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Gender differences in implicit and explicit personality traits

Michelangelo Vianello[a,*], Konrad Schnabel[b], N. Sriram[c], Brian Nosek[c]

[a] Department FISPPA, University of Padua, via Venezia, 8, Padova 35131, Italy
[b] Department of Psychology, University of Potsdam, 14476 Potsdam, Germany
[c] Department of Psychology, University of Virginia, Charlottesville, VA 22904-4400, USA

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ABSTRACT

This article investigates gender differences in implicit and explicit measures of the Big Five traits of personality. In a high-powered study ($N = 14{,}348$), we replicated previous research showing that women report higher levels of Agreeableness, Conscientiousness, Extraversion and Neuroticism. For implicit measures, gender differences were much smaller for all, and opposite in sign for Extraversion. Somewhat higher levels of implicit Neuroticism and Agreeableness were observed in women, and somewhat higher levels of implicit Extraversion and Openness were observed in men. There was no gender difference in implicit Conscientiousness. A possible explanation is that explicit self-concepts partly reflect social norms and self-expectations about gender roles, while implicit self-concepts may mostly reflect self-related experiences.

1. Introduction

Describing gender differences in personality is a cultural obsession. Books like "Men are from Mars, women are from Venus" (Gray, 1992) feed the popular imagination that men and women are distinct species. The research literature is somewhat less dramatic. The scientific debate on gender differences in personality traits ranges from claiming that gender differences are close to zero (Hyde, 2005) to the view that they have been obscured by methodological limitations and are actually very large (Del Giudice, Booth, & Irwing, 2012), and a variety of positions in between (Lippa, 2006). This article compares gender differences in personality traits measured with self-report (explicit measurement), which are well-studied, with gender differences in implicit personality traits, as measured by the Implicit Association Test (IAT, Greenwald, McGhee, & Schwartz, 1998; Nosek, Hawkins, & Frazier, 2011). This provides an opportunity to identify possible contributing differences to gender differences as implicit self-concepts are presumed to mostly reflect accumulated experience (Nosek & Hansen, 2008; Nosek et al., 2011), whereas explicit self-concepts are thought to be influenced by experience and other factors such as deliberate self-perceptions, social desirability concerns, and societal norms (cf. Gawronski & De Houwer, in press; Greenwald, Poehlman, Uhlmann, & Banaji, 2009).

1.1. Gender differences in self-reported measures of personality traits

Explicit personality assessments consistently document that women report higher levels of extraversion, neuroticism, agreeableness and conscientiousness on the Big Five personality dimensions (Costa, Terracciano, & McCrae, 2001; Feingold, 1994; McCrae, 2002; McCrae, Terracciano, & 78 Members of the Personality Profiles of Cultures Project, 2005). These differences are robust across methods (Feingold, 1994; McCrae et al., 2005) and vary slightly across countries (Schmitt, Realo, Voracek, & Allik, 2008). In western countries, gender differences are moderate for neuroticism ($d \approx .40$) and small for extraversion, agreeableness and conscientiousness ($d \approx .20$).

There are three main theoretical accounts that might explain these differences. The *evolutionary* account (Baron-Cohen, 2003; Buss, 1995) ascribes gender differences in personality traits to innate sex dispositional differences. In this model, sex differences stem from the different adaptive challenges that men and women faced throughout hominid history. For example, women are more agreeable and nurturing because in previous ages this behavior favored the survival of their children, which in turn provided this disposition with an evolutionary advantage over other trait-related behaviors. At the same time, this behavior was adaptively irrelevant for men because they spent less time nurturing their children. According to the *social role model* approach (Eagly, 1987), gender differences derive from shared social expectations of how men and women should think, feel and behave. Gender roles are internalized very early in life through socialization processes, and they both shape personality traits and trait-relevant behavior. According to this view, gender differences in personality derive from

* Corresponding author. Tel.: +39 049 827 6296; fax: +39 049 827 6600.
E-mail address: michelangelo.vianello@unipd.it (M. Vianello).

