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Gender, *g*, Gender Identity Concepts, and Self-Constructs as Predictors of the Self-Estimated IQ

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ABSTRACT. In all 102 participants completed 2 intelligence tests, a self-estimated domain-masculine (DMIQ) intelligence rating (which is a composite of self-rated mathematical–logical and spatial intelligence), a measure of self-esteem, and of self-control. The aim was to confirm and extend previous findings about the role of general intelligence and gender identity in self-assessed intelligence. It aimed to examine further correlates of the Hubris-Humility Effect that shows men believe they are more intelligent than women. The DMIQ scores were correlated significantly with gender, psychometrically assessed IQ, and masculinity but not self-esteem or self-control. Stepwise regressions indicated that gender and gender role were the strongest predictors of DMIQ accounting for a third of the variance.

Keywords: gender, *g*, self-control, self-esteem, self-estimated intelligence

This study is concerned with correlates and determinants of self-estimated intelligence (SEI), which is a topic of considerable current interest (Ackerman & Wolman, 2007; Freund & Kasten, 2012; Furnham & Shagabudinova, 2012; Kaufman, 2012; Perez, Gonzales & Beltran, 2010; Stieger et al., 2010).

Over 30 studies that used the multiple, SEI model (Furnham, Clark, & Bailey, 1999; Furnham & Gasson, 1998; Furnham, 2000; Furnham & Bunclark, 2006; Rammstedt & Rammsayer, 2002) have found that gender differences were

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strongest on the mathematical–logical and spatial intelligences, followed by overall (*g*) and then verbal intelligences; with men significantly overestimating, and women significantly underestimating, their abilities relative to each other. This consistent gender difference has been referred to as the Hubris-Humility Effect (HHE; Storek & Furnham, 2012).

A recent meta-analytical study investigating the magnitude of gender differences in mathematical–logical, spatial, overall, and verbal SEI (Szymanowicz & Furnham, 2011), found that the biggest weighted mean effect sizes were for mathematical–logical ($d = .44$), followed by spatial ($d = .43$), overall ($d = .37$), and verbal ($d = .07$) intelligence, with men providing higher estimates in all but verbal intelligence. Mathematical, spatial, and verbal intelligences were the best predictors of self-estimated overall intelligence, which has been demonstrated through numerous multiple regression analyses (Furnham, 2001). Furnham (2000) proposed that people view intelligence as male-normative, as mathematical–logical and spatial intelligences are areas where men are believed to excel.

This particular claim is explored in this study with the concept of the domain-masculine intelligence (DMIQ), a composite of mathematical–logical and spatial intelligences. The concept was first introduced by Storek and Furnham (2012, 2013) who found significant sex differences in both students and members of Mensa. Further, various studies have examined the possibility that it is gender role or orientation, rather than sex per se, that accounts for the HHE but most found much weaker effects for sex role than sex (Storek & Furnham, 2012).

This study aims to validate the previous findings by measuring gender identity concepts (i.e., masculinity and femininity) as well as self-constructs (i.e., self-esteem and self-control) as possible determinants of DMIQ. Self-concept appears to relate to all aspects of self-assessed or estimated traits and abilities. Further, they may have a self-fulfilling developmental consequence such that self-assessments lead to poor performance on tests, which confirm the low self-assessment. Thus, the poorer the self-concept or beliefs about self-control are, the lower the general self-confidence including beliefs about personal cognitive ability and intelligence are. The question is how much variance these self measures account for in DMIQ.

Given past studies it was predicted that HHE would be observed on DMIQ (i.e., men would give higher self-estimates than women [Hypothesis 1]). Gender was expected to influence the relationship between total *g* (i.e., fluid and crystallized psychometric intelligence measures combined and DMIQ [Hypothesis 2]). Men were expected to score higher than women on the intelligence tests used in this study, the Wonderlic Personnel test (WPT; 1992; Hypothesis 3) and the General Knowledge Test (GKT; Irwing, Cammock, & Lynn; Hypothesis 4) both used in many previous studies in this area (Furnham, Moutafi, & Chamorro-Premuzic, 2005).

