

# Why Can't a Man Be More Like a Woman? Sex Differences in Big Five Personality Traits Across 55 Cultures

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Previous research suggested that sex differences in personality traits are larger in prosperous, healthy, and egalitarian cultures in which women have more opportunities equal with those of men. In this article, the authors report cross-cultural findings in which this unintuitive result was replicated across samples from 55 nations ( $N = 17,637$ ). On responses to the Big Five Inventory, women reported higher levels of neuroticism, extraversion, agreeableness, and conscientiousness than did men across most nations. These findings converge with previous studies in which different Big Five measures and more limited samples of nations were used. Overall, higher levels of human development—including long and healthy life, equal access to knowledge and education, and economic wealth—were the main nation-level predictors of larger sex differences in personality. Changes in men's personality traits appeared to be the primary cause of sex difference variation across cultures. It is proposed that heightened levels of sexual dimorphism result from personality traits of men and women being less constrained and more able to naturally diverge in developed nations. In less fortunate social and economic conditions, innate personality differences between men and women may be attenuated.

**Keywords:** sex differences, personality traits, culture

Why can't a woman be more like a man?

—Alan Jay Lerner, *My Fair Lady*

In many studies, including several meta-analytic investigations, it has been found that men tend to be more assertive and risk taking than women, whereas women are generally higher than men in anxiety and tender-mindedness (Brody & Hall, 2000; Byrnes, Miller, & Schafer, 1999; Feingold, 1994; Kring & Gordon, 1998; Lynn & Martin, 1997; Maccoby & Jacklin, 1974). These sex differences in personality traits can be detected in early childhood (Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006; Wilgenbusch

& Merrell, 1999) and remain fairly constant across adulthood (Feingold, 1994; McCrae & Costa, 1984). The effects of these sex differences lead to predictable differences in men's and women's leisure behaviors, occupational preferences, and health-related outcomes (Browne, 1998; Collaer & Hines, 1995; Lippa, 2005). Although sex differences in personality traits are not as large as sex differences in mate preferences, permissive sexual behaviors, or physical strength (Feingold, 1992; Schmitt, 2005b; Thomas & French, 1985), sex differences in personality traits do appear to be larger and more robust than sex differences in other domains such as cognitive ability, attributional style, and self-esteem (Else-Quest et al., 2006; Hyde, 2005).

Observed sex differences in personality traits such as assertiveness and anxiety also appear to be culturally pervasive (Costa, Terracciano, & McCrae, 2001; Lynn & Martin, 1997). Feingold (1994) found that women in Canada, China, Finland, Germany, Poland, and Russia tended to score higher than men on scales related to the personality traits of neuroticism, agreeableness, and conscientiousness. Men, in contrast, scored higher in the extraversion-related trait of assertiveness across cultures. In a much larger study, self-report responses to the Revised NEO Personality Inventory (NEO-PI-R) across 36 cultures revealed that women in most countries are higher in several traits related to neuroticism, agreeableness, warmth, and openness to feelings, whereas men score higher on scales measuring assertiveness and openness to ideas (Costa et al., 2001; McCrae, 2002).

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Many of these sex differences in personality traits appear to transcend data sources (e.g., Williams & Best, 1990). In a large study of 50 cultures, college students were asked to identify an adult or a college-aged man or woman whom they knew well and to rate that person's personality traits, again using the NEO-PI-R (McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005). Men were rated by observers as being higher than women in assertiveness, excitement seeking, and openness to ideas. Women were rated by observers as being higher on many traits, especially in anxiety, vulnerability, aesthetics, feelings, and tender-mindedness (McCrae et al., 2005). Thus, sex differences in personality traits seem to be rather robust, persisting across a diverse array of measures, data sources, ages, and cultures.

### Cultural Variability in the Size of Sex Differences in Personality

Sex differences in most personality traits, however, are not uniform in magnitude across all samples. At times, sex differences can be much larger in some cultures than in others (Fischer & Manstead, 2000; Guimond et al., 2007; Schwartz & Rubel, 2005). One unexpected finding has been that sex differences in personality traits are often larger in prosperous, healthy, and egalitarian cultures in which women have more opportunities equal with men (Costa et al., 2001; McCrae, 2002). Both in self-report and in other-report data, Asian and African cultures generally show the smallest sex differences, whereas European and American cultures—in which living standard and gender equity indexes are generally higher—show the largest differences (McCrae et al., 2005). With improved national wealth and equality of the sexes, it seems differences between men and women in personality traits do not diminish. On the contrary, the differences become conspicuously larger.

It might seem intuitive to think that the more prosperous and egalitarian a society, the more free men and women are to be similar in terms of their personality profiles. This logic appears useful for explaining certain value priorities and sexual strategies pursued by men and women. For instance, Schwartz and Rubel (2005) found that sex differences in the value of self-direction are smaller in richer countries with more individualist and autonomous values than in poorer countries with more collectivist and embedded cultures. Similarly, Schmitt (2005b) found that sex differences in sociosexual orientation are smaller (though still moderate in magnitude) in countries with higher levels of prosperity and sexual equality. The finding that sex differences in personality traits are larger in rich and egalitarian cultures may therefore be somewhat counterintuitive and is certainly contrary to other established patterns of sexual differentiation across cultures. It is important to note that understanding this intriguing cross-cultural pattern might be particularly informative for discerning the ultimate origins of personality traits.

### Explaining Cultural Variability in the Size of Sex Differences in Personality

Several theoretical approaches would appear useful in explaining cultural variability in the size of sex differences in personality. In general, these approaches are founded on the same group of

theories used to explain the basic origins of psychological sex differences.

#### 1. Social Role Explanations

A leading candidate for explaining variations in the size of sex differences across cultures is the social role model approach. According to this approach, most sex differences are assumed to result from exposure to sex role socialization, a process whereby culture defines the appropriate ways of thinking, feeling, and behaving for men and women (Eagly, 1987; Ruble & Martin, 1998; though see Maccoby, 2000).

Because specified male and female roles are thought to contribute directly to all observed psychological differences between men and women, including personality traits, it is expected that when men and women occupy social roles that are more similar, sex differences will tend to erode (Eagly & Wood, 1999; Wood & Eagly, 2002). Thus, the social role model approach predicts that sex differences in personality traits will be attenuated in more progressive and gender egalitarian cultures and will be accentuated in more traditional cultures.

#### 2. Evolutionary Explanations

Evolutionary approaches consider sex-related differences as arising, in part, from innate dispositional differences between the sexes (Baron-Cohen, 2003; Buss, 1997; Geary, 1998). In this view, the sexes are thought to psychologically differ only in domains in which they have faced different adaptive problems throughout evolutionary history. As a consequence, much of the sex-related differences that appear in modern societies may be due to sexual selection pressures that shaped psychological sex differences in the evolutionary past (Buss & Kenrick, 1998; Mealey, 2000).

Sex differences in levels of obligatory parental investment (Symons, 1979; Trivers, 1972) are thought to have led to sexual selection pressures causing men to be more prone to take risks and to seek social dominance (which benefits the lesser-investing parental sex in a species), whereas women are thought to have been selected to be more cautious and nurturing (which benefits the heavier-investing parental sex; Buss, 1997; Campbell, 2002; MacDonald, 1995). Although evolutionary explanations can readily account for the existence of culturally pervasive differences between men and women, such explanations may seem less adept at explaining the variability in the size of sex differences across cultures (though see Buss, 2001; Gangestad, Haselton, & Buss, 2006; Gangestad & Simpson, 2000).

One evolutionary approach that directly addresses cultural variability is the mismatch perspective (Crawford, 1998; Nesse & Williams, 1994). Evolutionary mismatch theories explain psychological variations across cultures by the degree of mismatch between contemporary environmental conditions and those in which early humans evolved—namely, hunter-gatherer environments (Brown, 1991; Tooby & DeVore, 1987). When contemporary environments are different from hunter-gatherer environments, the adaptive development of innate psychological sex differences can be impeded.

