What Makes You Think You're so Smart?

Measured Abilities, Personality, and Sex Differences in Relation to Self-Estimates of Multiple Intelligences

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Abstract. This study examined the correlates of self-estimated levels of the eight abilities of Gardner's (1983) "multiple intelligences" framework. Participants ($N = 200$) estimated their own levels of the eight abilities, completed two maximum performance tests of each ability, and provided self-ratings of their personality characteristics. As observed in previous research, most participants tended to overestimate their levels of ability in most of the intelligence domains. Self-estimated ability levels were generally only modestly correlated with measured levels of the same ability, and tended to show equally strong correlations with personality variables. Sex differences were observed for self-estimates of some abilities, and these sex differences were largely independent of measured ability and personality. It was concluded that high levels of self-estimated ability were related to being male, having high measured ability, and being high in Conscientiousness, Extraversion, and Openness to Experience, and low in Emotionality.

Keywords: self-estimated intelligence, multiple intelligences, measured intelligence, personality

Introduction

Recently, there has been much research interest in self-estimated levels of the "multiple intelligences" of Gardner's (1999) multiple intelligences theory, which contends that there are at least eight independent ability domains: linguistic, spatial, logical-mathematical, interpersonal, intrapersonal, bodily-kinesthetic, musical, and naturalistic. Previous investigations (e.g., Furnham, Tang, Lester, O'Connor, & Montgomery, 2002) have examined self-estimated abilities in the context of several issues, including sex differences, "above-average" effects, relations with measured abilities, and relations with personality. We examine these same issues in the present study, with the aim of addressing several unresolved research questions.

Sex Differences in Self-Estimated Abilities

Both men and women show an above average effect (Myers, 1998) in the sense that most people of both sexes estimate their own ability levels to be higher than that of the average person. Beyond this overall tendency for people in general to overestimate their levels of ability, investigations have also reported some sex differences in self-estimates of mental abilities. For example, some studies have replicated Hogan's (1978) finding that men's self-estimates of their general intelligence were higher than women's (Bennett, 1996; Furnham & Rawles, 1995). Recent studies have examined self-estimated multiple intelligences in Gardner's framework, and have reported that men's self-estimates of mathematical and spatial abilities have been higher than women's (Furnham, Clark, & Bailey, 1999; Furnham & Ward, 2001; Rammstedt & Rammsayer, 2000). One interpretation of this result is that men, relative to women, may overestimate their own levels of these abilities. However, sex differences favoring men on tests have been observed for those abilities (Halpern, 1997), which suggests that men's self-estimates might not be more inflated than are women's; instead, the sex differences in self-estimates might be a reflection of sex differences in these areas of ability.

Correlations between Self-Estimated and Measured Abilities

When self-estimates of intelligence have been compared with actual test performance, correlations tend to be small but significant (Paulhus, Lysy, & Yik, 1998). Furnham and Fong (2000), for example, reported a mean correlation of .19 between self-rated and measured intelligence. Paulhus et al. (1998) found that participants' self-ratings correlated from .20 to .23 with measured intelligence, and a composite rating scale of four items ("Is intelligent;" "Is smart;" "Is ingenious, a deep thinker;" and "Is not exceptionally gifted at academic things" [reverse-keyed]) correlated with measured intelligence between .24 and .26. The authors concluded that self-report measures were not acceptable substitutes for IQ tests in a college sample, and that even with aggregation, the validity limit seemed to be about .30.

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Other research has employed a different method to examine the relations between self-estimated and measured abilities, by asking participants to provide retrospective estimates of their performance on tests of certain abilities. For example, Chamorro-Premuzic, Furnham, and Moutafi (2004), reported validity correlations of .39 to .49 when participants estimated their own scores on four intelligence tests 3 months following the completion of those tests. (In this study, the 83 student participants were provided with descriptive statistics about each of the tests prior to estimating their own performance.) The results of Chamorro-Premuzic et al., in comparison with those of previous studies of self-estimated abilities, suggest that people are more accurate in estimating their level of ability when the estimate is framed in terms of prior performance on a specific test of the ability.

Still other research has examined the accuracy of self-estimates of more specific aspects of intelligence. Rammstedt and Rammsayer (2002), for example, investigated the comparative accuracy of self-estimates of Thurstone's seven primary mental abilities. Correlations between self-estimated and measured ability ranged from –.04 for perceptual speed to .39 for verbal comprehension. In addition to verbal comprehension, correlations between self-estimates and measured ability were significant for numerical ability (labeled "mathematical intelligence" by Rammstedt and Rammsayer; .35), spatial ability (.27), reasoning (.22), and memory (.15), whereas correlations for verbal fluency (.07) and the aforementioned perceptual speed were nonsignificant. These results indicate that the accuracy of self-estimates of cognitive ability tends to vary widely across different areas of ability. This raises the question of how accurate self-estimates of ability would be for an even broader range of abilities, such as the (partly) noncognitive abilities of Gardner's (1983) multiple intelligences framework. The accuracy of self-estimates of all Gardner's intelligence domains has yet to be empirically studied, perhaps in part because of the lack of standardized psychometric measures for Gardner's eight ability domains.

