Running Head: BALANCED IDENTITY

Balance Identity Theory: Evidence for Implicit Consistency in Social Cognition

Dario Cvencek

Institute for Learning & Brain Sciences

University of Washington

Anthony G. Greenwald

Department of Psychology

University of Washington

Andrew N. Meltzoff

Institute for Learning & Brain Sciences

University of Washington

A chapter to appear in Gawronski, B., & Strack, F. (Eds.). *Cognitive consistency: A unifying concept in social psychology*. New York: Guilford Press.
Please do not circulate without permission of the authors.

Introduction

Balanced identity theory is an integrative theoretical account of social psychology's most important cognitive (stereotype and self-concept) and affective (attitude and self-esteem) constructs. This chapter starts by reviewing the theory and the methods for testing it. The chapter's main contribution is a meta-analytic summary of 14 studies that have tested the theory with implicit or explicit measures.

The theory was originally formulated as "Unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept" (Greenwald et al., 2002). This review uses a new name, borrowed from the name of a research design class that Greenwald et al. (2002) introduced to test some of theory's correlational predictions – the *balanced identity design*. Other than the name used to refer to it, the theory is unchanged from its original presentation.

Balanced identity theory was derived in part from three major mid-20th-century theories of cognitive-affective consistency: Congruity theory (Osgood & Tannenbaum, 1955), cognitive dissonance theory (Festinger, 1957), and balance theory (Heider, 1958). In a departure from these consistency theories, balanced identity theory derives its supporting evidence from recently developed implicit measures of social-cognitive constructs, especially the Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998), rather than from self-report measures.

As described by Greenwald et al. (2002), balanced identity theory rests on three assumptions. First, social knowledge is defined as knowledge of persons (including self), groups, and their attributes (including valence) that can be represented as a network of associations using node (concept) and link (association) diagrams such as Figure 1. Second, the self is a central entity in the associative knowledge structure, and is represented as a node that is highly connected in the structure. Third, positive and negative valence can be represented as nodes in the associative structure, permitting (for example) the representation of self-esteem as connections of the self node to positive or negative valence nodes.

Figure 1, which is adapted with minor variations from Figure 1 of Greenwald et al. (2002), displays a hypothetical schematic social knowledge structure (SKS). Although the nodes represented in Figure 1 comprise a small portion of any actual SKS, they suffice to illustrate the theory's representations of self-concept, self-esteem, stereotype, and attitude.

To describe expected relations among self-esteem, self-concept, stereotypes and attitudes within associative structures such as SKS (Figure 1), balanced identity theory posits three principles that constrain associative strengths within such structures. This chapter focuses on just the first of these, the balance–congruity principle, which has been the only focus of empirical testing. Its statement, which is quoted here from the original article (Greenwald et al., 2002, p. 6), required preliminary definition of a property of associative structures.

> ***Definition 1: Shared first-order link***. When each of two nodes is linked to the same third node, the two are said to have a shared first-order link.
>
> ***Principle 1: Balance–congruity***. When two unlinked or weakly linked nodes share a first-order link, the association between these two should strengthen.

The principle was named balance–congruity to acknowledge its relation to central principles of both Heider's (1946, 1958) balance theory and Osgood and Tannenbaum's (1955) congruity theory. In the structure of Figure 1, application of the balance–congruity principle to the shared first order links of *Me* and *math* to both *male* and *positive* should establish or strengthen a link between *Me* and *math*.

Methods for Empirical Tests of Balanced Identity Theory

As described by Greenwald et al. (2002), self-report measures are not necessarily preferred for testing balanced identity theory's predictions for two reasons. First, subjects may have no introspective access to some of the associative links of SKS (cf. Greenwald and Banaji, 1995). Second, self-report measures are susceptible to artifacts (especially impression management), which may distort assessment of associative links even when they are introspectively available. Consequently, empirical tests of the balance–congruity principle have made use of a recently developed alternative to self-report methods, the Implicit Association Test.