Mismatches between ancestral conditions in which sex differences in personality evolved and contemporary environments might at first glance appear largest in the most modern and

industrialized nation-states. However, this may not be the case (Pasternak, Ember, & Ember, 1997). Schmitt (2005a) has argued that the psychological mismatch between contemporary environments and those in which early humans evolved is not always a linear function of sociohistorical time. For example, according to the curvilinear hypothesis of cultural variation (Schmitt, 2005a), modern nation-states may be psychologically closer to hunter-gatherer cultures than are less-developed agricultural or pastoral cultures (Lee & Daly, 1999). Agricultural and pastoral cultures, with extremely large disparities in resource distribution, familial isolation, and relative gender inequality, may represent the largest psychological deviations from our hunter-gatherer past (Korotayev & Kazankov, 2003; Lamb & Hewlett, 2005). Over sociohistorical time, therefore, our most modern postagricultural environments may be gradually becoming more similar to, not more different from, the hunter-gatherer psychological conditions in which sex differences in personality traits evolved.

### 3. Artifact Explanations

A third type of explanation assumes that observed sex differences in personality are caused by forms of measurement error. For example, it is possible that social desirability biases lead men and women to endorse particular gender-relevant traits at different levels. In some cultures, certain traits (such as fearfulness) may be less undesirable for women to endorse than for men. Observed sex differences, in this case, would not reflect actual personality trait differences and would instead reflect each sex's comfort in revealing undesirable personality characteristics. However, the hypothesis that men and women have different social desirability biases in some cultures is unlikely. For instance, a study of 10 countries from around the world found strong correlations between men's and women's favorability ratings (Williams, Satterwhite, & Saiz, 1998).

Another possibility is that different frames of reference for self-description are used in different cultures (Guimond et al., 2007). Costa and his colleagues (Costa, Terracciano, & McCrae, 2001) proposed the following scenario: Self-descriptions in some cultures (but not others) are based on comparisons of the self with others of the same gender. For example, when asked whether she was kind, a traditional woman might rank herself relative to women she knows, but not relative to men. In that case, sex differences would be eliminated, just as they are eliminated by the use of within-sex norms. By contrast, in modern and more egalitarian cultures men and women may compare themselves with others from both sexes and thus reveal true sex differences in personality. If respondents in traditional cultures were explicitly instructed to compare themselves with both sexes, larger sex differences might be found (Costa et al., 2001).

Another artifact explanation of sex differences in personality traits, which was regarded by Costa et al. (2001) as the most plausible, relies on different attribution processes. In individualist and egalitarian cultures, an act of kindness by a woman may be perceived (by her and by others) as an act of free choice that directly reflects her personality. The same act by a woman in a collectivist and traditional culture might be dismissed as mere compliance with sex role norms. Thus, real sex differences in social behavior could be objectively seen everywhere but would be attributed to roles rather than to traits in more traditional cultures.

Thus, in traditional cultures, perceived sex differences between men and women might be attributed to social role requirements rather than to intrinsic differences in personality traits (Costa et al., 2001).

Finally, it is plausible that differences in personality traits are masked by measurement error. One might expect, for example, that in countries where people are better educated and more literate, overall internal consistency of personality scales is higher. In countries where access to education is more restricted, differences between men and women in personality traits may still exist, but these differences are attenuated due to a larger response inconsistency. Indeed, cross-cultural studies have observed that average Cronbach's alpha across all personality traits tends to be higher in prosperous and well-educated countries than in countries where access to knowledge and education is more constrained (McCrae et al., 2005).

Ultimately, these competing approaches—social roles, evolutionary psychology, and measurement artifacts—are not mutually exclusive, and each may explain part of the observed variability in personality sex differences across cultures.

### Basic Aims of the Current Study

The first goal in this study was to replicate the previously observed sex differences in personality traits. Thus far, there have been only two studies in which the widening gap between the personalities of men and women in more modern cultures has been reported. In both cases, the NEO-PI-R was used, either in self-report (Costa et al., 2001; McCrae, 2002) or in observer-report (McCrae et al., 2005) formats. Therefore, it is unknown whether this observed regularity across cultures is produced by the NEO-PI-R instrument itself and is not replicated by other personality measures. Although 36 (McCrae, 2002) and 50 (McCrae et al., 2005) cultures are large datasets, the selection of cultures in these studies has been biased toward European nations. Improved attempts to generalize these findings would include more diverse cultures, especially those from Africa. In the current study, several new African, Asian, and Middle Eastern samples were included.

The second aim in the current study was to provide evidence that could constrain the range of possible explanations for the widening gap between men's and women's personality traits in developed and more egalitarian countries. Obviously, this unresolved issue is not due to a lack of theoretical explanations but instead lies in the absence of decisive evidence that could eliminate less plausible theories. The current study was based on one of the largest cross-cultural studies of personality ever conducted, carried out as a part of the International Sexuality Description Project (ISDP; Schmitt & 121 Members of the ISDP, 2003, 2004). The 55 diverse nations of the ISDP allowed us to explore a wide range of culture-level factors that might influence variability in personality sex differences across cultures.

### Method

The research reported in this article is a result of the ISDP, a collaborative effort of over 100 social, behavioral, and biological scientists from 56 nations (Schmitt & 121 Members of the ISDP, 2003, 2004). A detailed description of the methodology and sampling techniques used in the ISDP is given elsewhere (Schmitt &

121 Members of the ISDP, 2003, 2004). Ukrainian data from the ISDP were eliminated from the current analysis due to poor translation of the Big Five Inventory (BFI), which resulted in very low internal reliability values. Thus, 55 ISDP nations constituted the current set of national samples.

### *Personality Traits*

All samples were administered the BFI of personality traits (Benet-Martínez & John, 1998). The 44-item English BFI was constructed to allow quick and efficient assessment of five personality dimensions—Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness—when there is no possibility or need for more differentiated measurement of personality facets (Benet-Martínez & John, 1998). Self-report ratings are made on a scale from 1 (*disagree strongly*) to 5 (*agree strongly*) for each of the 44 items. A more detailed description of the samples and psychometric qualities of the BFI in the ISDP are given elsewhere (see Schmitt, Allik, McCrae, & Benet-Martínez, 2007).

### *Cultural Values Indicators*

*Inglehart's value dimensions.* The construction of national scores of the traditional/secular-rational and survival/self-expression value dimensions were based on a factor analysis of culture-level data from the World Values Survey as described in Inglehart and Baker (2000). The actual national scores were received from Ronald Inglehart (personal communication, July 23, 2003). Higher scores reflect higher levels of secular-rational or self-expression values, respectively. People in traditional societies tend to emphasize the importance of religion, have high levels of national pride, favor more respect for authority, and value obedience and conformism. Societies high on secular-rationalism emphasize the opposite. Societies that stress survival values are relatively materialistic. People in those societies report poor health and low levels of trust and happiness, are relatively intolerant toward outgroups, show low enthusiasm for and awareness of environmental protection issues, and are meager in political activeness and personal responsibility. Societies high on self-expression emphasize the opposite (Inglehart & Baker, 2000; Inglehart, Norris, & Welzel, 2002; Inglehart & Welzel, 2005).

*Interpersonal trust and life satisfaction.* The interpersonal trust (percentage of respondents saying most people can be trusted) and life satisfaction (percentage of people saying that they are satisfied with their life as a whole these days) scores across the ISDP nations were based on the 1999–2002 World Values Survey (Inglehart, Basanez, Diez-Medrano, Halman, & Luijckx, 2004, Tables A165 and A170, respectively).

*Materialist and postmaterialist values.* Materialist and postmaterialist variables measure “the extent to which the respondent gives top priority to economic and physical security” (i.e., to materialist values) versus “autonomy and self-expression” (i.e., to postmaterialist values; Inglehart et al., 2004, p. 410). Percentages of people supporting materialist or postmaterialist values were taken from Inglehart et al. (2004, Table Y002).