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modeling by others and differential feedback about appropriate and desirable behavior to males and females.

A third model posits that gender differences are a measurement *artifact* (Feingold, 1990). In this view, men and women hold different values of what is adequate according to their sex, and gender differences in personality traits are an expression of social desirability rather than differences in the "real" trait (Feingold, 1994). Hence, responses to personality inventories are gender biased because some traits (e.g. dominance) are differently desirable for men and women, but men and women do not actually diverge. The implications of the artifact and social role models differ in whether gender differences are internalized. That is, the artifact account ascribes gender differences to biases in measurement rather than actual differences in personality. Indeed, the artifact account is weakened by the fact that both self-report and behavioral observation data provide similar patterns of gender differences (McCrae et al., 2005). Yet, social desirability could bias both sources of data. Previous research suggests that strong gender differences such as that in aggressive behavior disappear when the actors are anonymous or deindividuated (Lightdale & Prentice, 1994). Further, gender differences are frequently found to be moderated by social context. In a study by Robinson (2009), women scored higher in neuroticism than men only when they judged themselves in regard to situations with their parents whereas no gender differences were evident in regard to situations with their friends or work colleagues. In contrast, women reported higher agreeableness than men only for situations with friends and work colleagues but not for situations with parents. Gender differences in extraversion were not evident for situations with work colleagues, but women reported higher extraversion for situations with parents or friends.

1.2. Implicit measures of personality traits

One way to investigate the influence of social norms and expectations on personality traits is to compare the results obtained by means of traditional inventories with alternative measures that are resistant to socially desirable responding. A recently developed family of techniques – called implicit measures – measure association strengths between concepts (Nosek, Hawkins, & Frazier, 2012; Nosek et al., 2011). Personality traits are assessed indirectly measuring individuals' associations with the self-concept. IAT-based measures of personality traits (see Banse & Greenwald, 2007) have evidence of good reliability and convergent, discriminant and predictive validity (Egloff, Wilhelm, Neubauer, Mauss, & Gross, 2002; Greenwald et al., 2009; Grumm & Von Collani, 2007; Schnabel, Asendorpf, & Greenwald, 2008; Steffens & Schulze-König, 2006). In a meta-analysis, Greenwald and colleagues (2009) observed a moderate correlation between IAT-measured implicit personality traits and behavior ($r = .277$, $K = 24$, $N = 1{,}456$). Importantly, this relationship was independent of social sensitivity (subjects' eagerness to be perceived positively) that is known to reduce the predictive power of self-reported traits. Examination of implicit measures suggest that these measures are less susceptible to socially desirable answers or impression management strategies than explicit self-reports (Gawronski & De Houwer, in press; Nosek, Greenwald, & Banaji, 2007). At the same time, implicit measures are not completely immune to faking and can be distorted if participants are given direct instructions about how to alter their performance. In sum, current available evidence indicates that implicit measures are far more resistant to socially desirable responding than explicit measures and are therefore more suitable for the assessment of self-representations that participants may want to conceal.

Prior studies on gender differences in implicit personality traits have reported mixed findings. On the one hand, Egloff and Schmukle (2004), Frost, Ko, and James (2007) and Vianello, Robusto, and Anselmi (2010) found that sex differences for anxiety, hostility and conscientiousness were small or near zero when employing implicit measures, and higher for self-reported traits. However, a re-analysis of datasets from Asendorpf, Banse, and Mücke (2002) and Schnabel, Banse, and Asendorpf (2006a, 2006b) showed that sex differences for implicit shyness and anxiety ranged between $d = .34$ and $d = .58$ and were similar to explicit measures of the same traits.

While the evolutionary account does not make any specific *a priori* prediction regarding gender differences in implicit personality traits, the other models would anticipate smaller gender differences at the implicit (vs. explicit) measures. The measurement artifact account – which ascribes gender differences to social desirability – would predict null or close to zero implicit gender differences because implicit measures are less susceptible to impression management strategies. Alternatively, the social role model posits that gender differences derive from social expectations that are internalized early in life; hence reliable implicit gender differences should emerge.