Gender identity concepts or roles—masculinity and femininity—have also been used in this area (Storek & Furnham, 2012). The present agreement among

researchers is that masculinity and femininity are culturally determined cognitive concepts used by individuals to classify themselves (Bem, 1974, 1981; Lippa, 2001). Laypeople's definitions of masculinity and femininity are broader, incorporating personality traits, social roles, sexuality preferences and physical appearance (Lippa, 2001). Indeed, masculinity and femininity have been shown to correlate with gender role stereotypes (Biernat, 1991; Hirschy & Morris, 2002; Petrides, Furnham, & Martin, 2004; Rudman & Phelan, 2010) and personality traits (Marusic & Bratko, 1998). SEI studies did not include masculinity and femininity in the investigation of gender differences but Furnham and Gasson (1998) proposed that national masculinity scores, as defined by Hofstede (1998), could play role in the SEI gender discrepancy. Likewise, Petrides et al. reported that gender-role stereotypes play role in the way people perceive intelligence, with psychometric intelligence perceived as masculine and emotional intelligence as feminine. While this study uses Bem's masculinity and femininity measure, masculinity was expected to significantly correlate with DMIQ (Hypothesis 5).

Research has demonstrated a link between self-esteem and well-being, with small male advantage (e.g., Kling, Hyde, Showers, & Buswell, 1999). Equally, women have been shown to have better self-control or self-discipline, which leads to superior academic performance, test results, and achievement (Duckworth & Seligman, 2005, 2006). Thus, it seems plausible that high self-esteem and self-control lead to higher self-estimates of ability. Accordingly, self-esteem (Hypothesis 6) and self-control (Hypothesis 7) were expected to correlate with gender and DMIQ. Gender, however, was expected to be the best predictor of DMIQ, that is, that there would be no incremental validity of adding the other variables (intelligence, gender role, self-concepts [Hypothesis 8]; Freund & Kasten, 2012)

Method

Participants

A total of 102 undergraduate students took part in this study. There were 79 women and 23 men. Their age ranged from 17 to 46 years old (M age = 19.46 years, $SD = 4.31$ years) years, and 91% of participants stated to have accomplished A-levels (Grade 12) as their highest educational qualification, 3% stated nonuniversity higher education, 2% stated BA/BSc degree, and 1% stated that they had completed MA/MSc/MBA as their highest educational qualification. A total of 49% of participants described themselves as Caucasian, 22% as Subcontinent Asian, 16% as Far East Asian, 2% as Caribbean, and 1% as African.

Measures

Domain-Masculine Intelligence Type. Based on the self-estimated measure (Furnham & Gasson, 1998) the Domain-Masculine Intelligence Type is a shortened

version with exact same properties and layout, but containing only mathematical and spatial intelligences. The alpha for the Domain-Masculine Intelligence Type in this study was .71 and the interitem correlation (r) was .64.

WPT. This 50-item test can be administered in 12 min and measures general intelligence. Scores can range from 0 to 50. Items include word and number comparisons, disarranged sentences, serial analysis of geometric figures, and story problems that require mathematical and logical solutions, clearly measuring Gc and Gf. The test correlates very highly ($r = .92$) with the Wechsler Adult Intelligence Scale-Revised (WAIS-R; Wonderlic Personnel Test, 1992). The mean for the present study was 25.62 ($SD = 5.63$).

GKT. This 72-item questionnaire is administered in 20 min and assess knowledge of the following areas: literature, general knowledge, science, medicine, games, fashion, and finance. The mean score for the current population was 29.16 ($SD = 10.24$). The questionnaire has satisfactory psychometric properties (Furnham & Chamorro-Premuzic, 2006).

Self-Constructs

Self-Esteem Scale. The Self-Esteem Scale (Rosenberg, 1965) is a 10-item non-timed measure is designed for adults. Items were scored using a 4-point Likert type scale with responses ranging from 1 (*strongly agree*) to 4 (*strongly disagree*), with example questions being “On the whole, I am satisfied with myself,” “I certainly feel useless at times,” and “I wish I could have more respect for myself.” Adequate internal reliability (Cronbach’s $\alpha = .85$) and test–retest reliability (.87) has been reported (Pullman & Allick, 2000). The alpha value in this study was .90 and the interitem correlation (r) was .46.

Brief Self-Control Scale. The Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004) is a 36-item measure is designed for adults, but it is face valid also for adolescents. Items are endorsed on a 5-point Likert-type scale with responses ranging from 1 (*not like me at all*) to 5 (*very much like me*), with sample questions being “I have a hard time breaking bad habits,” “I often act without thinking through all the alternatives,” and “I am good at resisting temptation.” The BSCS is a nontimed measure. Previous studies reported adequate internal reliability (.85) and test–retest reliability (.87). The alpha in this study was .86.