*Hofstede's value dimensions.* Hofstede (1980, 2001), in his extensive IBM Corporation study of more than 50 countries, identified four primary cultural dimensions that explained more

than half of cross-cultural variation in work-related values: individualism–collectivism, power distance, masculinity–femininity, and uncertainty avoidance. All indices were standardized and were brought into a range between 0 and 100. Individualism–collectivism refers to the degree to which individuals are integrated into groups (higher individualism–collectivism scores reflect individualism); power distance is the extent to which less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally (higher scores reflect large power distance); masculinity–femininity describes the extent of emphasis on work goals (earnings, advancement, and assertiveness) as opposed to interpersonal goals (friendly atmosphere, getting along with the boss) and nurturance (higher masculinity–femininity scores reflect masculinity); and uncertainty avoidance deals with a society's tolerance for uncertainty and ambiguity (higher uncertainty avoidance scores reflect strong uncertainty avoidance). In our study, index scores of Hofstede's four cultural dimensions were taken from Hofstede (1991, 2001).

### *Gender Equality Indicators*

*Sex ratio.* The number of men for each woman in a total population represents the sex ratio of a culture. Data on national sex ratios in 2003 were retrieved from the Central Intelligence Agency (2006) *World Factbook* (<https://www.cia.gov/library/publications/the-world-factbook/index.html>).

*Gender Empowerment Measure (GEM).* The GEM (United Nations Development Programme, 2006) is a composite index measuring gender inequality in three basic dimensions of empowerment—economic participation and decision-making, political participation and decision-making, and power over economic resources. National GEM data for 2003 were taken from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*Gender-Related Development Index (GDI).* The GDI (United Nations Development Programme, 2006) is a composite index measuring average achievement in the three basic dimensions captured in the Human Development Index (HDI; United Nations Development Programme, 2006)—long and healthy life, knowledge and education, and decent standard of living—adjusted to account for inequalities in development between men and women. National GDI scores for 2003 were retrieved from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*Sex ratios.* The percentage of men smoking for each woman in the total population (World Health Organization, 2004), the latest data being available from 1995–2004, was obtained from <http://www.heartstats.org/datapage.asp?id=889>. The number of male students for each female student in the total population enrolled in primary, secondary, and tertiary levels of education, regardless of age, as a percentage of the population of official school age for the three levels (United Nations Development Programme, 2006), was available for 2002–2003 and was retrieved from <http://hdr.undp.org/statistics/data/indicators.cfm>. The national ratio of estimated female earned income to estimated male earned income for 2003 (United Nations Development Programme, 2006) was taken from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*Female professional and technical workers.* Women's share of positions defined according to the *International Standard Classification of Occupations* to include physical, mathematical, and



engineering science professionals (and associate professionals); life science and health professionals (and associate professionals); teaching professionals (and associate professionals); and other professionals and associate professionals for 2003 (United Nations Development Programme, 2006) were taken from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*Sex differences in life expectancy.* The number of years a newborn female infant would live longer than a newborn male infant if prevailing patterns of age-specific mortality rates at the time of birth were to stay the same throughout the children's life for 2003 (United Nations Development Programme, 2006) were taken from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*Sex differences in blood pressure.* Mean blood pressure of populations (age-adjusted to the World Health Organization Standard population, age 15 years and older) expressed in mmHg (millimeters of mercury, which is a unit of pressure) for men and women in 2002 (World Health Organization, 2006) were taken from <http://www.who.int/globalatlas/dataQuery/default.asp>.

### *Socioeconomic Indicators*

*HDI.* The HDI is a composite index measuring average achievement in three basic dimensions of human development—having a long and healthy life, having access to knowledge and education, and enjoying a decent standard of living. The reversed rank orders of national HDI levels for 2003 (United Nations Development Programme, 2006) were retrieved from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*Gross domestic product (GDP) per capita (in US dollars).* GDP converted to U.S. dollars with the average official exchange rate reported by the International Monetary Fund, divided by the midyear population, was used in the current study. National levels of GDP per capita for 2003 (United Nations Development Programme, 2006) were retrieved from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*School enrollment.* The number of students enrolled in primary, secondary, and tertiary levels of education, regardless of age, as a percentage of the population of official school age for the three levels were used in the current study. National school enrollment data for 2002–2003 (United Nations Development Programme, 2006) were retrieved from <http://hdr.undp.org/statistics/data/indicators.cfm>.

*Life expectancy at birth.* The number of years a newborn infant would live if prevailing patterns of age-specific mortality rates at time of birth were to stay the same throughout the child's life was used in the current study. National data for 2003 (World Health Organization, 2006) were obtained from <http://www.who.int/globalatlas>.

*Gini index.* The Gini index (United Nations Development Programme, 2006) measures the extent to which the distribution of income (or consumption) among individuals or households within a country deviates from a perfectly equal distribution. A value of 0 represents perfect equality; a value of 100 represents maximal inequality. National Gini indexes for 2003 were retrieved from <http://hdr.undp.org/statistics/data/indicators.cfm>.

### *Method Quality Indicators*

*Cronbach's alpha.* Average Cronbach's alpha across all five dimensions was computed as an indicator of internal consistency (see Table 1 for national scores).

*Interitem response variance.* The interitem response variance for each five dimensions was found after the reversal of negatively keyed items. Low variance of responses on an internally consistent scale indicates that the person responded comparably to all items. High variance indicates that the person responded erratically and inconsistently to different items of the scale. The mean value over the five interitem response variances was found.

*Acquiescence bias.* The acquiescence index was constructed from an equal number of positively and negatively keyed items from each of the BFI scales that were scored in the same direction.

*Negative item bias.* A previous study demonstrated that differences between aggregates of positive and negative items of the Rosenberg Self-Esteem Scale (Rosenberg, 1965) were smaller in developed nations (Schmitt & Allik, 2005). This indicates that negatively worded items were interpreted differently across cultures, and this, in turn, could affect the observed sex differences. The negative item bias was defined as a difference between sums of positively and negatively worded items of the Rosenberg Self-Esteem Scale, which was administered parallel to the BFI in the ISDP (Schmitt & Allik, 2005).

### *Results*

Across the ISDP, women reported significantly higher BFI levels of neuroticism, agreeableness, extraversion, and conscientiousness than did men. Sex differences were most pronounced on the Neuroticism dimension; in 49 ISDP nations, women scored significantly higher in BFI Neuroticism than did men. In no culture did men report significantly more neuroticism, though in Indonesia and Botswana, men's mean was slightly higher than women's mean. Women scored higher than men in BFI Agreeableness in 34 ISDP nations, with only South Korea displaying a significant difference in men reporting more agreeableness than reported by women. Women scored higher than men did in BFI Extraversion in 25 ISDP nations. In only two cases—India and Malaysia—did men score significantly higher than women on extraversion. Women scored higher than men did in BFI Conscientiousness in 23 ISDP nations. Only in India and Botswana did men score significantly higher than women did on conscientiousness.

Sex differences in openness to experience were decidedly mixed across cultures. In 37 cultures, men scored higher than women in BFI Openness to Experience (in 8 cultures this difference was statistically significant), but in 18 cultures, women's self-reported openness to experience was higher than men's (in 4 cultures this difference was statistically significant). These conflicting results were not entirely unexpected as women have been found to be more open than men to feelings, whereas men tend to be more open to new ideas (Costa et al., 2001; McCrae et al., 2005). The BFI Openness to Experience scale did not contain the necessary precision to distinguish among these facets of the higher order trait of openness to experience (McCrae & Costa, 1997).