The Implicit Association Test (IAT)

The Implicit Association Test (Greenwald, McGhee, & Schwartz, 1998) is a computerized categorization task that measures relative strengths of associations among concepts. An IAT measure of association strengths is calculated by comparing the speed with which people categorize exemplars from four categories under two instructional conditions that vary assignments of the four categories to two computer keyboard responses. The measure is based on the principle that subjects should find it easier to give the same response to items from two categories if the two categories are associated than if they are not (Greenwald, McGhee, & Schwartz, 1998, p. 1464). IAT measures provide relative, not absolute, measures of association strengths. For example, an IAT measure of self-esteem assesses strength of the *Me–positive* and *other–negative* associations relative to the strengths of *Me–negative* and *other–positive* associations.

Statistical Testing of the Balance–Congruity Principle

Balanced identity theory's balance–congruity principle can be tested by using the *balanced identity design* (BID), which was introduced in the 2002 theoretical statement. The BID requires measurement of the strengths of the associations among all pairs of three concepts, which typically include the self, a social category such as a group membership, and an attribute. These three associations can be identified as self–group (SG; corresponding to *identity*), group–attribute (GA; corresponding to *attitude* toward or *stereotype* of the group), and self–attribute (SA; corresponding to *self-esteem* or *self-concept*).

Greenwald et al. (2002) described a 4-test sequence that statistically assesses whether the interrelations among three measures of association strength reflect the operation of the balance–congruity principle. With the measures of SG, GA and SA associations, this analysis can be done using, in turn, each of the three association measures as criterion in a hierarchical regression in which, in the first step, the criterion association's strength is predicted from the product of the strengths of the other two. In the second step, the two predictor associations are entered singly. If it can be assumed that the associations are measured on scales with rational zero points that identify a point of equality of strengths of the sets of associations contained in the measure (e.g., self–positive and self–negative in a self-esteem measure), the prediction is a significant effect of the product term on the first step, and no additional variance predicted by the component associations on the second step (Greenwald et al., 2002, p. 11).

Each of the three 2-step regressions provides four tests: (a) the Multiple *R* should have a statistically significant and numerically positive regression coefficient at Step 1; (b) the product term's coefficient should remain numerically positive at Step 2; (c) the increase in criterion variance explained at Step 2 should not be statistically significant; and (d) neither regression coefficient associated with the individual predictors should differ from zero at Step 2. This 4-test sequence evaluates a *pure multiplicative* model, which asserts that the multiplicative product of two measures is the sole predictor of a criterion measure. This method bypasses the standard regression procedure of testing significance of a product term after first entering its component variables as predictors. Explanation of the 4-test procedure is given briefly in Greenwald et al. (2002, pp. 9–11) and at greater length by Greenwald, Rudman, Nosek, and Zayas (2006).

Quantitative (Meta-Analytic) Review of Empirical Findings

Search Method

Studies were initially sought using three methods: (a) PsycINFO search (using the keywords *cognitive balance*, *cognitive consistency*, *balanced identity*, *IAT*, *Implicit Association Test*, *implicit attitude, implicit identity, implicit self-esteem, implicit stereotype, implicit self-concept, 3 IATs, 3 Implicit Association Tests*), (b) PubMed search (using the same keywords as in the PsycINFO search), and (c) Internet search (using Google Scholar, same keywords as in the preceding two searches). In addition, the PsycINFO database was used to identify studies that referenced Greenwald et al. (2002). The search produced 16 reports containing 19 independent samples (Lipsey & Wilson, 2001, p. 112). For two of the 16 reports, the information needed for the meta-analysis was no longer available (Hummert, Garstka, O'Brien, Greenwald, & Mellott, 2002; Rudman & Goodwin, 2004). Consequently, the meta-analysis reported below was conducted on 17 independent samples (Lipsey & Wilson, 2001, p. 112) with a total of 1, 766 subjects (see Table 1).[1]

[1] The two rows for the Lane et al. (2005) study are for samples that differed only because of different patterns of missing data from the same larger group of subjects. These were nevertheless treated as independent samples because the hypotheses tested were sufficiently different so that it seemed inappropriate to average them into a single sample.

Calculation of Effect Sizes

Two of the statistical tests used in testing for fit of balanced identity results to multiplicative prediction are based on magnitudes of multiple *R* coefficients. These are at regression Step 1 (expected significance of multiplicative predictor) and Step 2 (expected non-significance of added predictors). Mean effect sizes (*r*s) for the results at Step 1 were computed from the standardized *b* coefficient in Step 1 (which are equivalent to a signed correlation coefficient, *r*). An inverse variance weight was computed for each mean *r* as ($n – 3$) with *n* being the number of subjects in the independent sample (Hedges Olkin, 1985).

