost 10 points, while the latter only did so by about 5 points. However, this difference was only approaching significance ($p = .05$).

There was a significant main effect on distal and proximal SEI, and their accuracies across IQ quartiles ($p < .001$, in all cases; Table 3). Bonferroni *post-hoc* tests showed that distal SEI was significantly lower in the lowest IQ quartile compared with the highest quartile with a difference of almost 13 IQ points ($p < .001$). Proximal SEI differed

Table 3. Means, Standard Deviations, and *F* ratios of SEI across IQ quartiles

IQ Quartiles		1	2	3	4
PSEI	*M*	92.92	96.21	101.02	109.79
	SD	12.72	11.97	9.97	8.74
	F	20.83	19.31*		
DSEI	*M*	103.05	106.33	109.15	115.91
	SD	19.85	13.51	12.56	11.92
	F	6.21	6.18*		

Note. *F* ratios are significant at $p < .001$. For a definition of abbreviations, please see Table 1.
*Adjusted for gender.

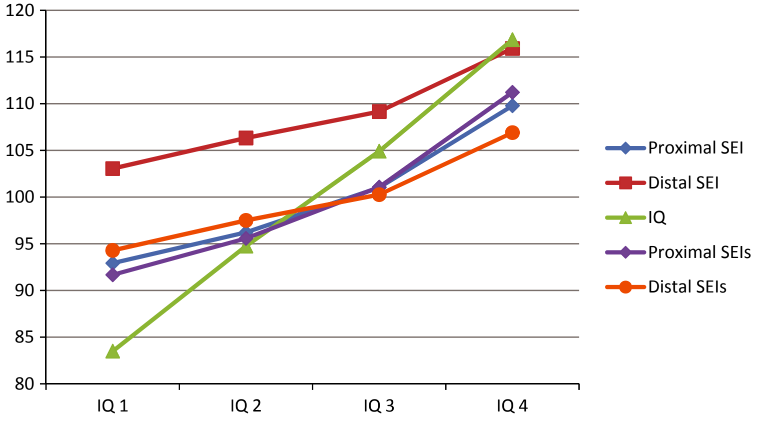

Figure 2. Means of intelligence quotient (IQ) and proximal and distal self-estimates of intelligence (SEI) across IQ quartiles. *Note.* SEIs refers to gender-adjusted SEI.

significantly between the lowest and highest IQ quartile (as well as between the second, third and the highest with $p < .001$ in all cases) with a difference of almost 17 IQ points. The lowest IQ quartile distorted their proximal SEI on average by 9 IQ points and their distal SEI by 20 IQ points (Figure 1). In people with higher IQ, the extent of distortion reduced and even reversed for distal and proximal SEI, with the highest IQ quartile estimating their distal SEI 1 point and their proximal SEI 7 points lower than their actual IQ. After adjusting proximal and distal SEI for gender,[1] the main effects of IQ on SEI remained significant ($p < .001$, in all cases) but the score differences changed. In the lowest IQ quartile, proximal SEI was now distorted by 8 points and distal SEI by 11 points, suggesting that gender notably reduced the IQ-related distortion effects on SEI. Conversely in the highest IQ quartile, distal SEI scores were 10 points and proximal SEI scores were 4 points below the IQ scores (Figure 2). Overall, the adjustment for gender affected the distal SEI estimates more than the proximal ones.

[1] *SEI scores were adjusted by regressing gender, saving standardized residuals and transforming the scores into an IQ-distribution.*

Discussion

The current study explored to what extent individual differences in intelligence, gender, and assessment method affected the accuracy of people's SEI. In particular, it was hypothesized that people of low intelligence would inflate their SEI to a greater extent than people with higher intelligence; that men overestimated their intelligence compared with women; and that estimates of intelligence were more distorted if assessed using a distal (i.e., based on a bell curve IQ score distribution) compared with a proximal measure (i.e., based on prior test performance).