Table 1  
*Mean z Score Differences (d) Between Women and Men in 55 Nations on Big Five Inventory (BFI) Factors*

Nation	<i>n</i>	GSDI	Mean z score differences					SD	Cronbach's $\alpha$
			N	E	O	A	C		
France	136	0.44	0.53	0.36	0.11	0.11	0.77	9.21	.73
Netherlands	241	0.36	0.67	0.05	0.05	0.41	0.30	9.18	.77
Czech Republic	97	0.34	0.31	0.40	0.04	0.55	0.11	9.53	.73
Brazil	235	0.34	0.63	0.59	-0.03	-0.03	0.15	9.59	.75
Belgium	522	0.32	0.46	0.17	-0.18	0.23	0.43	8.32	.61
Italy	200	0.32	0.58	0.16	0.14	0.27	0.26	8.90	.70
Slovakia	184	0.32	0.28	0.29	0.37	0.49	0.21	9.56	.72
Austria	467	0.31	0.45	0.29	-0.02	0.23	0.27	9.50	.81
Spain	273	0.31	0.60	0.21	-0.20	0.16	0.27	9.08	.77
Latvia	193	0.30	0.59	0.05	0.07	0.25	0.31	9.24	.74
New Zealand	274	0.30	0.35	0.34	-0.06	0.28	0.22	10.49	.79
Mexico	215	0.29	0.44	0.13	-0.12	0.23	0.36	10.17	.76
Morocco	182	0.29	0.81	-0.04	0.12	0.27	0.12	9.22	.62
Canada	1039	0.28	0.49	0.17	-0.14	0.20	0.27	8.90	.80
Estonia	188	0.28	0.61	0.22	0.33	0.28	0.01	9.74	.76
Australia	489	0.27	0.35	0.20	-0.02	0.33	0.21	8.77	.65
Lebanon	312	0.27	0.63	0.06	-0.13	0.30	0.10	9.03	.78
Romania	263	0.27	0.63	-0.02	-0.22	0.10	0.37	9.87	.68
Switzerland	251	0.27	0.30	0.52	0.03	0.01	0.25	9.73	.68
Chile	214	0.27	0.39	-0.02	-0.12	0.30	0.40	8.65	.81
United States	2793	0.27	0.53	0.15	-0.22	0.19	0.20	8.49	.81
Serbia	246	0.26	0.31	0.35	0.46	0.26	0.13	8.73	.72
Argentina	206	0.26	0.54	0.21	-0.29	0.16	0.12	8.47	.71
Peru	200	0.26	0.51	0.06	-0.03	0.26	0.19	9.35	.76
Israel	394	0.24	0.80	0.04	-0.17	0.19	-0.08	9.87	.75
Germany	181	0.23	0.48	0.12	0.11	0.09	0.23	8.43	.78
Turkey	790	0.23	0.58	0.07	-0.07	0.20	0.07	8.22	.80
Bolivia	412	0.23	0.49	0.06	0.04	0.31	0.04	9.37	.77
Lithuania	94	0.22	0.55	0.18	-0.10	0.13	0.01	8.58	.69
Poland	846	0.21	0.47	0.11	0.14	0.18	0.09	10.00	.73
Malta	222	0.20	0.52	-0.02	-0.05	0.12	0.18	9.30	.77
Croatia	331	0.20	0.22	0.31	0.02	0.00	0.25	9.84	.76
United Kingdom	483	0.20	0.55	0.03	-0.12	0.29	-0.09	9.17	.80
Slovenia	182	0.19	0.45	0.05	0.20	0.18	0.07	9.34	.77
Cyprus	60	0.18	0.21	0.25	0.18	0.27	-0.02	8.99	.72
Hong Kong	201	0.18	0.26	-0.05	0.07	0.23	0.26	8.42	.70
South Africa	162	0.17	0.41	0.19	-0.08	0.00	0.06	9.53	.71
Bangladesh	145	0.16	0.11	0.13	0.16	0.19	0.22	9.59	.80
Portugal	282	0.14	0.49	-0.18	-0.28	0.17	0.09	8.82	.67
Philippines	252	0.14	0.28	0.12	0.02	0.08	0.08	8.46	.80
Tanzania	136	0.13	0.05	0.03	-0.12	0.29	0.14	8.50	.59
Taiwan	209	0.12	0.34	0.21	0.00	-0.18	0.11	7.77	.75
Jordan	275	0.09	0.43	-0.03	-0.38	0.01	-0.04	8.80	.65
Ethiopia	240	0.07	0.17	-0.01	-0.12	0.12	-0.01	8.92	.48
Zimbabwe	200	0.06	0.25	-0.04	-0.12	-0.01	0.04	9.23	.66
Malaysia	229	0.05	0.26	-0.38	-0.41	0.20	0.12	9.32	.74
Greece	141	0.05	0.17	-0.29	-0.04	0.22	0.09	7.60	.68
Japan	259	0.04	0.09	0.08	-0.13	0.03	-0.05	9.15	.74
South Korea	122	0.01	0.40	0.02	-0.02	-0.20	-0.17	6.62	.79
India	200	0.01	0.60	-0.38	-0.46	0.09	-0.27	8.19	.73
Finland	490	0.01	0.32	-0.19	-0.24	-0.05	-0.06	9.50	.71
Botswana	213	0.00	-0.13	0.36	-0.18	0.07	-0.28	7.42	.63
Fiji	163	-0.04	0.27	0.12	-0.15	-0.28	-0.28	8.57	.60
Congo	192	-0.09	0.20	-0.11	-0.21	-0.27	-0.19	8.21	.48
Indonesia	111	-0.16	-0.12	-0.36	-0.31	-0.11	-0.04	9.13	.68
Total average	17637	0.19	0.40	0.10	-0.05	0.15	0.12	8.99	.72

*Note.* Standard deviation (SD) indicates the mean standard deviation around the mean values of the five personality traits. Cronbach's  $\alpha$  indicates the mean Cronbach's alphas across all five personality dimensions. *n* = the number of participants; GSDI = General Sex Difference Index, N = Neuroticism; E = Extraversion; O = Openness to Experience; A = Agreeableness; and C = Conscientiousness.

### *The Magnitude of Sex Differences in Personality Across Cultures*

Overall, the magnitudes of sex differences (expressed in terms of the  $d$  statistic, in which the mean scores of one gender are subtracted from the mean scores of the other and are then divided by the pooled standard deviation<sup>1</sup>) were relatively small to moderate in size (see Table 1). On average, across the ISDP nations, the magnitude of sex differences in personality traits was largest for neuroticism ( $d = .40$ ). In 2 cultures, Morocco and Israel, sex differences in neuroticism were large ( $d > .80$ ). In 17 cultures, including France, Netherlands, Estonia, Italy, Brazil, Latvia, Spain, Peru, Lebanon, Romania, United States, Turkey, Lithuania, Malta, Argentina, United Kingdom, and India, sex differences in neuroticism were moderate to large in magnitude ( $.50 < d < .80$ ). In 29 cultures, sex differences in neuroticism were small to moderate in size ( $.20 < d < .50$ ). In only 7 cultures—Bangladesh, Tanzania, Ethiopia, Greece, Japan, Botswana, and Indonesia—were sex differences in neuroticism negligible ( $d < .20$ ). The overall magnitude of sex differences in personality across the ISDP was next largest for agreeableness ( $d = .15$ ), followed by conscientiousness ( $d = .12$ ) and extraversion ( $d = .10$ ).

In order to illustrate geographic variations in the degree of sexual differentiation among personality traits, we grouped the 55 ISDP nations into 10 major world regions (see for details Schmitt et al., 2007; Schmitt & 121 Members of the ISDP, 2003, 2004): North America (3 countries), South America (5), Western Europe (8), Eastern Europe (10), Southern Europe (6), Middle East (4), Africa (7), Oceania (3), South or Southeast Asia (5), and East Asia (4). It is important to acknowledge that the placement of cultures into these world regions may be viewed as arbitrary and that different classifications certainly may exist for various purposes. Nevertheless, aggregation of data over geographical world regions allowed us to notice several trends that might be hidden when countries are observed in isolation. As shown in Figure 1, Neuroticism showed the strongest and most reliable sex differences. A one-way analysis of variance (ANOVA) with world region as the independent variable and national sex differences in neuroticism as the dependent variable revealed a significant main effect of world region,  $F(9, 45) = 2.43, p < .05$ . Multiple post hoc analyses (e.g., Tukey's honestly significant difference) revealed no significant differences between specific world regions.