For the regression Step 2, the magnitude of effect sizes is not as meaningful as at the regression Step 1, primarily because of the variety of ways in which the two added predictors can produce effects. The Step 2 results were, therefore, examined only in terms of whether or not the increment was statistically significant. The statistical significance of *R* increase at Step 2 was calculated from multiple regression results with the following formula:

$$F\text{-change} = [(R_2^2 - R_1^2)/(k_2 - k_1)]/[(1-R_2^2)/(n - k_2 -1)],$$

where R_1 and R_2 are multiple correlation coefficients at regression Steps 1 and 2 respectively, k_1 and k_2 are number of predictors at regression Steps 1 and 2 respectively, and *n* is the sample size. The 2-tailed probabilities associated with the *F*-change values were converted to 1-tailed *p* values for meta-analytic use. With this step and probit conversion of 1-tailed *p* values to *z*-value effect sizes, an *F*-change of 0 (i.e., zero increment in explained variance at Step 2) is appropriately represented as an effect size of zero.

Aggregate Effect Sizes and Homogeneity Tests

The weighted average effect sizes (with 95% confidence intervals) for implicit measures were close to the conventionally moderate value of $r = .3$: $r_{SG} = .304$ (±.064), $r_{GA} = .300$

(±.072), and r_{SA} = .251 (±.055). All three types of effect size were (a) significantly heterogeneous when tested with fixed-effects models (see bottom three rows of Table 1) and (b) significantly different from zero in the positive direction by a random-effects test (all *p*s < .0001).[2] A repeated-measures ANOVA was conducted on *r*-to-*Z* transformations of effect sizes at Step 1 to test for differences of the multiplicative product term at Step 1 among the three types of associations (i.e., SG, GA, and SA). This analysis found no effect of association type ($p > .25$).

Effect sizes for explicit measures were close to conventionally small value of $r = .1$: r_{SG} = .096 (±.077), r_{GA} = .060 (±.079), and r_{SA} = .099 (±.078). None of the three effect sizes was significantly heterogeneous when tested with fixed-effects models (Table 2). The weighted average effect sizes for explicit measures were significantly different from zero in the positive direction for SG and SA measures (both *p*s ≤ .02), but were not significant for GA measures ($p = .14$) when tested with a random-effects test.

Confirmation of the Expected Data Patterns for Balanced Identity

Multiplicative product term at Step 1. One expectation of a pure multiplicative model is that the data of the balanced identity design should be fit entirely by the multiplicative product term. Statistically, this translates to the expectation that the multiple *R* associated with the product term should be statistically significant at the first step, with no significant increase in *R* from adding the individual predictors on the second step. Data obtained with the implicit measures supported this expectation more strongly that the parallel data obtained with explicit

---

[2] A non-significant *Q* does not always warrant a conclusion that a fixed-effects model is justified. With small numbers of effect sizes, such as the number of studies reported here, the homogeneity test may lack sufficient statistical power to reject homogeneity even when the variability among the effect sizes is considerable and due to factors other than subject-level sampling error (Lipsey & Wilson, 2001, p. 117). Consequently, random-effects estimates are reported for analyses involving weighted average effect sizes.

measures. A 3 (Association type: SG, GA, and SA) X 2 (Measure type: Implicit and explicit) repeated-measures ANOVA was conducted on *r*-to-*Z* transformations of effect sizes at Step 1 using only the 8 samples for which both implicit and explicit measures were available. This analysis was done to test for (a) differences of the multiplicative product term at Step 1 among the three types of associations (i.e., SG, GA, and SA) for both implicit and explicit measures and (b) differences between implicit and explicit measures.

The results indicated a main effect of measure type, $F(1, 7) = 13.11$, $MSE = 0.82$, $p = .008$. There was no main effect of association type, nor a measure X association type interaction (both *p*s >. 24). These results suggest that, while effect sizes at Step 1 were larger for implicit than explicit measures, they did not vary as a function of the association type.