Intelligence and SEI

In line with previous research (Dunning *et al.*, 2003; Kruger & Dunning, 1999), people of low intelligence showed a greater extent of distortion for both proximal and distal SEI. Specifically, people in the lowest IQ quartile overestimated their ability in the proximal measurement condition by 9 IQ points and in the distal condition by even 20 IQ points. Conversely in the highest IQ quartile, both proximal and distal SEI were lower than the groups' actual mean IQ; in fact, they were underestimated by 1 (proximal) and 7 (distal) points (Figure 2). This finding shows that less intelligent people are unaware of their comparatively poor performance, while more intelligent people are more accurate in their self-assessment but underestimate their IQ (see also Moore & Healy, 2008). Dunning *et al.* (2003) suggested that top performers' underestimation has a different source than the overestimation of poor performers: top performers know how well they perform in absolute terms, such as their raw test scores, but they overestimate how well other people are doing on the same test (Fussell & Krauss, 1992). Conversely, poor performers overestimate their intelligence because they 'lack the skills to produce correct answers, [and] they are also cursed with an inability to know when their answers, or anyone else's, are right or wrong' (Dunning *et al.*, 2003, p. 85). Overall, people tend to have imperfect information about their own intelligence and even worse information about others' intelligence (Moore & Healy, 2008).

Gender and SEI

The current study did not find any significant gender differences in the means of distal and proximal SEI, which is in contradiction with most previous research (e.g., Kaufman, 2012; von Stumm *et al.*, 2009; Szymanowicz & Furnham, 2011). However, in the present sample, women scored significantly higher than men on actual IQ and thus, they were by numbers overrepresented in the higher IQ quartiles. In line with this, the extent of distortion in both distal and proximal measurement conditions changed after adjusting for the effect of gender on SEI. In particular, the degree of overestimation in the lowest IQ quartile reduced by half for distal SEI (about 9 points less compared to 20 points before adjustment for gender), while the underestimation of the high IQ group increased 10-fold (Figure 2). As a consequence, distal SEI closely approximated proximal SEI, suggesting that gender differences in SEI distortion occur particularly when using distal assessment. One might speculate that men employ multiple and variable evaluation criteria when estimating their intelligence as an ambiguous, distal trait, allowing them to achieve an overly positive self-judgement compared with women (Dunning *et al.*, 1989). In line with this, evidence for men's hubris and women's humility was more evident in distal but only marginal in the proximal SEI assessments.

Assessment method

Proximal SEI were found to correlate more closely with actual IQ scores than distal SEI, which is in line with previous research (Chamorro-Premuzic *et al.*, 2004). In addition, distortion effects due to IQ and gender differences were more pronounced for distal than proximal SEI scores. Thus, distal SEI measures appear to encourage misestimations of intelligence, while proximal SEI measures seem to constitute fairly accurate indicators of people's intelligence. That said, the majority of SEI research employs distal rather than proximal SEI measurements (Freund & Kasten, 2012), which may explain why SEI have been previously claimed to lack concurrent and predictive validity (cf. Furnham, 2001).

Limitations

This study has some strengths but is also not without weaknesses. First, the study was advertised as an investigation into 'intellectual competence'. Thus, the recruited sample is likely to have a greater interest in intelligence and related measures than the general population, which may have biased the results. Second, distal SEI were assessed towards the end of the testing session, after completing the intelligence tests as well as several other measures. It is therefore possible that participants based their distal SEI ratings to a greater extent on their actual intelligence test performance than it would have been the case if distal SEI were measured prior to administering the intelligence tests. Third, participants may not have correctly interpreted the distal SEI measure (i.e., the bell curve distribution of IQ), although this has not been found to be the case in previous research (e.g., Furnham, 2001). Finally, it is possible that all data are cross-sectional and descriptive and therefore, causalities are inferred but not proven.

Conclusions

The current study highlights that people's distortion of their SEI varies as a function of their intelligence, with top performers underestimating and poor performers overestimating their IQ. Furthermore, distal assessment of SEI encourages a greater level of distortion in estimates of intelligence compared with proximal measures. In this context, men's hubris and women's humility in SEI may be partially due to gender differences in the breadth assessment criteria that they consider when making self-estimates. In other words, men might overestimate their intelligence to a greater extent than women, because they apply less restrictive criteria when evaluating their ability than women do. Overall, the findings suggest that the distal SEI assessment method results in greater gender- and IQ-related distortions of self-estimated intelligence.

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