In a one-way ANOVA with world region as the independent variable and national sex differences in extraversion as the dependent variable, we found a significant main effect of world region,  $F(9, 45) = 2.14, p < .05$ . Again, multiple post hoc analyses (e.g., Tukey's honestly significant difference) revealed no significant differences between specific world regions. One-way ANOVAs with world region as the independent variable and national sex differences in agreeableness, conscientiousness, or openness to experience as dependent variables showed no main effects of world region.

As in the study by Costa and colleagues (Costa et al., 2001), the magnitude of sex differences on different personality dimensions was correlated across cultures: Those cultures in which sex differences in one domain of personality were prominent tended also to have large sex differences in other domains. Correlations between domains varied from .05 to .51, only three of which did not reach statistical significance. On the basis of these strong intercorrela-

tions, we formed a General Sex Difference Index (GSDI) as the mean average of sexual differentiation on four dimensions—Neuroticism, Extraversion, Agreeableness, and Conscientiousness—for which we found that women, on average, scored higher than men did (see Table 1 for nation scores). Averaging differences across the four women-dominated dimensions gave an overall index of the extent to which sex differences were emphasized in a particular culture (see Costa et al., 2001). The GSDI was significantly correlated with the mean value of men on four personality dimensions—Neuroticism, Extraversion, Agreeableness, and Conscientiousness,  $r(54) = .69, p < .001$ , but was not significantly correlated with the mean score of women,  $r(54) = .25, p = .06$ . Thus, national changes in men's scores seemed to be the primary contributor to sexual differentiation in personality traits across cultures.

In 40 nations, computation of the GSDI resulted in a score above .10. On this composite index, only three countries—Fiji, Congo, and Indonesia—had a negative score (see Table 1). A one-way ANOVA with world region as the independent variable and GSDI as the dependent variable found a significant main effect of world region,  $F(9, 45) = 4.03, p < .001$ . Based on this overall index, multiple post hoc analyses (e.g., Tukey's honestly significant difference) revealed that the African and South/Southeast Asian world regions tended to have smaller sex differences in personality than did most Western world regions (Europe, North and South America). Indeed, perhaps the most striking trend across world regions in Figure 1 was that sex differences appear to diminish as one moves from Western to non-Western cultures.

### *Convergence of Personality Trait Sex Differences in the ISDP With Other Studies*

Costa et al. (2001) computed an overall index of sex differences in personality based on four variables. Because all the Neuroticism and Agreeableness facets of NEO-PI-R show the same direction of sex differences, they were included. For extraversion and openness to experience, however, women scored higher only on some of subscales. To represent gender differences in these domains, two new variables—feminine extraversion and feminine openness—were created. Feminine extraversion was calculated as (E1: warmth + E2: gregariousness – E3: assertiveness – E5: excitement seeking + E6: positive emotions)/5. Similarly, feminine openness was calculated as (O2: aesthetics + O3: feelings + O4: actions – O5: ideas)/4.

Figure 2 shows the cross-measure cross-cultural convergent correlation between the self-reported GSDI of the BFI and the self-reported NEO-PI-R sex difference index. There were 27 overlapping nations among which the convergent correlation was quite strong,  $r(25) = .73, p < .001$ . Indeed, this is a remarkably high

<sup>1</sup> The  $d$  statistic is traditionally computed such that positive values indicate that men are higher than women on a particular scale (Cohen, 1988). However, previous studies on sex differences in personality traits (Costa et al., 2001) have computed  $d$  such that positive values indicate that women are higher than men, and we have used this convention to increase the comparability of the current findings with previous studies. Cohen (1988) defined sex differences in terms of  $d$  as large if differences are greater than .80, moderate if differences are between .50 and .80, and small if differences are between .20 and .50.

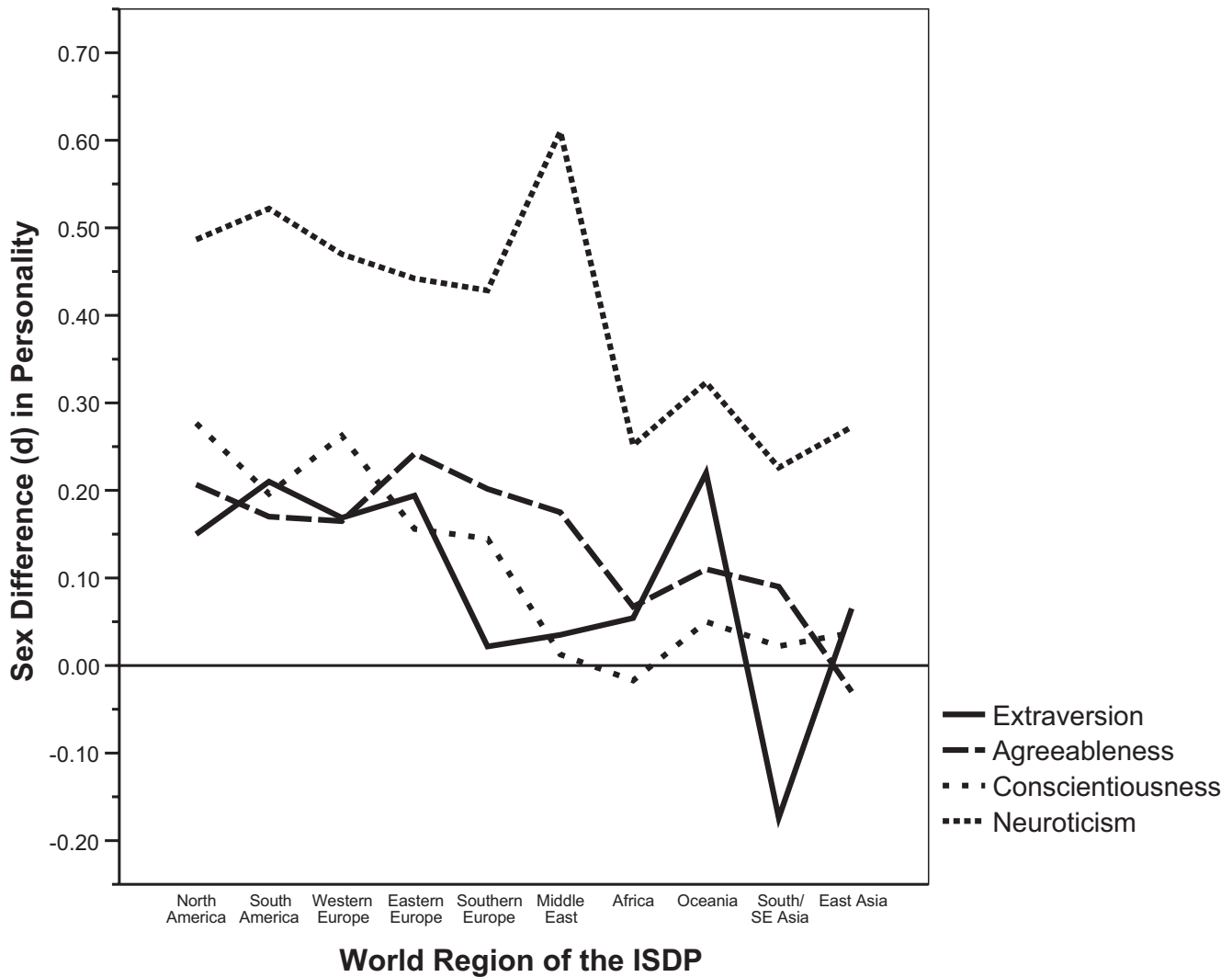


Figure 1. Magnitude of sex differences ( $d$ ) in extraversion, agreeableness, conscientiousness, and neuroticism, across the 10 major world regions of the International Sexuality Description Project (ISDP; Schmitt & 121 Members of the ISDP, 2003).

value compared with relatively modest correlations between the BFI and the NEO-PI-R domain scales (Schmitt et al., 2007). The convergent correlation between sex differences of the BFI self-reports and that of the NEO-PI-R reports (McCrae et al., 2005) was smaller but still statistically significant,  $r(37) = .48, p < .01$ . Thus, sex differences in personality traits persisted across measuring instruments and evaluation methods, providing evidence of convergent validity for the current findings.