Personality in Relation to Self-Estimated and Measured Abilities

There is evidence that personality has a stronger relation with self-estimated intelligence than with measured intelligence. Furnham, Moutafi, and Chamorro-Premuzic (2005), for example, reported that NEO-PI-R Agreeableness (–.23) and Neuroticism (–.24) were significantly correlated with self-estimated intelligence but that none of the personality factors were correlated with measured intelligence. These findings were consistent with a previous study (Furnham & Chamorro-Premuzic, 2004) in which NEO-PI-R Neuroticism (–.23) and Agreeableness (–.20) were significantly negatively correlated with self-estimated but not psychometric intelligence.

In the latter two studies, the Openness to Experience factor was uncorrelated with measured intelligence. Other studies, however, have generally supported the notion that Openness to Experience is positively and significantly correlated with intelligence (Ackerman & Heggestad, 1997; Holland, Dollinger, Holland, & McDonald, 1995). Recent studies have clarified the nature of this relationship (Ashton, Lee, Vernon, & Jang, 2000; Bates & Shieles, 2003), by showing that Openness to Experience is substantially associated with crystallized aspects of intelligence (e.g., general knowledge, vocabulary) but not with fluid aspects (e.g., numerical and spatial reasoning).

Sex Differences in Personality

Given that there are some consistent sex differences in measured personality, it is surprising that there has been little research investigating whether sex differences in self-estimated abilities are mediated by personality. In terms of the Big Five or five-factor model framework, the average levels of Neuroticism and of Agreeableness are higher among women than among men, with differences of about half a standard deviation unit in self-reports (see Costa & McCrae, 1992, Tables B-1 & B-3). This pattern of differences is consistent with that observed for the dimensions of the HEXACO model of personality structure (e.g., Lee & Ashton, 2004), in which an Emotionality factor corresponds roughly to a blend of the five-factor model Neuroticism and Agreeableness, and in which an Agreeableness (versus Anger) factor corresponds roughly to a blend of the five-factor model Agreeableness and *low* Neuroticism. Specifically, Lee and Ashton (2004) reported that women averaged about one standard deviation unit higher than did men on the HEXACO Emotionality factor, whereas women and men showed nearly identical means on the HEXACO Agreeableness factor. Also reported by Lee and Ashton (2004) was a sex difference on the Honesty-Humility factor, which has no direct counterpart within the Big Five or five-factor model. Specifically, women averaged more than half a standard deviation higher than did men on the Honesty-Humility dimension.

Given the existence both of links between personality and self-estimated intelligence and also of sex differences in some aspects of personality, the question arises as to whether the observed sex differences in self-estimated intelligence are mediated, at least in part, by personality. The finding that self-estimated intelligence is negatively associated with the same dimensions that show sex differences in personality–specifically, the Big Five or five-factor model Agreeableness and Neuroticism dimensions–suggests that such mediation is plausible. However, some initial evidence on this question suggests that personality does not fully account for sex differences in self-estimated abilities: Furnham and Buchanan (2005) found that participant sex contributed independently to the prediction of self-estimat-

ed ability, beyond the contribution of personality characteristics.

Thus, to the extent that sex differences are observed in self-estimated abilities, these sex differences may be attributable to differences between men and women in personality characteristics, in addition to any differences between men and women in measured abilities. One aim of this study was to examine whether sex differences in self-estimated multiple intelligences would remain when personality and measured ability were taken into account.

The Current Study

The current study was designed to address several gaps in the literature on self-estimated multiple intelligences. Most prominent among these is that, despite an abundance of investigations of this topic, none of these studies has included participants' scores on maximum performance measures of all of the "intelligences." Toward this end, we obtained not only participants' self-estimates for Gardner's eight domains and for overall intelligence, but also their scores on tests of the abilities within each domain. The inclusion of these variables allowed us to address our main research question, specifically: To what extent can self-estimated abilities be predicted by measured abilities, by personality characteristics, and by participant sex? In relation to this question, we were also interested in determining (1) the relative importance of measured ability and of personality in predicting self-estimated ability and (2) the extent to which participant sex would be associated with self-estimated ability, beyond the influence of measured ability and of personality.

Method

Participants

The 200 participants of this study (116 women, 84 men) took part in an empirical investigation of Gardner's multiple intelligences theory (Visser, Ashton, & Vernon, 2006). The participants ranged in age from 17 to 66 years (M = 22.73, SD = 6.14), although most (171 = 85.5%) were aged 25 or under, and all spoke English as a first or best language. Participants were recruited through posters and classroom presentations in diverse faculties and departments at two universities. A total of 171 participants were undergraduate students, and the other participants were graduate students; nonstudent members of the university community; or friends, relatives, or romantic partners of students. Participants were paid $30 for completing the study.