Bem Sex Role Inventory. The Bem Sex Role Inventory (BSRI; Bem, 1981) is a nontimed 60-item measure is designed to measure the orthogonal constructs masculinity and femininity. Each construct is made of 20 items, with the remaining 20-items measuring the gender-neutral or androgynous characteristics; the items are worded as adjectives. Items were scored using a 7-point Likert-type scale

with responses ranging from 1 (*never or almost never true*) and 7 (*almost always true*), with sample characteristics being athletic, sensitive to other's needs, and solemn. The scale has been shown to have satisfactory internal reliability and homogeneity, with alphas of .86 for masculinity and .74 for femininity (Francis & Wilcox, 1998). The alphas for masculinity and femininity in this study were .83 and .75, respectively.

Procedure

Ethical committee approval was sought and given. Participants were tested in exam conditions. It took around an hour to collect all the data. All were later given specific feedback on their scores.

Results

Hubris and Humility Effect and the Domain-Masculine Intelligence Type

An independent t test, $t(100) = -6.29, p = .001$ (two-tailed), confirmed significant differences between men ($M = 120.17, SD = 8.01$) and women ($M = 106.67, SD = 9.34$) in DMIQ. The magnitude of the differences in the means (mean difference = -13.50 , 95% CI [$-17.77, -9.24$]) was large ($\eta^2 = .28$; Hedge's Adjustment $d = 1.54$). Hypothesis 1 was therefore confirmed.

Impact of Gender and Total g on the Domain-Masculine Intelligence Type

The psychometric intelligence measures, the WPT and GKT were combined, creating a new variable Total g . This was done for two reasons: first, the correlation between the measures was high ($r = .55$) and, second, because a total score was probably a better measure of the participants' general intelligence. We treated the data both categorically and dimensionally. First, categorically: Group 1 contained subjects that had the lowest Total g scores ($g < 48.50; n = 33$); Group 2 was made of subject that had average Total g scores ($48.51 < g < 62.00; n = 34$) and Group 3 was made of subjects with highest Total g scores ($g > 62.01; n = 31$)

A two-way between-groups analysis of variance was conducted to explore whether gender influences the relationship between Total g and DMIQ (see Table 1 and Figure 1). Inevitably, because of the number of men, relative to women in this study the cell sizes for men was rather low. The interaction effect between Total g and gender was not significant, $F(2, 92) = .63, p = .53, \eta_p^2 = .01$. The main effect for Total g , $F(2, 92) = 4.97, p < .01, \eta_p^2 = .10$, was significant, with medium effect size. The main effect for gender was also significant, $F(1, 92) = 32.47, p = .00, \eta_p^2 = .26$, with large effect size.

Planned contrasts revealed significant differences between Group 1 and Group 3 (contrast estimate = $-6.85, p < .01$). Post hoc comparisons using Tukey HSD

TABLE 1. Two-Way Analysis of Variance (Total *g* and gender) on DMIQ

Variable	Tot <i>g</i> score	Total		Men		Women		<i>F</i>		
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	Total <i>g</i>	Gender	Tot <i>g</i> × Gender
DMIQ1	G1 (L)	105.23	11.58	113.00	9.08	103.84	11.56	4.97**	32.47***	.63
	G2 (M)	109.90	9.70	121.11	5.88	105.86	7.33			
	G3 (H)	114.47	9.15	123.22	7.56	110.89	7.18			

Note: DMIQ = domain-masculine intelligence type.

* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

and Bonferroni tests indicated that mean scores for Group 1 (≤ 48.50) differed significantly from mean scores for Group 3 ($62.01+$). Results were confirmed by the Ryan-Einot-Gabriel-Welch range test of homogenous subsets. Hypothesis 2 was confirmed.