Statistical significance at Step 2. For the regression Step 2, at which no significant increase in prediction is expected from adding the individual predictors, the result is useful only in terms of whether or not it is statistically significant (as described earlier). Therefore, the same 3 X 2 repeated measures ANOVA was conducted on z-transforms of the *p* values obtained at Step 2. There were no main effects for either measure or association type, nor was there an interaction of measure X association type interaction (all *p*s > .33).

Multiple *R* at Steps 1 and 2. The expectation of the pure multiplicative model regarding the multiple *R*s at regression Steps 1 and 2 can be examined by how often the two crucial tests of Greenwald et al.'s (2002) 4-test method were passed. The two statistical tests presented in this section are the ones based on magnitudes of multiple *R* coefficients and passing of both tests can be used to test for fit of balanced identity results to multiplicative prediction (The full 4-test method is detailed only in part in the section below, because we did not have access to the complete 4-test results for all of the studies in the meta-analysis).

Table 1 displays the statistical significance of effect sizes at regression Steps 1 and 2 for the 17 independent samples included in this report using implicit measures. Regression analyses from the 17 samples for which implicit data were available provided 51 opportunities to confirm the theoretical expectations at both regression steps. Implicit measures confirmed the expected pattern in 29 of these 51 opportunities (57%). In contrast, analyses from the 8 samples for which explicit data were available (see Table 2) provided 24 opportunities, with the expected pattern confirmed only 3 times (12%). When implicit analyses were limited only to the 8 independent samples for which explicit data were available, regressions confirmed the expected theoretical pattern 15 times in the 24 opportunities (63%; see Table 1). These results confirm previous reports that evidence conforming to the balance–congruity principle is stronger on implicit than on corresponding explicit measures (Greenwald et al. 2002; Greenwald, Rudman, Nosek, & Zayas, 2006).

Passing of the 4-test method. The expectation of the pure multiplicative model can also be examined by how often *all four tests* of Greenwald et al.'s (2002) 4-test method were passed. For the six studies for which we had results for all four tests from each of the three regression analyses (Banaji, Greenwald, & Rosier, 1997; Cvencek, Greenwald, & Meltzoff, in press; Farnham & Greenwald, 1999; Mellott & Greenwald, 2000; Nosek, Banaji, & Greenwald, 2002; Rudman, Greenwald, & McGhee, 2001) results indicated that, of the 18 possible opportunities to pass all 4-tests, implicit data passed 12 (67%). In contrast, of the 12 opportunities to pass all 4-tests, explicit data passed only 1 (8%).

Zero-order correlations. Another expectation of the balance–congruity principle's multiplicative model is that the zero-order (i.e., bivariate) correlations between any two of the three association-strength measures in the balanced identity design should have the same sign as the mean value of the remaining association's measure, when that value is measured on a scale for which zero indicates equality of contrasted association strengths (see Greenwald et al., 2002, pp. 11–12). Data obtained with implicit measures conformed closely to this expectation, whereas the data obtained with explicit measures did not. Figure 2 display these results. Fit for the three types of implicit measures (panels A, B, and C) is indicated by significant positive regression slopes (rs $\geq .67$; ps $\leq .003$) that do not deviate significantly from passing through the origin. Conversely, fit for the three explicit measures (panels D, E, and F) was quite poor, as indicated by non-significant regressions (rs $\leq .35$; ps $\geq .40$). These results confirm other indications that fit with predictions of the balance–congruity principle is evident with implicit, but not explicit, measures.

Discussion

The main goal of this meta-analysis was to test predictions of the balance–congruity principle with implicit and explicit measures. These predictions were supported more strongly in the data obtained with implicit measures, as indicated, in part, by larger average effect sizes (rs) for implicit than explicit measures at the first regression step, at which only the product term is entered. The weighted average of these SG, GA and SA effect sizes for the implicit measures, based on 17 independent samples, were $r_{SG} = .304$, $r_{GA} = .300$, and $r_{SA} = .251$, levels close to the conventional "moderate" value of $r = .30$ (Cohen, 1988). In contrast, weighted average effect sizes for the parallel self-report measures were considerably smaller — close to the conventional "small" value of $r = .1$: $r_{SG} =.096$, $r_{GA} =.060$, and $r_{SA} =.099$. This difference in effect size for the product term at Step 1 was statistically significant.