Measures

Demographic Information

Participants indicated their age, sex, and (if a student) information about their current academic specialization and performance.

Self-Estimated Ability

Self-estimated ability was measured with a self-rating scale. Participants rated their relative ability on each of nine items, which represented Gardner's eight ability domains as well as overall intelligence. The items were written to correspond closely to the definitions of Gardner's domains as well as to the content of the tests intended to assess those domains. (For example, the item for musical ability is "Natural sense of musical pitch and rhythm"). For each item, participants were instructed to compare themselves with other university students at their own institution by placing an *x* on a line, anchored by 0% and 100%, to estimate what percentage of students had a lower level of ability than the participant. The score on this measure was the percentile ranking that participants assigned themselves. Note that the use of "university students" as the reference group for eliciting self-estimates allows straightforward interpretation of the mean self-estimates across the entire sample: These self-estimates can be interpreted as overestimates if above the 50th percentile, or as underestimates if below the 50th percentile. In contrast, these interpretations would not apply if the general population were used as the reference group, given that university students are, in fact, substantially above the population mean in cognitive ability.

Measured Ability

Listed below are the tests used to measure each of the ability domains. For detailed information about the ability tests, see Visser et al. (2006). Note that to derive one ability score for each domain, standardized scores were calculated for each ability test, and the two tests within each domain were averaged.

Two Educational Testing Service (ETS; Ekstrom, French, Harman, & Derman, 1999) tests assessed linguistic intelligence: the Advanced Vocabulary Test II assessed verbal comprehension, and the Opposites Test assessed associational fluency by requiring participants to generate words that are opposite or nearly opposite in meaning to eight target words. Each of the two tests had a split-half reliability in this sample of .67, and scores on the two linguistic tests correlated .55.

The two tests of spatial ability were the ETS Map Planning Test (a measure of spatial scanning) and the ETS Paper Folding Test (a measure of the ability to make serial mental rotations of spatial stimuli). The split-half reliabilities of

the tests were .80 and .76 respectively, and the two tests correlated .46.

For the logical-mathematical domain, we used the ETS Subtraction and Multiplication Test (a measure of the ability to perform basic arithmetic operations with speed and accuracy), and the ETS Necessary Arithmetic Operations Test (a measure of general arithmetic reasoning). The split-half reliabilities of the tests were .94 and .81 respectively, and scores on the two tests correlated .32.

For interpersonal ability, the two tests were Social Translations (O'Sullivan & Guilford, 1965b) and Cartoon Predictions (O'Sullivan & Guilford, 1965a). Social Translations is a test of the ability to recognize changes in behavioral meaning. Participants choose one of three pairs of people with which the same verbal statement would have a different meaning. (For example, "Take this" said by a doctor to a patient is different from the same phrase when said by a fighter to an opponent.) Cartoon Predictions, a 10-min test of 30 items, measures the ability to predict social consequences. Participants view a target cartoon, then choose one of three related cartoons to indicate which would most logically happen next. The split-half reliabilities of these two interpersonal tests were .90 and .45 respectively, and the two interpersonal test scores correlated .28.

One test of intrapersonal ability was consistency, a measure of the consistency of personality self-descriptions. This score was calculated from the self-ratings on a series of personality-descriptive adjectives (see Personality subsection below). Specifically, we calculated the standard deviation of each participant's responses to the adjectives belonging to the same personality factor, and then averaged those within-person standard deviations across the six factors. This index is assumed to reflect intrapersonal intelligence to the extent that participants with high intrapersonal intelligence would tend to rate themselves consistently within each personality factor. The second intrapersonal measure was an accuracy coefficient, which reflected how closely participants' self-ratings in each ability domain matched their actual performance. A within-person correlation between self-estimated ability and actual ability was calculated across the eight abilities after conversion of self-estimated percentile ranks to standard scores. The split-half reliability of consistency was .53, but split-half reliability cannot be calculated for the accuracy measure. The two intrapersonal tests were uncorrelated ($r = .01$).

The two tests of naturalistic ability were ETS Making Groups (Ekstrom et al., 1999), a test of the ability to combine objects into logical groups, and ETS Diagramming Relationships (Ekstrom et al., 1999), a test of the ability to diagram relationships among objects. These classification and categorization tasks assess the core capacities of the naturalistic domain as conceptualized by Gardner (1999). The split-half reliabilities for the two tests were .79 and .82, respectively, and scores on the two tests correlated .42.