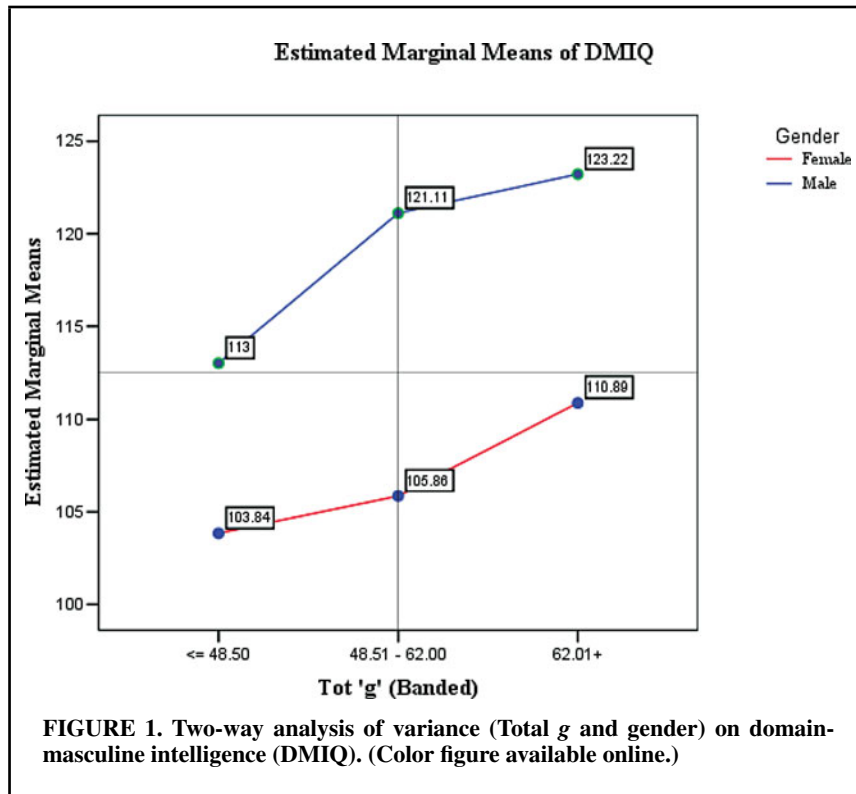


TABLE 2. Independent Samples *t* Tests and Effect Sizes for Two Psychometric Measures

	Men		Women		<i>F</i>	<i>t(df)</i>	Mean difference	95% CI	Effect size	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>					η^2	<i>d</i>
WPT	28.09	4.82	24.90	5.68	1.30	2.45(99)*	-3.19	(-5.78, -0.60)	.06	0.60
GKT	31.74	9.18	28.29	10.46	2.96	1.42(96)*	-8.26	(-8.26, 1.37)	.02	0.35

Note. *d* = Hedge's Adjustment or Cohen's *d* adjusted for sample size. WPT = Wonderlic Personnel Test; GKT = General Knowledge Test.

p* < .05. *p* < .01. ****p* < .001 (two-tailed).

Gender Differences in *g*

Independent samples *t* tests were computed in order to examine whether gender differences occurred on the WPT and GKT. Results are presented in Table 2. Hypotheses 3 and 4 were confirmed.

Gender, *g*, Gender Identity Concepts, and Self-Concept Constructs as Predictors of the Domain-Masculine Intelligence Type

The relationship between DMIQ, gender, *g*, gender identity, and self-concept constructs as well as age was explored. The results of the correlational analysis are presented in Table 3.

TABLE 3. Correlations, Means and Standard Deviations Between DMIQ, Gender, *g*, Gender Identity Concepts, Self-Constructs, and Age

<i>X</i>	Abbreviation	DMIQ	<i>G</i>	WPT	GKT	<i>M</i>	<i>F</i>	SE	SC	<i>A</i>
<i>SD</i>		109.72	1.23	25.62	29.10	4.50	4.89	1.96	3.17	19.46
		10.66	0.42	5.63	10.24	0.68	0.57	0.52	.45	4.31
Domain-masculine IQ	DMIQ									
Gender	<i>G</i>	.53***								
WPT	WPT	.32**	.24*							
GKT	GKT	.32**	.14	.55***						
Masculinity	<i>M</i>	.26*	.32**	-.02	.13					
Femininity	<i>F</i>	-.16	-.40**	-.21*	-.13	-.18				
Self-esteem	SE	-.19	-.28**	.02	-.03	-.27**	.06			
Self-control	SC	-.02	-.14	.11	.07	-.21*	.29*	-.13		
Age	<i>A</i>	.16	-.01	.04	.26*	.07	.13	.09	.21*	

Note. *N* = between 97 and 102. WPT = Wonderlic Personnel Test; GKT = General Knowledge Test.

p* < .05. *p* < .01. ****p* < .001 (two-tailed).