2. Method

2.1. Participants and procedure

18,020 study sessions were initiated (67.2% females) and 14,348 were completed between October 15 and November 28, 2010 through the Project Implicit (PI) research website (https://implicit.harvard.edu/; see Nosek, 2005 for more information). More than 1 million study sessions are completed at Project Implicit each year across a variety of studies. While participants are very diverse, they are not representative of any particular population; further these participants self selected to take part in the "Personality IAT" study advertised on the home page for the study duration. Visitors are not financially compensated but received feedback at the end about their implicit and explicit personality scores. We discarded incomplete sessions from subsequent analysis. Participants' mean age was 27.98 (SD = 12.17); 65.2% were female. Participants came from 127 different countries (79.6% United States, 4.5% Canada, 3.4% United Kingdom, 1.6% Australia). The race of the participants was as follows: 6.5% were Asian, 7.2% were African–American, 73.4% were white. An advanced degree was reported by 23.7% of participants, a bachelor or associate degree by 23.6% and 36.7% had some college/university experience. Once participants entered the study, they were provided with 6 self-concept Brief-IATs (Sriram & Greenwald, 2009) measuring five implicit traits and implicit gender identity, corresponding explicit measures of these traits, and a demographic questionnaire. The order of the BIATs and the two sets of questionnaires was randomized. On average, participants completed the study in 18.35 min (SD = 12.42).

2.2. Materials

2.2.1. Explicit measures

We administered the 50-item IPIP representation of Costa and McCrae's (1992) five NEO domains (Goldberg, 1999) and a 40-item adjective measure ("Mini-Markers") of the five-factor structure developed by Saucier (1994). These "Mini-Markers" are a reduced set of the 100-markers developed by Goldberg (1990). The IPIP inventory includes 10 items for each of the five factors. The Mini-Markers scale includes eight adjectives for each of the five factors. Eight adjectives were used to measure participants' gender identity. Response options for all explicit scales ranged from 1 (Very accurate) to 6 (Very inaccurate).

2.2.2. Implicit measures

6 BIATs were used to measure Extraversion, Neuroticism, Conscientiousness, Agreeableness, Openness and Gender Identity. Each BIAT used 2 blocks composed of 26 trials each in which participants focus simultaneously on two categories of stimuli (e.g. "I" and "Male") provided one under the other on the top center of the computer screen. These categories are called focal categories. Stimuli are provided one at a time on the center of the computer screen and participants are asked to categorize them with one response key (e.g., the "i" key). Non-focal stimuli (i.e. stimuli that do not belong to the focal categories displayed on the top center of the screen) also are provided and participants are asked to categorize them as "non-belonging" using another key (e.g., the "e" key). Measures of association strengths derive from the comparison of participants' performance in two blocks that present the same focal attribute (e.g., "I") and different focal concepts (e.g., "Male", "Female"). The first IAT of each session was composed of 4 blocks of – respectively – 18, 26, 18 and 26 trials. Blocks 1 and 2 were identical, and provided randomly one of the two critical tasks of the BIAT (e.g. "I" and "Male"). Blocks 3 and 4 were also identical, and provided the remaining critical task (e.g. "I" and "Female"). The first two trials of each block were presented in predictable order as practice trials, hence they were discarded from the main analyses. Stimuli of the Big Five BIATs were words related to the "Me" category (e.g. "I", "Me"), words related to "Not Me" (e.g. "They", "Them") and personality adjectives (e.g. "Anxious", "Talkative", "Dependable") that have been selected according to Nye, Roberts, Saucier, and Zhou (2008) cross-cultural validation of Goldberg's (1990) adjectives. See web supplement for the list of all stimuli.