Also consistent with the conclusion that expectations of the balance–congruity principle were better fit by data for implicit measures, (a) implicit measures showed substantially more frequent confirmation of the combined expectation of statistical significance of the product term as the sole predictor (at Step 1) and non-significant increment in *R* when the product term's component associations were added as individual predictors (Step 2), and (b) signs of the zero-order correlations between any two of the three association-strength measures in the balanced identity design corresponded to the sign of the measure of the remaining association measured on a scale with rational zero value (see Figure 2).

Also noteworthy is that the pattern of confirmation of balance–congruity expectations in both Steps 1 and 2 for all three regressions in the same study was observed for implicit measures in 7 of the 17 samples, and was very close to that in three others (Banaji et al., 1997; Dunham et al., 2007, Sample 2; Lane et al., 2005). This pattern was not confirmed in full for any of the 8 samples for explicit measures, was very close to confirmation in only one sample (Cvencek, Meltzoff, & Greenwald, in press), and was not close to confirmation in any others.

Greenwald et al. (2002) attributed the relatively poor fit of explicit measure findings to predictions from the balance–congruity principle to (a) introspective limits that may render association strengths inaccessible to measurement by self-report and (b) response factors such as demand characteristics and evaluation apprehension that may distort self-report measures (Greenwald et al., p. 17). The only study for which regressions involving all three explicit measures came very close to full confirmation of the pure multiplicative model was also the only study in which subjects were young children (Cvencek et al., in press; see Table 2). This may indicate that the response factors that may distort results with explicit measures in adult samples are less of an interfering factor in children. Because there is no other evidence for that interpretation, it should be regarded as speculation that awaits the appearance of additional relevant studies.

Conclusion

This review confirms previous indications that evidence for Balanced Identity Theory is stronger when tested with IAT measures of association strengths than when tested with parallel self-report measures. There were four relevant results. First, the average effect sizes obtained with implicit measures were larger at the first regression step (weighted average r = .29) than those obtained with corresponding explicit measures (weighted average r = .09). Second, the implicit measures confirmed the expectation of the pure multiplicative model at regression Steps 1 and 2 considerably more often than did the explicit measures. Third, the data obtained with the implicit (but not explicit) measures conformed to the expectation that the sign of the zero-order correlations between any two of the three association-strength measures in the balanced identity design should correspond to the mean value of the measure of the third association. Additionally, the meta-analysis also indicated that the implicit measure findings did not vary by association type, supporting the expectation that the three association measures in a balanced identity design are effectively interchangeable in their roles in data analysis.

References

Aidman, E.V., & Carroll, S.M. (2003). Implicit individual differences: Relationships between implicit self-esteem, gender identity, and gender attitudes. *European Journal of Personality*, *17*, 19-23.

Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.

Banaji, M. R., Greenwald, A. G., & Rosier, M. (1997, October). *Implicit esteem: When collectives shape individuals.* Paper presented at the Preconference on Self, Toronto, Ontario, Canada.

Bargh, J. A. (1997). The automaticity of everyday life. In R. S. Wyer (Ed.), *Advances in social cognition* (Vol. 10, pp. 1–61). Mahwah, NJ: Erlbaum.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd edition). Hillsdale, NJ: Erlbaum.

Cvencek, D., Meltzoff, A. N., Greenwald, A. G. (in press). Math–gender stereotypes in elementary school children. *Child Development*.

Devos, T., Blanco, K., Munoz, C., Dunn, R., & Ulloa, E.C. (2008). Implicit orientation toward family and school among bilingual Latino college students. *The Journal of Social Psychology*, *148*, 449-471.

Devos, T., Blanco, K., Rico, F., & Dunn, R. (2008). The role of parenthood and college education in the self-concept of college students: Explicit and implicit assessments of gendered aspirations. *Sex Roles*, *59*, 214–228.

Devos, T., & Cruz Torres, J.A. (2007). Implicit identification with academic achievement among Latino college students: The role of ethnic identity and significant others. *Basic and Applied Social Psychology*, *29*, 293–310.

Devos, T., Diaz, P., Viera, E., & Dunn, R. (2007). College education and motherhood as components of self-concept: Discrepancies between implicit and explicit assessments. *Self and Identity*, *6*, 256–277.