For the bodily-kinesthetic domain, tests of both fine and gross motor skills were used in order to represent the domain as Gardner conceptualized it. The Stork Stand (Johnson & Nelson, 1986), a test of balance, was chosen to represent gross motor ability, because it is a key element in assessing potential in gymnastics, diving, skating, and many other athletic activities. The General Aptitude Test Battery (GATB; US Department of Labor, 1970) Mark Making test was used to measure fine motor ability. The split-half reliabilities for the two tests were .92 and .93, respectively, and the two tests correlated .13. The weak within-domain correlations of the bodily-kinesthetic and intrapersonal tests will be addressed in the Discussion section below.

For the musical domain, we used GIA Publications' Advanced Measures of Music Audiation (AMMA; Gordon, 1989). For each item, the participant must decide whether two musical statements are the same, tonally different, or rhythmically different. Tonal and rhythm scores were calculated. For the purposes of all analyses in the current study, only the first half of the rhythm test and the second half of the tonal test were used; this corrects for the fact that tonal and rhythm total scores were artificially correlated because of overlapping content in incorrect responses. The split-half reliabilities of tonal and rhythm were .17 and .28 respectively, and scores on the two tests correlated .19. (The low reliability of the musical tests will be addressed in the Discussion section below.)

The Wonderlic Personnel Test (WPT; Wonderlic, 2002) Form A, a 50-item, 12-min omnibus test, was used as a measure of overall intelligence. The internal consistency reliability (coefficient Cronbach's α) of the WPT in this sample was .80.

Personality

We assessed self-rated personality with a list of 48 adjectives related to the six personality factors of Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness to Experience. The selected adjectives were among those found to be very highly loaded on these six personality factors in an English-language lexical study of personality structure (Ashton, Lee, & Goldberg, 2004). (Note that the Agreeableness and Emotionality factors as obtained in that lexical study, and in similar investigations of various other languages, roughly represent rotated versions of the traditional Big Five Agreeableness and Emotional Stability factors.) For five of the personality scales, four of the eight adjectives were reverse-keyed (e.g., "unimaginative" for Openness to Experience), but for the Honesty-Humility scale, all eight adjectives were reverse-keyed (e.g., "pompous"). For each adjective, participants rated themselves on a scale from 1 (*extremely inaccurate*) to 9 (*extremely accurate*). A composite score was calculated for each personality factor by averaging the self-ratings on the eight relevant adjectives. The internal-consistency reliabilities of the six personality factors ranged from .66 (Openness to Experience) to .86 (Extraversion) with a mean of .76.

Table 1. Means, standard deviations, and sex differences for self-estimated multiple intelligences and *g*

Intelligence domain	Mean all	(*SD*)	Mean female	(*SD*)	Female 50th perc. *t*	Mean male	(*SD*)	Male 50th perc. *t*	Male vs. female *t*	*d*
Linguistic	67.61	(18.85)	67.51	(18.22)	10.35***	67.74	(19.80)	8.21***	.09	.01
Spatial	61.33	(21.17)	57.61	(20.78)	3.95***	66.47	(20.73)	7.28***	2.98**	.42
Logical-mathematical	55.34	(24.17)	49.88	(23.44)	–.55	62.89	(23.25)	5.08***	3.89***	.55
Interpersonal	70.06	(17.32)	71.88	(14.81)	15.91***	67.55	(20.10)	8.00***	–1.76	–.25
Intrapersonal	71.75	(18.59)	72.42	(17.04)	14.17***	70.83	(20.60)	9.27***	– .59	–.08
Naturalistic	60.99	(20.24)	60.92	(20.21)	5.82***	61.09	(20.41)	4.98***	.06	.01
Bodily-kinesthetic	64.21	(21.61)	60.19	(22.46)	4.89***	69.76	(19.15)	9.46***	3.16**	.45
Musical	54.38	(24.46)	52.40	(25.82)	1.00	57.12	(22.32)	2.92**	1.38	.20
Overall	69.77	(17.11)	67.64	(16.81)	11.30***	72.71	(17.17)	12.13***	2.09*	.30
General SEA	.00	(.90)	–.08	(.85)	N/A	.11	(.97)	N/A	1.48	.21

Note. Overall = Overall intelligence; General SEA = general self-estimated ability factor from factor analysis. For all domains except general SEA, values are self-estimated percentile ranks. For general SEA, values reported here are factor scores computed from estimates on the eight specific domains (i.e., excluding Overall). $N = 200$. $^{*}p < .05$. $^{**}p < .01$ $^{***}p < .001$, two-tailed.

Procedure

Participants who met the inclusion criterion were tested in groups of 2 to 36 in various meeting rooms on a university campus. All participants were given information letters as well as an oral description of procedures prior to providing signed informed consent. The testing session took place over a 2.5- to 3-h period, with a 10-min break at approximately the halfway point, following completion of the music test.