#### *Psychological Origins of Sex Differences in Personality Traits*

To help understand the factors responsible for sex differences, we correlated the nation-level personality differences between women and men (as expressed in the GSDI) with other culture-level variables (see Table 2). As in previous studies, sexual differentiation was correlated with Hofstede's individualism dimen-

sion,  $r(43) = .48, p < .001$ . Western nations with individualistic values exhibit greater sex differences in self-reported personality traits than do non-Western, collectivistic cultures (Costa et al., 2001). Sex differences in personality were also positively correlated with Inglehart's survival/self-expression values,  $r(43) = .29, p < .05$ , postmaterialist values,  $r(43) = .35, p < .01$ , and life satisfaction,  $r(44) = .32, p < .05$ . Sex differences in personality were negatively correlated with materialist values,  $r(43) = -.33, p < .05$ . Finally, the GSDI was not significantly correlated with Hofstede's power distance dimension, failing to support the Guimond et al. (2007) contention that sex differences should be larger in cultures in which women compare themselves only with other women and men compare themselves only with other men.

Table 2 also shows that nation-level sex differences in personality were correlated with several socioeconomic indicators. The strongest overall predictor was the HDI, which is a summary



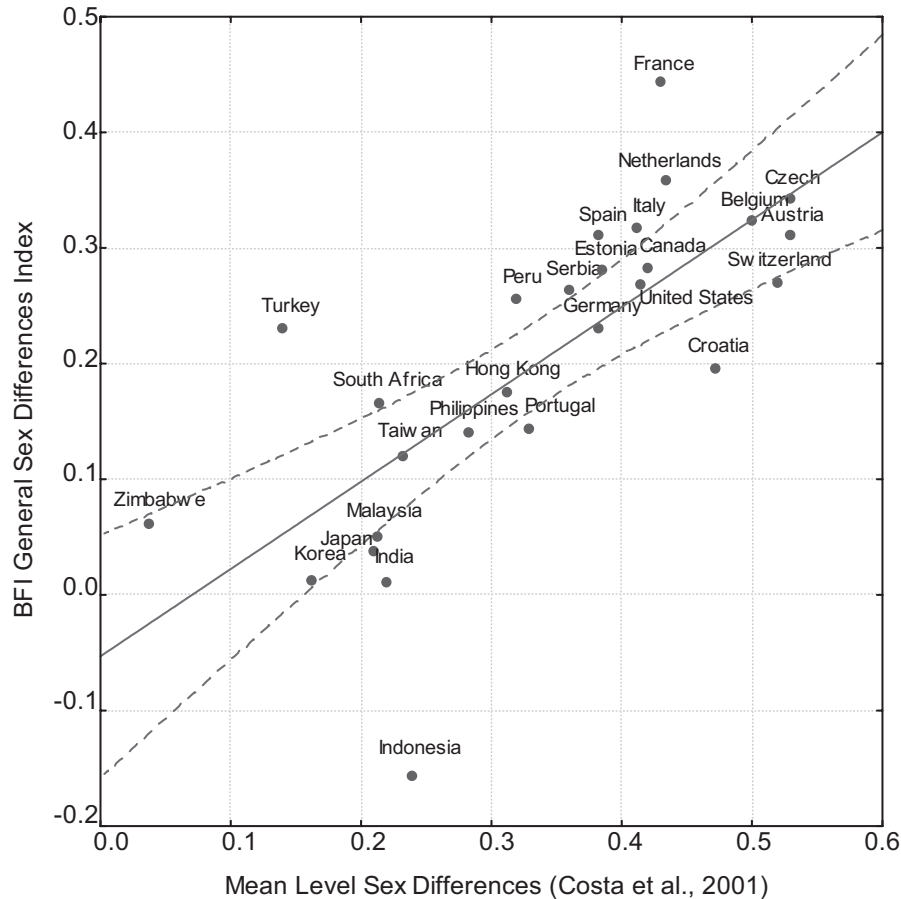


Figure 2. The cross-cultural convergent correlation between the Big Five Inventory General Sex Differences Index (this study) and the Revised NEO Personality Inventory (Costa et al., 2001) sex differences indices,  $r(25) = .73, p < .001$ . Data for Austria, Canada, Czech Republic, Switzerland, and Turkey were obtained from Robert R. McCrae (personal communication, January 27, 2006). Costa et al.'s (2001) data were averaged across Black and White South Africans. Costa et al.'s (2001) data for Yugoslavia were matched with the Serbian data in the current study. The dotted lines indicate 95% confidence bands around the fitted regression line.

measure consisting of three basic components: long and healthy life, knowledge and education, and decent standard of living. Similar results were evident for HDI-related components of GDP, life expectancy, and school enrollment. These results converge with previous findings showing that more modern and progressive cultures tend to have larger sex differences in personality than do more traditional cultures (Costa et al., 2001). The larger contribution to this correlation came from men's shifts in personality as the mean value of their averaged scores on four dimensions—Neuroticism, Extraversion, Agreeableness, and Conscientiousness—was significantly correlated with HDI,  $r(53) = .56, p < .001$ , whereas the same correlation for women was insignificant,  $r(53) = .17, p = .22$ .

Several indicators of gender quality (including the GEM, the GDI, the earned income ratio, and the Female Professionals and Workers index) correlated positively with the GSDI of personality traits. These findings strongly refute the social role model approach in which greater gender equality within a society should lead to smaller sex differences. In fact, the opposite has now been documented across multiple samples—increasing

gender equality in a society results in larger sex differences in personality traits (Costa et al., 2001; McCrae et al., 2005).

Similarly, we found other sociocultural indicators of sex difference show increases in more modern cultures. In modern and egalitarian countries like Switzerland, New Zealand, and the Netherlands, men have much higher systolic blood pressure than do women. In more traditional countries like Indonesia, Bangladesh, and Ethiopia, the blood pressure of men and that of women are practically identical. For the 45 ISDP countries where we had blood pressure data, the absolute difference between men and women in their blood pressure was significantly correlated with national HDI levels,  $r(43) = .41, p < .01$ . Thus, like the widening gap in personality traits, men's blood pressure and women's blood pressure widens as cultures become more modern.

Still, is it the case that larger sex differences in personality are linked to greater gender equality, or are they simply linked to increases in general human development? The last column in Table 2 shows the partial correlations between nation-level sex differences (GSDI) and predictor variables when the influence of HDI was partialled out. Most of the correlations became

Table 2

*Product Moment and Partial Correlations Between Mean Level General Sex Differences Index and Selected Nation-Level Indicators*