Devos, T., Gavin, K., & Quintana, F.J. (2010). Say “Adios” to the American dream? The interplay between ethnic and national identity among Latino and Caucasian Americans. *Cultural Diversity and Ethnic Minority Psychology*, *16*, 37-49.

Dunham, Y., Baron, A. S., & Banaji, M. R. (2007). Children and social groups: A developmental analysis of implicit consistency in Hispanic Americans. *Self and Identity*, *6*, 238–255.

Farnham, S. D., & Greenwald, A. G. (1999, June). *In-group favoritism: Implicit self-esteem x in-group identification.* Paper presented at the 11th annual meeting of the American Psychological Society, Denver, CO.

Fazio, R. H., Jackson, J. R., Dunton, B. C., & Williams, C. J. (1995). Variability in automatic activation as an unobstrusive measure of racial attitudes: A bona fide pipeline? *Journal of Personality and Social Psychology*, *69*, 1013–1027.

Festinger, L. (1957). *A theory of cognitive dissonance*. Palo Alto, CA: Stanford University Press.

Greenwald, A. G., & Banaji, M. R. (1995). Implicit social cognition: Attitudes, self-esteem, and stereotypes. *Psychological Review*, *102*, 4–27.

Greenwald, A. G., Banaji, M. R., Rudman, L. A., Farnham, S. D., Nosek, B. A., & Mellott, D. S. (2002). A unified theory of implicit attitudes, stereotypes, self-esteem, and self-concept. *Psychological Review*, *109*, 3–25.

Greenwald, A. G., McGhee, D. E., & Schwartz, J. L. K. (1998). Measuring individual differences in implicit cognition: The Implicit Association Test. *Journal of Personality and Social Psychology*, *74*, 1464–1480.

Greenwald, A. G., Nosek, B. A., & Banaji, M. R. (2003). Understanding and using the Implicit Association Test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology*, *85*, 197–216.

Greenwald, A. G., Poehlman, T. A., Uhlmann, E., & Banaji, M. R. (2009). Understanding and using the Implicit Association Test: III. Meta-analysis of predictive validity. *Journal of Personality and Social Psychology*, *97*, 17–41.

Greenwald, A. G., Rudman, L. A., Nosek, B. A., & Zayas, V. (2006). Why so little faith? A reply to Blanton and Jaccard's (2006) skeptical view of testing pure multiplicative theories. *Psychological Review*, *113*, 170–180.

Hedges, L. V., & Olkin, I. (1985). *Statistical methods for meta-analysis.* Orlando, FL: Academic Press.

Heider, F. (1946). Attitudes and cognitive organization. *Journal of Psychology*, *21*, 107–112.

Heider, F. (1958). *The psychology of interpersonal relations*. New York: Wiley.

Hummert, M.L., Garstka, T.A., O'Brien, L.T., Greenwald, A.G., & Mellott, D.S. (2002). Using the Implicit Association Test to Measure Age Differences in Implicit Social Cognitions. *Psychology and Aging, 17*, 482-495.

Lane, K.A., Mitchell, J.P., & Banaji, R.M. (2005). Me and my group: Cultural status can disrupt cognitive consistency. *Social Cognition*, *23*, 353–386

Lipsey, M. W., & Wilson, D. B. (2001). *Practical meta-analysis.* Thousand Oaks, CA: Sage.

Mellott, D. S., & Greenwald, A. G. (2000). *But I don't feel old! Implicit self-esteem, age identity and ageism in the elderly*. Unpublished manuscript, University of Washington, Seattle.

Nosek, B. A., Banaji, M. R., & Greenwald, A. G. (2002). Math = male, me = female, therefore math ≠ me. *Journal of Personality and Social Psychology*, *83*, 44–59.

Osgood, C. E., & Tannenbaum, P. H. (1955). The principle of congruity in the prediction of attitude change. *Psychological Review*, *62*, 42–55.

Rudman, L.A., & Goodwin, S.A. (2004). Gender Differences in Automatic In-Group Bias: Why Do Women Like Women More Than Men Like Men? *Journal of Personality and Social Psychology, 87*, 494–509.

Rudman, L.A., Greenwald, A.G., & McGhee, D.E. (2001). Implicit self-concept and evaluative implicit gender stereotypes: Self and in-group share desirable traits. *Personality and Social Psychology Bulletin*, *27*, 1164-1178.