3. Results

3.1. Explicit measures

Responses were averaged to obtain an overall score for each trait. Internal consistencies and intercorrelations among all study variables are provided in Table 1. We observed an adequate convergence between the 50-item IPIP inventory and the Mini-Markers. The average uncorrected correlation between different explicit measures of the same trait was .63. The lowest correlation was obtained for Openness (r = .42).

Table 2 provides means, standard deviations, and Cohen's d effect sizes of the differences between mean scores obtained by Male and Female respondents. In line with previous literature (Costa et al., 2001; McCrae, 2002; McCrae et al., 2005), women reported higher levels of Neuroticism (d_{IPIP} = .20; $d_{Mini\text{-}M}$ = .28), Extraversion (d_{IPIP} = .22; $d_{Mini\text{-}M}$ = .16), Agreeableness (d_{IPIP} = .33; $d_{Mini\text{-}M}$ = .36), and Conscientiousness (d_{IPIP} = .30; $d_{Mini\text{-}M}$ = .29), than men in both the IPIP and Mini-Markers scale. Male reported higher levels of Openness ($d_{Mini\text{-}M}$ = −.18) at the Mini-Marker scale and a trivial difference was found between males and females at the IPIP Openness scale (d_{IPIP} = .04). The multivariate effects of gender across explicit traits are Mahalanobis D = .65 for the IPIP scales and .67 for the Mini-Markers scales.

3.2. Implicit measures

Responses at the BIAT were analyzed following scoring recommendations from Nosek, Bar-Anan, Sriram, and Greenwald (2013). Extreme latencies below 400 ms and above 2000 ms were recoded to these boundaries. The first two trials of each block were discarded. Participants were discarded if their percentage of latencies below 300 ms was higher than 10% (4.97% of participants dropped). Individual scores of association strength based on BIATs were computed using the D measure (Greenwald, Nosek, & Banaji, 2003), which is computed as the difference between mean latencies of the two BIAT blocks divided by the standard deviation of latencies in the two blocks (Nosek et al., 2013).

The implicit measures showed internal consistencies ranging from α = .61 for the Neuroticism BIAT to α = .78 for the Gender Identity BIAT (mean alpha across traits: .63). As can be seen in Table 1, homotrait–heteromethod correlations were always higher than homomethod–heterotrait correlations. Within methods, the mean heterotrait correlations were .025 for the BIAT, −.034 for the IPIP-50 and 0 for the Mini-Markers. On the other side, the mean homotrait–heteromethod correlation computed across the three measures was r = .34. The mean same-trait correlation between the two explicit measures was r = .63 and the mean same-trait Implicit–Explicit correlation was .19 (mean r = .17 for the IPIP scales and mean r = .21 for the Mini-Markers). The highest mean correlation between implicit and explicit measures of the same trait was r = .29 for IPIP-Extraversion and the lowest was r = .13 for IPIP-Agreeableness. Within methods and across traits, correlations

Table 1
Implicit and explicit measures: intercorrelations and reliabilities (α).

			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	BIAT	Neuroticism	*.61*																
2		Conscientiousness	−.19	*.63*															
3		Agreeableness	−.17	.21	*.63*														
4		Openness	−.10	.12	.12	*.63*													
5		Extraversion	−.09	.11	.11	.13	*.64*												
6		Gender Identity	.00	−.03	−.09	−.03	.00	*.78*											
7	IPIP−50	Neuroticism	**.16**	−.08	−.05	−.01	−.11	−.06	*.80*										
8		Conscientiousness	−.07	**.15**	.05	−.01	.04	−.10	−.38	*.87*									
9		Agreeableness	−.07	.06	**.13**	.00	.02	−.12	−.39	.29	*.87*								
10		Openness	−.02	.02	.06	**.18**	.04	−.04	−.05	.02	.13	*.88*							
11		Extraversion	−.06	.06	.04	.06	**.24**	−.07	−.35	.25	.18	.18	*.77*						
12	Mini-Markers	Neuroticism	**.20**	−.09	−.04	−.02	−.08	−.08	**.70**	−.36	−.30	−.03	−.28	*.83*					
13		Conscientiousness	−.08	**.17**	.05	−.02	.04	−.08	−.35	**.71**	.28	−.03	.19	−.39	*.83*				
14		Agreeableness	−.07	.09	**.14**	.01	.05	−.13	−.34	.31	**.59**	.08	.29	−.35	.40	*.83*			
15		Openness	−.04	.05	.04	**.24**	.10	.06	−.10	.04	.01	**.42**	.30	−.09	.03	.07	*.85*		
16		Extraversion	−.06	.05	.03	.06	**.29**	−.05	−.29	.21	.12	.09	**.73**	−.24	.21	.26	.25	*.75*	
17		Masculinity–Femininity	−.06	.03	−.08	.04	.10	**.40**	−.16	.06	−.21	−.02	.12	−.20	.03	−.23	.14	.18	*.60*