Indicator	N	Mean NEAC		GSDI	GSDI*
		Women	Men		
Cultural value dimensions					
World Values Survey (Inglehart et al., 2004)					
Traditional/secular-rational	45	−0.44	−0.44	0.14	−0.31
Survival/self-expression	45	0.08	−0.21	0.29	−0.06
Materialist values	45	−0.19	0.15	−0.33	−0.06
Postmaterialist values	45	0.22	−0.24	0.45	0.23
Interpersonal trust	46	−0.18	−0.06	−0.14	−0.44
Life satisfaction	46	0.06	−0.25	0.32	−0.12
IBM study (Hofstede, 2001)					
Power distance	45	−0.22	0.04	−0.21	0.03
Uncertainty avoidance	45	0.17	0.00	0.17	0.06
Individualism	45	0.31	−0.24	0.48	0.29
Masculinity	45	−0.06	−0.15	0.08	0.04
Socioeconomic indicators					
Human Development Index (rank)	53	0.17	0.56	0.50	—
GDP per capita (US dollars)	53	−0.05	−0.40	0.39	−0.08
Life expectancy	53	−0.12	−0.53	0.48	0.06
School enrollment	53	−0.50	0.43	−0.14	−0.06
Gini index	47	0.20	0.30	−0.16	0.09
Gender equality indicators					
Sex ratio in total population	55	0.04	0.34	−0.38	−0.23
Gender Empowerment Measure	41	0.10	−0.30	0.39	0.06
Gender-Related Development Index	53	−0.19	−0.56	0.49	−0.03
Sex ratio in smoking	47	−0.40	0.11	−0.45	−0.35
Sex ratio in school enrollment	53	0.05	−0.24	0.34	0.11
Earned income ratio	53	−0.13	−0.15	0.08	−0.03
Female Professionals and Workers	43	0.05	−0.27	0.41	0.27
Sex difference in life expectancy	53	−0.31	−0.61	0.45	0.19
Sex difference in blood pressure	45	−0.05	−0.38	0.31	0.14
Method quality indicators					
Cronbach's α	55	−0.02	−0.36	0.41	0.16
Interitem response variance	55	0.40	−0.11	0.41	0.25
Acquiescence bias	55	0.38	0.13	0.17	0.32
Negative item bias	53	−0.00	0.30	−0.33	−0.05

Note. Significant  $p < .05$  correlations are in bold.  $N$  = number of countries; Mean NEAC = the mean value of Neuroticism, Extraversion, Agreeableness, and Conscientiousness scores, separately for women and men; GSDI = General Sex Difference Index; GSDI\* = General Sex Difference Index controlled for Human Development Index 2003 (HDI; <http://hdr.undp.org/statistics/data/indicators.cfm>); GDP = gross domestic product.

insignificant, demonstrating that most sociocultural predictors do not have independent contributions beyond that of human development. However, there were four predictors that made independent contributions to sexual differentiation beyond HDI: cultures in which there are traditional values,  $r(42) = -.31$ ,  $p < .05$ , and in which people think that most people cannot be trusted,  $r(43) = -.44$ ,  $p < .01$ , have smaller sex differences, whereas when the percentage of smoking women is high compared with that of smoking men,  $r(44) = .35$ ,  $p < .05$ , and when the respondents are more inclined to agree with a question irrespective its content,  $r(54) = .32$ ,  $p < .02$ , cultures have greater disparity between men's and women's personality traits.

When all four predictors were combined with the HDI and put into a multiple regression equation, they jointly explained 54.6% of variance in the cross-cultural sex differences in personality ( $R = .74$ ),  $F(5, 35) = 8.42$ ,  $p < .00003$ . Table 3 shows

the results of the multiple regression analysis with the strongest predictors of the GSDI. The results demonstrate that the level of human development has the strongest contribution, but a high proportion of smoking women and a distrust of other people also contribute to sex differences in personality traits.

Finally, we found no support for the notion that measurement artifacts influence the degree of sexual differentiation across cultures. Although Cronbach's alpha,  $r(54) = .41$ ,  $p < .001$ , and negative item bias,  $r(53) = .32$ ,  $p < .016$ , significantly correlated with size of sex differences in personality traits, their contribution vanished when level of human development was controlled. After accounting for variability in the HDI, only the impact of the acquiescence bias became significant,  $r(54) = .32$ ,  $p < .024$ . This impact, however, was opposite to that of the artifact explanation. In cultures with equal human development, when people respond affirmatively to questions with no regard to content, men and women are more dissimilar in personality.

Table 3

*Prediction of the Mean Level General Sex Differences Index From the Best Set of Nation-Level Indicators*

	$\beta$	SE of $\beta$	$t(35)$	$p$	$n$
Intercept			1.22	.23	
Human Development Index (rank)	.67	.17	-3.91	.00	53
Interpersonal trust	-.43	.13	-3.27	.00	46
Sex ratio in smoking	-.34	.12	-2.76	.01	47
Traditional/secular-rational	-.12	.19	-0.64	.53	45
Acquiescence bias	.10	.14	0.68	.50	55

### Discussion

This study provides strong support for the claim that with greater human development and with greater opportunities for gender equality, the personalities of men and women do not become more similar (see also Costa et al., 2001; McCrae, 2002; McCrae et al., 2005). To the contrary, in more prosperous and egalitarian societies the personality profiles of men and women become decidedly less similar. Moreover, these changes appear to result from men's cross-cultural personality variation. In more traditional and less developed cultures a man is, indeed, more like a woman, at least in terms of self-reported personality traits.

#### *Sex Roles Do Not Explain Why Sex Differences in Personality Traits Vary Across Cultures*

These findings may seem paradoxical because in traditional and economically deprived countries the division of labor between the sexes appears more disparate than it does in wealthy and egalitarian societies. In patriarchic and traditional countries, women occupy roles that demand communal, domestic, and subordinate behaviors more than men do. Men, on the contrary, occupy positions that demand agentive and dominant behavior for successful sex role performance (Eagly & Wood, 1999). So far, two large-scale cross-cultural data sets have shown that the gap between the personality traits of men and that of women widens as the society in which they live becomes more modern, economically affluent, and gender egalitarian (Costa et al., 2001; McCrae et al., 2005). This study confirms and extends this observation to a new set of countries, including several African and Middle East countries.

An accumulating body of evidence, including the current data, provides reason to question social role explanations of gender and personality development (Baron-Cohen, 2003; Campbell, Shirley, & Candy, 2004; Geary, 1998; Lytton & Romney, 1991; Maccoby, 2000; Mealey, 2000; Spiro, 1996; Tiger & Shepher, 1975). In this study, a collection of eight different gender equality indicators provided a comprehensive set of measures that assess disparity between male and female roles in society. In every case, significant findings suggest that greater nation-level gender equality leads to psychological dissimilarity in men's and women's personality traits. If differences in personality traits are controlled by the drastically different social roles that men and women play in the society then in cultures in which women earn considerably less than men, in which they have limited access to education, and in which only few of them become professionals, women's personality profiles should be very different from men's. In reality, these women's personality profiles are more similar to those of men. Whatever the source of men's and women's personality trait

differences across cultures, differences in social roles appear unlikely to play a significant causal role.

#### *Method Artifacts Do Not Explain Why Sex Differences in Personality Traits Vary Across Cultures*

There are many forms of bias in personality measurement and some of these biases are very difficult to quantify (Cheung & Rensvold, 2000; Grimm & Church, 1999). For example, it can be difficult to determine whether self-reports reflect role requirements, intrinsic differences in personality traits, or some interactive combination of both. It is, however, much easier to observe simpler biases such as dissimilar responding to positively and negatively worded items or overall inconsistency in responses to personality items. Schmitt and Allik (2005) observed that in countries with lower differences between positively and negatively worded items and higher internal consistency of responses, people tend to live longer; be economically more prosperous; and support individualistic values and equality in rights, wealth, and power. In this regard, this study provided no strong evidence for the artifact explanation. Negative item bias and Cronbach's alphas lost their influence on the magnitude of sex differences in personality when level of human development was controlled for. Although acquiescent responding became significantly related to sex differences in personality when the impact of the HDI was partialled out, the direction of this correlation was opposite of the predicted artifact effect.