Table 1.
Effect Sizes and Characteristics of the 17 Independent Samples Providing Implicit Data.

Citation	Subjects	*N*	Group Concept	Attribute concept	Criterion Association Measure					
					Self-Group		Group-Attribute		Self-Attribute	
					Effect size		Effect size		Effect size	
					r (Step 1)	*p* (Step 2)	*r* (Step 1)	*p* (Step 2)	*r* (Step 1)	*p* (Step 2)
Aidman & Carroll (2003)	males, females	66	female	pleasant	**.55*****	***	**.45*****	***	.17	***
Banaji et al. (1997)	Whites, Blacks	61	White	positive	**.58*****	**	**.70*****	–	**.27***	*
Cvencek et al. (in press) [a]	girls, boys	222	boy	math	**.21*****	–	**.16***	–	**.20****	†
Devos & Cruz Torres (2007)	Latinos, Whites	80	White	high achievement	**.29****	***	**.27***	***	**.28***	–
Devos & Cruz Torres (2007)	Latinos	49	significant other	high achievement	**.39****	†	**.41****	*	**.37****	**
Devos et al. (2007) [a]	mothers	60	college education	pleasant	**.28***	–	**.35****	–	**.32***	–
Devos et al. (2008a) [a]	females	169	woman	college education	**.33****	–	**.32*****	–	**.31*****	–
Devos et al. (2008b)	bilingual Latinos	128	school	pleasant	.12	–	.12	*	.11	*
Devos et al. (2010)	Latinos, Whites	108	White	American	.18	***	**.20***	***	**.20***	***
Dunham et al. (2007)	Hispanic children, Hispanic adults	129	Hispanic	good	.06	–	.05	–	.00	–
Dunham et al. (2007)	Hispanic children, Hispanic adults	137	Hispanic	good	**.23****	†	**.20***	–	**.16†**	–
Farnham & Greenwald (1999) [a]	Females	65	female	positive	**.47*****	–	**.45*****	†	**.43*****	–
Lane et al. (2005) [a]	Yale students	235	Yale	good	**.31*****	–	**.37*****	–	**.29*****	–
Lane et al. (2005)		215	residential college	good	**.24*****	*	**.30*****	–	**.23*****	–
Mellott & Greenwald (2000)	undergraduates	98	old	positive	**.38*****	–	**.30*****	**	**.40*****	*
Nosek et al. (2002) [a]	Females	91	male	math	**.41*****	–	**.23***	–	**.43*****	–
Rudman et al. (2001) [a]	Females	68	male	potent	**.36****	–	**.36****	–	**.30***	–
				Average *r*	.304		.300		.251	
				(95% CI)	(±.064)		(±.072)		(±.055)	
				SD	.136		.153		.114	
				p [Q]	.003		.0001		.068	

Note. Subjects = subject groups comprising independent samples in each study; *N* = number of subjects contributing to each balanced identity analysis;

Balanced identity design always includes measures of associations that link the concept of *self* with one *group concept* (e.g., female, school, Hispanic) and one *attribute concept* (e.g., valence, math); Effect sizes (*r*) are presented separately for each of the three regressions in which one measure of association strength is always entered as a criterion (e.g., measure of the *self-group* association) and the other two measures as predictors (e.g., measures of *group-attribute* and *self-attribute* associations). The weighted mean effect sizes ate the first regression step (*r*), their 95% confidence intervals (CIs), and their weighted standard deviations (*SD*s), transformed back to the *r* metric were computed from a random-effects test for Fisher's *Z*-transformed *r* values at Step 1 of a multiple hierarchical regression analysis. *p* = statistical significance of effect sizes at the second regression step (see below); *p* [Q] = probability values for fixed-effects test of homogeneity (Hedges & Olkin, 1985).

Bold font indicates statistically significant effect sizes ($p \leq .05$).

– = ns ; † = .05 < p < .10; * = .01 < p < .05; ** = .005 < p < .01; *** = < .005

[a] These samples confirmed balance–congruity expectations in Steps 1 and 2 for all three regressions.

Table 2.
Effect Sizes and Characteristics of the 8 Independent Samples Providing Explicit Data.