Gender correlated positively ($r = .53, p = .00$), with the DMIQ, with men providing higher scores than women ($M_{\text{Male}} = 120.17, SD_{\text{Male}} = 8.01; M_{\text{Female}} = 106.67, SD_{\text{Female}} = 9.34$). Medium positive relationships were observed between the WPT ($r = .32, p < .01$) and DMIQ as well as between the GKT ($r = .32, p < .01$) and DMIQ. Masculinity ($r = .26, p < .05$), but not femininity ($r = -.16, p = .13$), correlated positively with DMIQ. Negative relationship was observed between self-esteem and gender but no significant relationship was observed between self-esteem and DMIQ. Contrary to prediction, no significant relationships were observed between self-control and gender and DMIQ. Thus, Hypothesis 6 was partially confirmed and Hypothesis 7 was not confirmed.

A mediation analysis was then attempted testing whether sex differences on the DMIQ would be mediated by masculinity and femininity after controlling for the intelligence test scores and self-esteem. This proved nonsignificant.

Despite the age range of participants (29 years) no significant relationship was observed between age and the DMIQ. An independent t test for age was not significant, $t(100) = -0.14, p = .89$. No other significant relationships between DMIQ and the remaining variables were observed.

Gender as the best predictor of Domain-Masculine Intelligence Type

To further investigate whether the correlational patterns differed for men and women, the data was split per gender and the correlations recomputed. Results are presented in Table 4.

TABLE 4. Correlations, Means and Standard Deviations Among DMIQ, g Measures, Gender Identity, Self-Concept Constructs, and Age, by per Gender

Variable	DMIQ Men	DMIQ Women
<i>M</i>	120.17	106.67
<i>SD</i>	8.01	9.34
<i>n</i>	23	79
WPT	.43*	.19
GKT	.49*	.25*
Masculinity	.02	.14
Femininity	.08	.06
Self-esteem	.09	-.08
Self-control	-.05	.10
Age	.10	.21

Note. DMIQ = DMIQ = domain-masculine intelligence type; WPT = Wonderlic Personnel Test; GKT = General Knowledge Test.

* $p < .05$.

For men, a significant positive medium strength relationship was observed between the DMIQ and WPT ($r = .43, p < .05$). A positive medium strength relationship was also observed between the intelligence type and GKT ($r = .49, p < .05$). For women, the only positive medium strength relationship occurred between DMIQ and GKT ($r = .25, p < .05$).

Table 5 shows the results of a hierarchical regression analysis. Gender, *g*, gender identity, and self-construct measures were regressed on DMIQ to ascertain which variable is the best predictor of the intelligence type. Preliminary analyses were conducted to ensure no violation of the assumptions of normality, linearity, multicollinearity, and homoscedasticity.

Gender ($\beta = .53, p = .00, r_{\text{part}} = .53$) was entered in Step 1, explaining 28% of the variance in DMIQ. WPT and GKT were added in Step 2, with gender ($\beta = .48, p = .00, r_{\text{part}} = .47$) being the only significant predictor of DMIQ, explaining 22% of variance. When the gender identity variables (i.e., masculinity and femininity) were added at Step 3, gender ($\beta = .49, p = .00, r_{\text{part}} = .42$) remained the only significant predictor, explaining 18% of variance in DMIQ. None of the remaining predictor variables reached significance. When self-constructs (i.e., self-esteem and self-control) were added at Step 4, gender ($\beta = .48, p = .00, r_{\text{part}} = .40$) accounted for 16% of variance in DMIQ. As in Step 3, none of the remaining entered predictor variables reached significance. The overall regression was significant, $F(7, 85) = 7.04, p = .00, f^2 = .59$, with the overall model explaining 37% of total variance in DMIQ. Hypothesis 5 was not confirmed and Hypothesis 8 was confirmed. Thus, Hypotheses 1, 2, 3, 4, and 8 were confirmed and Hypotheses 5, 6, and 7 were not confirmed.

Discussion

The main focus of this study was to confirm previous and extend findings about the role *g* and gender play in prediction of DMIQ. As in previous studies, the existence of HHE on DMIQ was validated ($\eta^2 = .28, d = 1.54$), further affirming that large gender differences in SEI occur on the numerical-spatial factor (Storek & Furnham, 2012)

Next, the role gender plays in the relationship between *g* and SEI was investigated. Results revealed significant *g* and gender effects, with significant differences in DMIQ self-estimates provided by the lowest and the highest *g* groups. Consistent with previous findings, men provided higher DMIQ estimates on all three ability groups and providing further support for HHE. Men's and women's DMIQ estimates were even more accurate (i.e., lowest DMIQ estimates) were provided by the lowest ability group, medium estimates by the medium group, and highest estimates by the highest ability group. Results confirmed male advantage on WPT and GKT. Correlational results confirmed these findings. The results were in line with existing literature.