Results

Descriptive Statistics

Descriptive statistics for the separate tests within each ability domain are reported in Visser et al. (2006). Note, however, that the descriptive statistics for the WPT in this sample ($M = 26.62$, $SD = 5.85$) indicate that the distribution of mental ability levels is similar to that of other college student samples (e.g., Wonderlic, 2002), with a mean that is almost one standard deviation above that of normative samples drawn from the general population. The mean Wonderlic score for male participants ($M = 27.31$, $SD = 5.85$) was not significantly different from that for female participants ($M = 26.08$, $SD = 5.86$), $d = .21$, $t = 1.48$, $p = .14$.

Descriptive statistics for the self-estimates of abilities are presented in Table 1. For the personality items, which were rated on a 9-point Likert scale, participants rated themselves highest, on average, on adjectives related to the Openness to Experience factor ($M = 6.75$, $SD = .98$) and lowest on Agreeableness ($M = 5.85$, $SD = 1.20$).

Self-Estimated Abilities: Above-Average Effect and Sex Differences

Table 1 shows that, on average, participants rated themselves as above the 50th percentile of the university student distribution in every ability domain, a result that is consistent with the above-average effect reported in previous research. Recall that the participants were providing self-estimates in comparison with other university students; therefore, the finding that participants tended to rate themselves as above average in these abilities suggests that the participants tended to overestimate their abilities. (If instead the self-estimates had been elicited with reference to the general population as the comparison group, then the finding of mean self-estimates above the 50th percentile could have been attributable to accurate perceptions of above-average levels of ability.) Participants rated themselves highest in intrapersonal (mean self-estimated percentile = 72) and interpersonal (70) abilities and lowest in the musical (54) and logical-mathematical (55) domains. Consistent with findings from previous research, men's self-estimates were significantly higher than women's in the bodily-kinesthetic, logical-mathematical, spatial, and overall intelligence domains, although the effect sizes were not large.

Sex Differences in Measured Abilities

With regard to measured abilities, there were statistically modest but significant sex differences in only two of the ability domains. Women scored somewhat higher than did men on the interpersonal tests ($d = –.31$, $t = –2.17$, $p < .05$), whereas men scored somewhat higher than did women in the logical-mathematical domain ($d = .35$, $t = 2.45$, $p < .05$). Sex differences in all other measured abilities (including the general factor and the WPT) were less than one-quarter of a standard deviation unit in size.

Correlations Among Self-Estimated Abilities and Among Measured Abilities

Correlations among the ability self-estimates ranged from .09 (musical and naturalistic) to .62 (linguistic and overall intelligence). All pairs of self-estimated abilities, with the exceptions of musical with naturalistic and with logical-mathematical, were correlated .20 or greater, suggesting that most people report somewhat consistent levels of ability across domains.

Factor analysis of the eight ability self-estimates (i.e., excluding self-estimated overall intelligence) using principal axis factoring yielded a substantial general factor (see Table 2), with loadings ranging from .34 (musical) to .68 (spatial).

A similar analysis was undertaken with measured ability, in that the averaged test scores for Gardner's eight domains (but not the WPT measure of overall intelligence) were factor-analyzed using principal axis factoring (Table 2). Again, a substantial general factor emerged, with loadings ranging from .09 (bodily-kinesthetic) to .82 (naturalistic).[1]

Scores on the self-estimate general factor and the measured ability general factor were saved as new variables. The self-estimate general factor (as derived from self-estimates on the eight specific domains) correlated .71 with the single item assessing self-estimated overall intelligence. Similarly, the measured ability general factor (as derived from measured abilities in the eight specific domains) correlated .72 with the WPT, the single-test measure of overall intelligence.

Table 2. Loadings of self-estimated and measured abilities on first unrotated factors

Intelligence Domain	Self-estimated Ability loadings	Measured Ability loadings
Linguistic	.63	.54
Spatial	.68	.59
Logical-mathematical	.54	.53
Interpersonal	.67	.55
Intrapersonal	.60	.33
Naturalistic	.59	.82
Bodily-kinesthetic	.59	.09
Musical	.34	.17

Note. N = 200. For each method of assessing abilities, loadings are derived from the first unrotated factor (of a one-factor solution) extracted from all eight domains. Analyses were performed separately for self-estimated abilities and for measured abilities.

Correlations Between Self-Estimated Abilities and Measured Abilities

To determine the extent to which individual differences in self-estimated abilities correspond to individual differences in actual measured abilities, we calculated correlations between self-estimates and performance in ability domains. As seen in Table 3, self-estimates of abilities showed substantial correlations with test performance in some, but not all, domains. Self-estimated linguistic and logical-mathe-

Table 3. Prediction of self-estimated abilities by measured abilities, personality dimensions, and participant sex