#### *Evolutionary Theories May Explain Why Sex Differences in Personality Traits Vary Across Cultures*

Evolutionary theories rooted in parental investment theory (Trivers, 1972) have predicted that sexual selection pressures have caused men to be more prone than women to take risks and seek social dominance, whereas women are thought to have been selected to be more nurturing and cautious (Buss, 1997; MacDonald, 1995). Thus, evolutionary theories can readily account for the existence of culturally pervasive differences between men and women. In principle, evolutionary theories can also explain the widening gap between the personalities of men and women by a version of the mismatch theory (specifically, the curvilinear hypothesis), according to which discrepancies between contemporary environmental conditions and those in which early humans evolved have begun to lessen as humans move from agricultural to modern societies (Schmitt, 2005a). In the ancestral past, as hunter-gatherers, men and women naturally developed sexually selected differences in personality traits such that men were more risk

taking and dominance seeking and women were more nurturing and cautious. As societies rooted in agriculture and monotheism emerged, the personalities of men and women were relatively constrained and sex differences in personality may have been less likely to surface (see Pasternak et al., 1997). Finally, as modern societies have become more egalitarian (more similar to hunter-gatherer cultures; Marlowe, 2003; Yanca & Low, 2004), innate sex differences in personality traits may have become more likely to materialize. However, until there are larger studies that include a wider range of cultures—ideally including hunter-gatherer, horticultural, pastoral, agricultural, and developing nations—this curvilinear hypothesis must remain speculative.

### *Magnitude of Sex Differences in Personality Traits May Demonstrate Gene–Environment Interaction*

Like other forms of sexual dimorphism, differences in personality traits may be controlled or mediated by sex-linked genes. However, the existence of innate sex differences alone would not explain the widening gap between the personalities of men and women with the development of more prosperous and egalitarian societies. In addition to the curvilinear hypothesis, there may be other mechanisms that drive cultural variation in the magnitude of sex differences in personality traits. According to the diathesis-stress interaction scheme (Meehl, 1962; Monroe & Simons, 1991), environmental pressures and life events can activate or suppress innate predispositions to think, feel, and behave in a consistent way. It may be the case that the genetic personality predispositions of men and women are sensitive to certain contextual factors (e.g., environmental stress) in ways that differentially activate or suppress these predispositions (e.g., Belsky, 1999; Ellis & Garber, 2000).

Sex differences in reactivity to environmental stress have been documented in other human attributes. For example, sex differences in height and blood pressure show increasing sexual dimorphism in prosperous and egalitarian societies and are relatively attenuated in poor societies. It is universally true that on average, men are taller than women in every human population. This sexual dimorphism in body size reached modern levels at least 150,000 years ago or even earlier (Ruff, 2002; Wolfe & Gray, 1982) and appears to have been produced by selection pressures that favor relatively taller men and shorter women (Nettle, 2002; Pawlowski, Dunbar, & Lipowicz, 2000). Over evolutionary time, such a situation tends to maintain mean-level sexual dimorphism, even though there is considerable overlap in men's and women's height distributions (Gaulin & Boster, 1985; Nettle, 2002).

Like personality traits, the degree of sexual dimorphism in height varies across cultures. Such variations likely reflect subtle reactions to environmental forces, such as climate, nutrition, stress, and disease (e.g., Bogin & Rios, 2003; Frayer & Wolpoff, 1985; Katzmarzyk & Leonard, 1998). For example, it is well documented that well-nourished populations are more sexually dimorphic in height than are malnourished ones, in part because male growth is more susceptible to nutritional deficiencies during development than is female growth (Brauer, 1982; Hamilton, 1982). A drastic example of a more deleterious effect of environmental influence on boys than on girls is the consequences of the atomic bombing of Japan (Greulich, Giswan, & Turner, 1953). Sexual dimorphism in height is higher in richer countries than in poorer countries

(Eveleth, 1975; Eveleth & Tanner, 1990; Guégan, Teriokhin, & Thomas, 2000), and within cultures, sexual dimorphisms in height are larger in richer socioeconomic classes than in lower classes (Malina, Little, Buschang, Demoss, & Selby, 1985). The same appears to be relevant concerning personality. In the ISDP, it appears that men's personality trait scores, more than women's, change with the development of human society. As human development increases, men's personalities are fully fed and sex differences tend to increase.

Like personality traits, systolic blood pressure is stable in time and has a considerable heritable component (Hottenga et al., 2005). Both systolic and diastolic blood pressures demonstrate significant heritability ranging from 34% to 67%. Correlations over time across an average period of 7.1 years are between .41 and .70. At the same time, there is no evidence for heritability of sex differences in blood pressure (Hottenga et al., 2005). As expected, blood pressure is higher in modern and economically developed societies than in traditional and economically less developed countries (Pollard, Brush, & Harrison, 1991; Waldron et al., 1982). Nevertheless, the correlation between mean level of sex difference in blood pressure and level of human development is positive. In countries like Switzerland, New Zealand, and the Netherlands, men have much higher systolic blood pressure than do women. In more traditional countries like Indonesia, Bangladesh, and Ethiopia, the blood pressure of men and women is practically identical. Again, like personality traits, the gap between men's and women's blood pressure widens with increasing human development.

Thus, larger sex differences in personality among modern nations may reflect a more general biological trend toward greater dimorphism in resource rich environments and reduced dimorphism in constrained or high stress environmental conditions (Teder & Tammaru, 2005). It seems to be also universal that the larger of the two sexes (among insects females are typically larger than males) is the more vulnerable to environmental pressures (Abouheif & Fairbairn, 1997; Teder & Tammaru, 2005). It is therefore possible that the observed level of sexual dimorphism in more developed countries corresponds to a natural tendency for men and women to develop differing personalities: It is mainly men, not women, who became less neurotic but also less agreeable and conscientious in their self-descriptions. In less fortunate conditions, the innate personality differences between men and women are attenuated. Although speculative, another illustration of this principle may be seen regarding sex differences in competitiveness: Even when opportunities and incentives for achieving in sport grow in a way to become more equitable, sex differences in the proportion of men to women who run relatively fast increase with greater opportunity (Deaner, 2006).

Like morphological and physiological features, sex differences in personality are vulnerable to restraining environmental pressures. As a society becomes more prosperous and more egalitarian, innate dispositional differences between men and women have more space to develop and the gap that exists between men and women in their personality traits becomes wider. As summarized by Ridley (2003),

Ironically, the more egalitarian a society is, the more innate factors will matter. In a world where everybody gets the same food, the heritability of height and weight will be high; in a world where some



live in luxury and others starve, the heritability of weight will be low. Likewise, in a world where everybody gets the same education, the best jobs will go to those with the most native talent. That's what the word *meritocracy* means. (Ridley, 2003, p. 262)

This is perhaps the same reason why preexisting gaps between advantaged and less advantaged persons across different domains, including health and education, often widen when opportunities are made more equitable (Ceci & Papierno, 2005; Gottfredson, 2004).

This interactive gene-environment view of personality development is amenable to empirical verification because it supposes that heritability of personality traits is higher in developed societies and lower in more traditional and less modern cultures. Previous studies have revealed a broad genetic influence on all Big Five personality traits, explaining from 40% to 60% of their total variance (Jang, Livesley, & Vernon, 1996; Riemann, Angleitner, & Strelau, 1997). Cross-cultural studies have shown that genetic influences remain invariant across diverse nations (Yamagata et al., 2006). Unfortunately, all existing twin studies of personality have been carried out in highly developed countries. Therefore, the prediction that the heritability of personality traits would be lower in less developed cultures remains to be demonstrated by future investigations.

In summary, we have found that differences between men and women in their personality traits become more extreme with the increasing development of human society. Reported ISDP data indicate that human development—long and healthy life, access to education, and economic wealth—is a primary correlate of the gap between men and women in their personality traits. Most other correlates appear to be mediated by general level of development in health, education, and economy. In societies in which longevity is threatened by poor health, in which only a fraction of people have opportunities for a good education, and in which people suffer from economic hardship, the development of one's inherent personality traits is more restrained. In these hold-down or malnourished conditions, there is a smaller variation around the mean level of personality traits across the ISDP, and it is more likely that any one individual is more like all other individuals. In traditional and less developed countries, therefore, an average man is more like an average woman, not in terms of his social roles or value preferences, but in his basic personality tendencies to feel, think, and act in a way more comparable with women.

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