Note: The main diagonal provides internal consistencies (α); values in bold indicate homotrait–heteromethod correlations. Alpha coefficients for the BIATs have been computed on participants' scores on five different sets of trials. Correlations higher than |.03| are significant for α = .01.

Table 2
Gender differences in implicit and explicit measures of the Big Five traits and gender identity.

	BIAT Mean (SD)			IPIP Mean (SD)			Mini-Markers Mean (SD)		
	Female	Male	*d* (99% CIs)	Female	Male	*d* (99% CIs)	Female	Male	*d* (99% CIs)
Neuroticism	−.197 (.442)	−.236 (.440)	.089 (.076–.106)	3.034 (.988)	2.833 (1.008)	.201 (.170–.248)	3.177 (.903)	2.926 (.901)	.278 (.249–.320)
Conscientiousness	.292 (.461)	.294 (.452)	−.004 (−.017–.014)	4.356 (.901)	4.079 (.950)	.299 (.271–.344)	4.576 (.860)	4.322 (.919)	.286 (.258–.328)
Agreeableness	.429 (.460)	.375 (.468)	.116 (.104–.135)	4.546 (.762)	4.291 (.803)	.326 (.302–.363)	4.808 (.762)	4.528 (.805)	.357 (.333–.394)
Openness	.211 (.431)	.228 (.440)	−.039 (−.051–.022)	4.574 (.818)	4.537 (.852)	.044 (.018–.084)	4.139 (.783)	4.280 (.791)	−.179 (−.205–−.143)
Extraversion	.050 (.455)	.084 (.449)	−.075 (−.088–−.057)	4.090 (.972)	3.873 (1.022)	.218 (.187–.265)	3.923 (.995)	3.758 (1.026)	.163 (.131–.210)
Gender Identity	−.485 (.449)	.487 (.473)	−2.108 (−2.121–−2.090)	N/A	N/A	N/A	3.062 (.673)	3.932 (.725)	−1.245 (−1.267–−1.211)
Multivariate Effects (Mahalanobis *D*)			.189 (.142–.238)*			.645 (.595–.697)*			.667 (.617–.719)*

* Nonparametric Bootstrap (Case resampling), $N = 10000$.

range from $r = -.39$ for the relationship between IPIP-Neuroticism and IPIP Agreeableness to $r = .26$ for the relationship between IPIP Agreeableness and IPIP Conscientiousness.