Self-estimated ability	Measured ability	H	E	X	A	C	O	Sex	*R*	*R*adj
Linguistic	.31 (.21)	–.03 (–.06)	–.13 (–.19)	.17 (.13)	.05 (.02)	.17 (.14)	.35 (.23)	.01 (–.04)	.49	.46
Spatial	.05 (.03)	–.06 (–.06)	–.11 (–.10)	.13 (.10)	.12 (.10)	.20 (.16)	.27 (.23)	.21 (.17)	.43	.38
Logical-mathematical	.38 (.31)	–.12(–.04)	–.28 (–.20)	–.03 (.01)	.02 (–.01)	.23 (.27)	.00 (.03)	.27 (.13)	.54	.51
Interpersonal	.16 (.09)	.02 (–.06)	.05 (–.07)	.28 (.20)	.10 (.07)	.24 (.16)	.32 (.22)	–.12 (–.09)	.45	.41
Intrapersonal	–.10 (–.04)	.03 (.00)	–.11 (–.22)	.14 (.08)	.08 (.03)	.36 (.34)	.17 (.11)	–.04 (–.08)	.45	.41
Naturalistic	–.01 (–.03)	–.02 (–.01)	–.07 (–.11)	.08 (.05)	–.01 (–.02)	.14 (.13)	.12 (.11)	.00 (–.02)	.21	.08
Bodily-kinesthetic	.20 (.20)	–.11 (–.10)	–.19 (–.14)	.21 (.24)	.17 (.21)	.12 (.10)	.06 (.02)	.22 (.17)	.48	.44
Musical	.25 (.23)	–.06 (–.08)	.07 (.08)	.11 (.10)	.08 (.08)	.08 (.03)	.12 (.07)	.10 (.12)	.33	.27
Overall	.20 (.16)	–.01 (.07)	–.16 (–.16)	.09 (.05)	–.07 (–.14)	.22 (.21)	.26 (.23)	.15 (.10)	.46	.42
General	.08 (.01)	–.06 (–.07)	–.15 (–.20)	.22 (.17)	.12 (.10)	.30 (.26)	.30 (.24)	.10 (.06)	.51	.47

Note. N = 200. Measured Ability refers to the ability indicated under the Self-Estimated Ability column. Sex is coded as women = 0, men = 1. Values not in parentheses are zero-order correlations; values in parentheses are semipartial correlations from regression equation that includes all other predictors. H = Honesty-Humility; E = Emotionality; X = Extraversion; A = Agreeableness; C = Conscientiousness; O = Openness to Experience. See text for description of Overall and General abilities. Correlations with absolute values exceeding .14 and .18 are significant at $p < .05$ and $p < .01$, respectively.

[1] With regard to solutions involving additional factors, there were some similarities between the self-estimated and measured ability variable sets in their respective two- and three-factor solutions (using promax or varimax rotations). Both two-factor solutions showed a division between linguistic and interpersonal abilities, on one hand, and spatial and logical-mathematical abilities, on the other hand. Both three-factor solutions added a new factor defined mainly by bodily-kinesthetic and musical abilities. Note that we used common factor analysis (specifically, principal axis factoring) rather than principal components analysis, to avoid the inflation of loadings on the first unrotated factor that occurs when principal components analysis is used (see, e.g., Jensen & Weng, 1994).

matical abilities had the highest correlations with measured abilities at .31 and .38, respectively. In contrast, self-estimates of spatial, naturalistic, and intrapersonal abilities were roughly uncorrelated with performance on corresponding tests of ability. Self-estimated bodily-kinesthetic ability was correlated .20 with measured bodily-kinesthetic ability. Interestingly, this result conceals the rather different correlations of this self-estimate with performance on the two bodily-kinesthetic subtests. Self-estimated bodily-kinesthetic ability was uncorrelated with performance on the fine motor skills task (Mark Making; $r = .00$) but substantially correlated with performance on the gross motor skills task (Stork Stand; $r = .31$). The self-estimate general factor was uncorrelated ($r = .08$) with the measured ability general factor. Self-estimated overall intelligence was significantly correlated with the WPT ($r = .20$), consistent with the .20 to .23 range reported by Paulhus et al. (1998).

Personality: Sex Differences and Relations with Measured and Self-Estimated Abilities

There were significant sex differences in three of the six personality factors, with women having significantly higher levels of self-reported Extraversion ($d = –.28$, $t = –1.98$, $p = .05$), Honesty/Humility ($d = –.48$, $t = –3.38$, $p < .001$), and Emotionality ($d = –.84$, $t = –5.90$, $p < .001$). The latter two differences were hypothesized, whereas women's higher self-reported Extraversion was not.

The personality variables generally showed only weak relations with measured abilities. Neither the Extraversion nor the Agreeableness factors yielded any statistically significant associations with any of the ability tests. Honesty-Humility and Emotionality both showed weak negative correlations with spatial ability ($r = –.17$, $p < .05$, and $r = –.21$, $p < .01$, respectively), and Emotionality also correlated negatively (but weakly) with WPT scores ($r = –.16$, $p < .01$). Conscientiousness had a weak negative correlation with intrapersonal ability ($r = –.18$, $p < .05$). Openness to Experience produced the greatest number of significant associations with measured abilities, correlating positively with linguistic ($r = .34$, $p < .001$), interpersonal ($r = .21$, $p < .01$), and naturalistic ($r = .15$, $p < .05$) abilities, and also with the general factor derived from the specific abilities ($r = .16$, $p < .05$).