TABLE 5. Hierarchical Regression of Gender, *g*, Gender Identity Concepts, and Self-Constructs onto DMIQ

Regression models	Domain-Masculine IQ		
	Standardized β	<i>t</i>	r_{part}
Step 1:			
Gender	.53	6.00***	.53
Regression model ¹		$F(1, 91) = 35.96^{***}$	
R^2		.28	
R^2 Change		.28	
Adj. R^2		.28	
f^2		.39	
Step 2:			
Gender	.48	5.47***	.47
WPT	.09		.86.07
GKT	.20		1.98.17
Regression model ²		$F(3, 89) = 15.96^{***}$	
R^2		.35	
R^2 Change		.07	
Adj. R^2		.33	
f^2		.54	
Step 3:			
Gender	.49	4.92***	.42
WPT	.12	1.15	.10
GKT	.19	1.79	.15
Masculinity	.10	1.06	.09
Femininity	.11	1.13	.10
Regression model ³		$F(5, 87) = 10.05^{***}$	
R^2		.37	
R^2 Change		.02	
Adj. R^2		.33	
f^2		.59	
Step 4:			
Gender	.48	4.65***	.40
WPT	.12	1.19	.10
GKT	.18	1.76	.15
Masculinity	.09	.96	.08
Femininity	.10	1.03	.09
Self-esteem	-.03	-.30	-.03
Self-control	.01	.09	.01
Regression model ⁴		$F(7, 85) = 7.04^{***}$	
R^2		.37	
R^2 Change		.00	
Adj. R^2		.32	
f^2		.59	

Note: Significant values are in bold. DMIQ = DMIQ = domain-masculine intelligence type; WPT = Wonderlic Personnel Test; GKT = General Knowledge Test. Superscript 1–4 refers to corresponding step.

* $p < .05$. ** $p < .01$. *** $p < .001$ (two-tailed).

We also set out to validate that gender is the best predictor of DMIQ. Correlation analysis revealed that in the male subsample, DMIQ correlated with WPT and GKT. However, the female results showed GKT but not WPT significantly correlated with DMIQ. These results therefore show that participants are reasonably aware of their intelligence although it should be pointed out neither of the tests used specifically measure mathematical or spatial intelligence

In disagreement with some the literature in the field (e.g., Duckworth & Seligman, 2005, 2006; Kling et al., 1999), no relationship was observed between gender and self-control. Women had higher self-esteem than men in this sample. Equally, neither self-esteem nor self-control correlated with DMIQ.

The hierarchical regression analysis revealed that gender was the best and only predictor of DMIQ, accounting for 16% of explained variance. Contrary to expectations masculinity did not significantly contribute to DMIQ prediction, nor did self-esteem or self-control. Moreover, with the introduction of gender identity and self-construct variables, the psychometric measures ceased to be the best predictor of DMIQ and gender regained its standing as the best determinant of DMIQ.

Studies in the area of self-estimated intelligence have sought to find other variables than participant gender that may account for significant amounts of the variance. These have included some of variables used in this study like participant intelligence and gender role but also beliefs about intelligence, as well as experience of IQ tests (Furnham & Ward, 2001). We attempted to confirm previous studies but also examine with self-beliefs (self-esteem, self-control) may account for additional variance in self-estimated intelligence. However while the self-measures were related to gender and gender role, so confirming much previous literature, correlations with self-estimated DMIQ and psychometrically assessed IQ were relatively weak.

One interesting issue raised by this study is the change in self-assessment over time and their possible self-fulfilling nature of self-assessed intelligence, particularly DMIQ. Thus low self-confidence specifically with respect to performance on ability tests may lead to lower effort, which results in poor performance so confirming the theory.

The study had several limitations. It would have been better to have a large *N*, particularly of men, and of participants of different ages to explore possible developmental trends. Next, it may have been interesting to get participants to estimate their IQ after, rather before they did the IQ tests as this has been shown to effect scores (Ackerman & Wolman, 2007). In further research in this area it would always be advantageous to get participants to complete a reliable intelligence test so that their estimates could be compared to it. Equally, it would be interesting to replicate these results on a more up-to-date measure of gender identity.

AUTHOR NOTES

Josephine Storek is a consultant in London. **Adrian Furnham** is a professor of psychology at University College London, currently finishing one book on the psychology of money and the other on High Flyers.

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