3.3. Hypothesis test

We estimated a multivariate analysis of variance (MANOVA) for repeated measures with a two-level between-subject factor (Gender), a three-level within-subject factor (Measure: BIAT, IPIP, Mini-Markers) and the five personality traits as dependent variables. We standardized the BIAT, IPIP and Mini-Markers measures of personality traits before running the analysis (Mean = 0, SD = 1). The main multivariate effects of Gender and Measure were significant (Gender: Wilks' $\lambda = .92$, $F_{(5,4258)} = 78.135$, $\eta^2 = .08$, Measure: Wilks' $\lambda = .98$, $F_{(10,4253)} = 7.407$, $\eta^2 = .02$), although the main effect of Measure was small. Importantly, the Gender by Measure interaction was significant (Wilks' $\lambda = .96$, $F_{(10,4253)} = 18.236$, $\eta^2 = .04$). Most critical for our hypothesis, the multivariate pairwise comparisons of Gender across the three levels of Measure is significant for the IPIP (Mean difference = .208, $p < .001$) and Mini-Markers (Mean difference = .185, $p < .001$) and not significant for the BIAT (Mean difference = .073, $p = .024$). Confidence intervals (99%) around gender differences across measures are plotted in Fig. 1 and confirm this conclusion: at the multivariate level, gender differences were large for both the IPIP and Mini-Markers scales (IPIP: $T^2 = 328.097$, $\lambda = .93$, $F_{(5,4258)} = 65.846$, $p < .01$, $\eta^2 = .072$; Mini–Markers: $T^2 = 413.317$, $\lambda = .91$, $F_{(5,4258)} = 82.506$, $p < .01$, $\eta^2 = .088$), and much smaller for the BIAT ($T^2 = 46.87$, $\lambda = .99$, $F_{(5,4258)} = 9.544$, $p < .01$, $\eta^2 = .011$).

Computing Mahalanobis *D*s for our measures, we observe that $D = .19$ for the BIAT ($Dc = .26$ when correcting for unreliability), and more than 3 times larger for the IPIP-50 ($D = .64$; $Dc = .76$) and the Mini-Markers ($D = .67$; $Dc = .78$). Table 2 provides bootstrapped confidence intervals around the *D*s. The multivariate effect size of the gender difference in implicit measures is very low and different from those of the explicit measures, which in turn are not different from each other (Fig. 2).

4. Discussion

In our study, implicit measures of personality yielded weak or near zero gender differences. Women scored slightly higher in

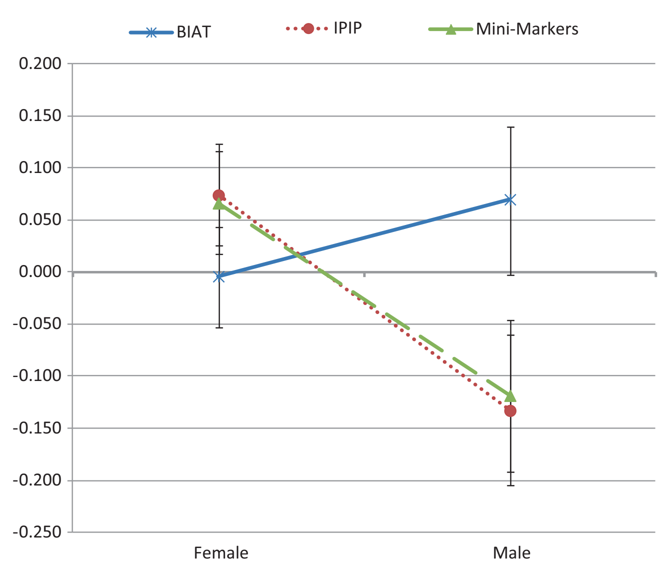

Fig. 1. The multivariate interaction effect of gender and measure across traits. The vertical axis represents multivariate estimated marginal means separately for males and females across the three measures. Error bars represent 99% *CIs* around the multivariate means.