In contrast to the relations between personality characteristics and measured abilities as described above, there were many significant associations between personality characteristics and self-estimated abilities. As seen in Table 3, Emotionality was negatively correlated with self-estimated overall intelligence and with self-estimated logical-mathematical and bodily-kinesthetic abilities. Extraversion was positively correlated with self-estimated interpersonal, bodily/kinesthetic, and linguistic abilities. Agreeableness was positively correlated with self-estimated bodily-kinesthetic ability. Conscientiousness was positively correlated with self-estimated overall intelligence and linguistic, spatial, logical-mathematical, interpersonal, and intrapersonal abilities. Openness to Experience was positively correlated with self-estimated overall intelligence and linguistic, spatial, interpersonal, and intrapersonal abilities.

Prediction of Self-Estimated Abilities by Measured Abilities, Personality Characteristics, and Participant Sex

We next conducted a series of regression equations in which each self-estimated ability was predicted simultaneously by measured ability in the corresponding domain, by the six personality scales, and by participant sex. The results of these analyses (see Table 3) showed that self-estimated naturalistic and musical abilities were only weakly predicted ($R = .21$ and $R = .33$, respectively), but that self-estimates of the remaining abilities were moderately well predicted by measured abilities, personality, and participant sex (all Rs between .43 and .54).

The results of Table 3 also indicate the relative importance of measured ability and of personality characteristics in predicting self-estimated abilities. As can be seen from the pattern of semipartial correlations, the personality variables were generally at least as important as the measured abilities in predicting most of the self-estimated abilities. Of particular interest were the findings involving self-estimated overall intelligence and the general factor derived from the ability self-estimates. Specifically, the personality variables of Conscientiousness and Openness to Experience yielded higher semipartial correlations with the self-estimated ability variables than did the measured ability variables.

Finally, the results of Table 3 also indicate that participant sex showed modest independent associations with several self-estimated abilities, beyond the influence of personality characteristics and self-estimated abilities. As seen in the table, participant sex yielded significant semipartial correlations with self-estimated spatial and bodily-kinesthetic abilities and also with self-estimated logical-mathematical ability, although in the latter case the semipartial correlation was noticeably lower than the corresponding zero-order correlation. Thus, the tendency for men to give higher self-estimates than do women for these ability domains cannot be attributed to sex differences in measured abilities or in personality characteristics, although these do partly explain the sex difference in self-estimated logical-mathematical ability.

Discussion

In the present study, we examined participants' levels of self-estimated abilities in the eight "intelligences" proposed by Gardner, and we investigated the relations of those self-estimates with measured levels of the corre-

sponding abilities, with personality characteristics, and with participant sex. Our results indicated that participants tended to overestimate their levels of ability somewhat, at least within some of the intelligence domains. Also, self-estimated abilities were generally only modestly associated with measured abilities, and were also associated with personality characteristics independently of measured abilities. Men tended to give higher self-estimates of ability in some of the intelligence domains than did women, and these sex differences in self-estimates were largely independent of the modest sex differences that were also observed in some measured abilities and in some personality characteristics. Below, we discuss several implications of these results, as well as some limitations of the present research.

Reliability and Domain Coherence

Several of the ability tests showed low levels of reliability in the present sample, and this will likely have limited the correlations involving the "intelligences" measured by those tests (see discussion in Visser et al., 2006). In particular, the two musical tests showed very poor reliability (an unexpected result given the high split-half reliability, exceeding .80, cited in the test manual). This low reliability may well have limited the extent to which measured musical ability would be able to predict self-estimated musical intelligence, although the correlation between self-estimated and measured ability was nevertheless higher for the musical domain than for all but two of the other domains.

There was also a rather low level of reliability for the consistency test, which was a first attempt to measure intrapersonal intelligence via an index of the coherence of personality self-descriptions. Future refinements of this test should be aimed at improving its reliability; alternatively, intrapersonal (and interpersonal) intelligence might be assessed using a measure of emotional intelligence such as the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT; Mayer, Salovey, & Caruso, 2002).

In addition, it should be noted that there was little coherence between the two ability tests within two domains: intrapersonal and bodily-kinesthetic. Within the intrapersonal domain, consistency of self-description and within-person accuracy of self-estimates were uncorrelated, and within the bodily-kinesthetic domain, performances on fine-motor and gross-motor tasks were only weakly correlated. Nevertheless, the content of these tests was consistent with Gardner's description of the relevant domains. For example, Gardner clearly included tasks such as sculpting and crafting as well as dancing and playing sports in his bodily-kinesthetic domain. Thus, the low correlations between gross and fine motor skills appear to reflect the inherent heterogeneity of this proposed domain rather than any inadequate sampling of that domain.

As noted above, the relatively poor reliability and within-domain coherence of the ability tests may have limited their relations with self-estimated abilities. However, we should note that the main pattern of results from this study also holds even if we consider only the results obtained from relatively coherent domains, in which both tests had at least minimally acceptable reliability and intercorrelations (linguistic, logical-mathematical, spatial, naturalistic, and overall intelligence [WPT]). That is, in some domains, self-estimated ability correlated modestly with measured ability (linguistic, logical-mathematical) and in other domains, self-estimated ability was uncorrelated with performance (spatial, naturalistic).

Accuracy of Self-Estimates of Ability

Recall that self-estimates of ability were elicited in this study by asking participants to estimate their own level of ability in relation to the percentile distribution of their fellow university students. The main advantage of using this comparison group is that the resulting self-estimates will provide an accurate indication of the extent to which participants in general tend to overestimate or underestimate their levels of ability. If we had instead asked the participants to use the general population as the reference group, then even a finding of sample mean self-estimates far above the 50th percentile would not necessarily have indicated overestimation of ability levels, because university students are, in fact, well above the general population median in levels of cognitive abilities. However, the results of this study showed that even though we did use university students as the comparison group, the sample mean self-estimates reached or exceeded the 60th percentile for all ability domains except logical-mathematical and musical. Thus, our participant sample did show the above-average effect.

The above-average effect observed in this study was generally stronger for men than for women. Men's self-estimates of their abilities were significantly higher than women's in three of the eight domains (logical-mathematical, bodily-kinesthetic, and spatial) and in overall intelligence. These sex differences in self-estimated abilities were, to a considerable extent, independent of any sex differences in measured ability (which were small) and any sex differences in personality (which were larger). Given that both men and women tended to estimate their own abilities as above average, these results indicate that women were more accurate in their estimates than were men, in the sense of showing a smaller degree of overestimation.

With regard to the relations between self-estimated and measured abilities, the results of this study are comparable with those of previous research. For example, Paulhus et al. (1998) found that self-report measures, even with aggregation, did not exceed .30 in correlations with measured intelligence. In the current study, correlations between self-estimated and measured abilities slightly exceeded Paulhus et al.'s .30 maximum for only two domains, logical-mathematical and linguistic. In general, self-estimates of ability did not provide accurate indications of measured levels of

ability, suggesting that people are not accurate in judging their own competence, relative to that of other people, within most domains.

We should note that the use of different methods of obtaining self-estimates of ability might yield different results from those observed here. For example, the accuracy of ability estimates would likely be substantially increased by having participants estimate their own *scores* on a specific test of ability that they have completed (Furnham & Buchanan, 2005). Results might also differ if self-estimates were elicited, not in relation to simple percentiles, but instead in relation to more detailed distributional descriptions: For example, Furnham and Buchanan (2005) provided participants with an image of the normal distribution of IQ scores and indicated standard deviations and categories (e.g., average, gifted). It is unclear to what extent the different methods of obtaining self-estimates will yield similar results, although the current study found sex differences and above-average estimates that are consistent with the existing literature.

What Makes People Think They're Smart?

The current study investigated the relative contributions of measured ability, personality, and sex in predicting individuals' estimations of their own levels of Gardner's multiple intelligences as well as overall intelligence. The results suggest that these predictors, even in combination, can only partially explain individual differences in self-estimates of these abilities. In general, there was some tendency for higher levels of self-estimated ability or of "thinking one is smart" to be associated with Conscientiousness, of Openness to Experience, Extraversion, and (low) Emotionality, with measured ability, and with being male. However, much of the variation in self-estimated abilities remained unexplained by these basic individual difference variables. Future research on the bases of self-estimated abilities might, therefore, focus on variables that might be more proximal predictors, such as interests, self-concepts, and prior experience in the various domains.

Conclusions

The major findings of this study can be summarized as follows. First, both men and women overestimated their abilities in some but not in all domains, but men showed greater overestimation than did women. These sex differences in self-estimated abilities were not accounted for by measured ability or by personality. In general, high levels of self-estimated ability in a given domain were associated modestly with Conscientiousness, Openness to Experience, Extraversion, and (low) Emotionality, with measured ability in the same domain, and with being male. Furthermore, despite the limited role that is accorded to the general factor in multiple intelligences theory, we found a large general factor in analyses both of measured abilities and also of self-estimated abilities. However, the measured ability factor, interpretable as *g* (see Visser et al., 2006), was nearly uncorrelated with the self-estimated ability factor. Future research could further develop reliable and valid tests of Gardner's intelligences, and also explore additional predictors (e.g., interests, self-concept, etc.) to answer more fully the question of what makes people think they're smart.

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