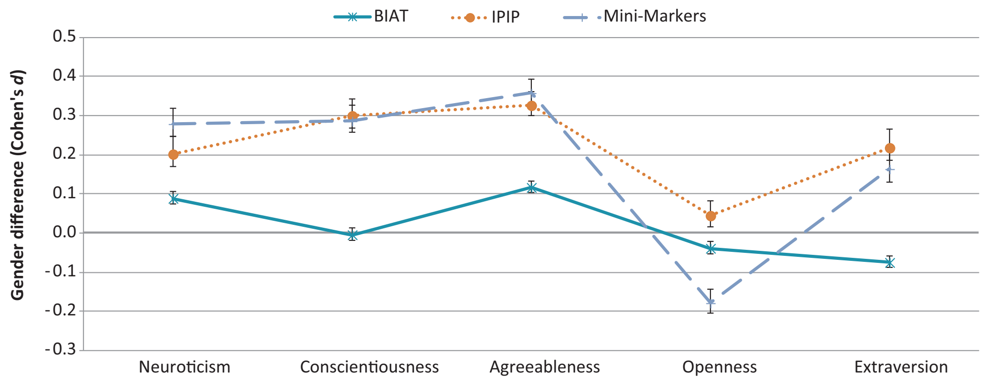

Fig. 2. Graphical representation of gender differences (*d*) across traits and measures. Higher *d*s represent higher female scores. Error bars represent 99% *CIs* around the *d*s.

implicit Neuroticism and Agreeableness, whereas men scored slightly higher in implicit Openness and Extraversion. No difference was found in implicit Conscientiousness. On the contrary, with explicit measures, women scored higher in Neuroticism, Conscientiousness, Agreeableness and Extraversion. Openness was higher for men when measured with the IPIP-50 and lower when measured with the Mini-Markers. The largest gap between implicit and explicit measures was in Extraversion. Women reported moderately stronger extraversion whereas men showed slightly stronger implicit identification with extraversion. Overall, the multivariate personality distributions of males and females differ by 8% when implicit measures were employed and 25% when explicit measures were employed. One limitation of drawing a strong conclusion is the different internal consistencies of the implicit and explicit measures. However, even after applying a correction for unreliability, implicit measures still showed much weaker gender differences.

These results could be observed if implicit measures are less sensitive than explicit measures, and hence just failed to observe actual gender differences. However, the implicit measures were sensitive enough to elicit a strong correlation between implicit gender identity and self-reported gender ($r = .7$). This correlation is even stronger than that between self-reported gender and self-reported masculinity–femininity ($r = .5$). Finally, if sensitivity were the sole explanation, then effect would have all been positive, just near zero. However, Extraversion actually elicited a small effect in the opposite direction. Taken together, these results suggest that gender differences that have been constantly observed in self-reported personality traits are not held similarly implicitly.

There is no conclusive explanation for these effects, but they have interesting implications for the theoretical explanations of gender differences in personality. Some accounts anticipate that explicit measures are influenced by deliberate self-perceptions, social desirability concerns, and societal norms. This study provides a first estimate of the magnitude of this influence. Results support both the "measurement artifact" (Feingold, 1990) and the "social role model" (Eagly, 1987) accounts, but simultaneously suggest that neither is complete. A pure version of the measurement artifact account would anticipate no gender differences implicitly, as implicit measures are not thought to be influenced by social desirability concerns (however, some evidence suggests that the effect of social desirability on implicit measurement may not be zero; Gawronski & De Houwer, in press; Schnabel e al., 2006a). Also, the social role model suggests that gender differences are internalized. The fact that implicit gender differences were 3 times smaller than explicit gender differences could suggest that internalization is incomplete.

A possible resolution with the present empirical data is a "social artifact" hypothesis. Gender differences are larger for self-report scales because self-reports may be influenced by experience and subjective assessment of social norms that are applied to self-definition. Associations assessed with implicit measures may likewise be influenced by observation and experience with social norms and expectations thus creating implicit gender differences. Simultaneously, these associations may reflect accumulated daily experience with the trait concepts and their own behavior (Gawronski & Bodenhausen, 2006; Nosek & Hansen, 2008; Nosek et al., 2011, 2012). If those daily experiences are not differentiated by gender, then this would lead to weaker gender differences when using implicit measures. This hypothesis could be evaluated by examining gender differences in behaviors that are predicted particularly well by implicit or explicit measures. When implicit measures are a better predictor, gender differences in the behavior should be weaker; when explicit measures are a better predictor, gender differences in the behavior should be stronger.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.paid.2013.08.008.

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