Citation	Subjects	*N*	Group Concept	Attribute concept	Criterion Association Measure					
					Self-Group		Group-Attribute		Self-Attribute	
					Effect size		Effect size		Effect size	
					r (Step 1)	*p* (Step 2)	*r* (Step 1)	*p* (Step 2)	*r* (Step 1)	*p* (Step 2)
Cvencek et al. (in press)	girls, boys	220	boy	math	**.16***	†	**.12†**	–	**.21****	*
Devos & Cruz Torres (2007)	Latinos, Whites	80	White	high achievement	.18	–	.18	–	.13	–
Devos & Cruz Torres (2007)	Latinos	49	significant other	high achievement	.11	***	.09	***	.10	–
Devos et al. (2008a)	females	169	woman	college education	.03	†	.03	–	.03	*
Devos et al. (2010)	Latinos, Whites	108	White	American	**.19***	***	**.19***	–	.14	***
Farnham & Greenwald (1999)	females	65	female	positive	-.15	**	-.15	†	-.15	**
Mellott & Greenwald (2000)	undergraduates	98	old	positive	-.00	†	-.03	–	.17	–
Rudman et al. (2001)	females	68	male	potent	.18	–	-.11	*	-.00	–
				Average *r*	.096		.060		.099	
				(95% CI)	(±.077)		(±.079)		(±.078)	
				SD	.101		.103		.103	
				p [Q]	.287		.260		.264	

Note. Subjects = subject groups comprising independent samples in each study; *N* = number of subjects contributing to each balanced identity analysis; Balanced identity design always includes measures of associations that link the concept of *self* with one *group concept* (e.g., female, school, Hispanic) and one *attribute concept* (e.g., valence, math); Effect sizes (*r*) are presented separately for each of the three regressions in which one measure of association strength is always entered as a criterion (e.g., measure of the *self-group* association) and the other two measures as predictors (e.g., measures of *group-attribute* and *self-attribute* associations). The weighted mean effect sizes at the first regression step (*r*), their 95% confidence intervals (CIs), and their weighted standard deviations (*SD*s), transformed back to the *r* metric were computed from a random-effects test for Fisher's *Z*-transformed *r* values at Step 1 of a multiple hierarchical regression analysis. *p* = statistical significance of effect sizes at the second regression step (see below); *p* [Q] = probability values for fixed-effects test of homogeneity (Hedges & Olkin, 1985).
Bold font indicates statistically significant effect sizes ($p \leq .05$).
– = ns ; † = .05 < p < .10; * = .01 < p < .05; ** = .005 < p < .01; *** = < .005

Figure Captions

Figure 1. A social knowledge structure (SKS) of a young male assistant professor (Adapted from Greenwald et al., 2002.) This structure includes associations corresponding to social psychology's major affective (self-esteem, and attitude) and cognitive (stereotypes and self-concept) constructs. Concepts are represented as nodes (ovals) and associative relations are represented by links (lines). Line thickness indicates association strength. The *self-concept* includes the links of the *Me* node to concepts that correspond to roles (scientist, father) and traits (intelligent, warm). *Self-esteem* includes the links –either direct or mediated through the self-concept–of the *Me* node to valance (+ + + or - - -). Analogous to self-concept, *stereotypes* are links between nodes that represent social roles and traits. Analogous to self-esteem, *attitudes* are links, either direct or mediated through components of a stereotype, that connect social category nodes to valence nodes (+ + + or - - -).

Figure 2. Zero-order correlations between pairs of association-strength measures as a function of the third predictor, measured on scales with rational zero points. Dots indicate independent samples. Panels A, B, and C are for implicit measures and Panels D, E, and F are for explicit measures. The two-letter codes indicate the two types of concepts constituting each of the three possible predictors. SG = self–group (identity) association; GA = group–attribute association. SA = self–attribute association; The regressions test the hypothesis that the zero-order correlations of any pair of association strengths should have the same sign as the mean value of the remaining predictor, when the latter is measured on a scale with a rational zero point. *r* = zero-order correlations coefficient; *k* = number of independent samples; *p* = statistical significance of the correlation. The 95% confidence intervals (dashed curves) indicate that

regression slopes for Panels A, B, and C do not significantly deviate from the expectation that they should pass through the origin.

Figure 1.

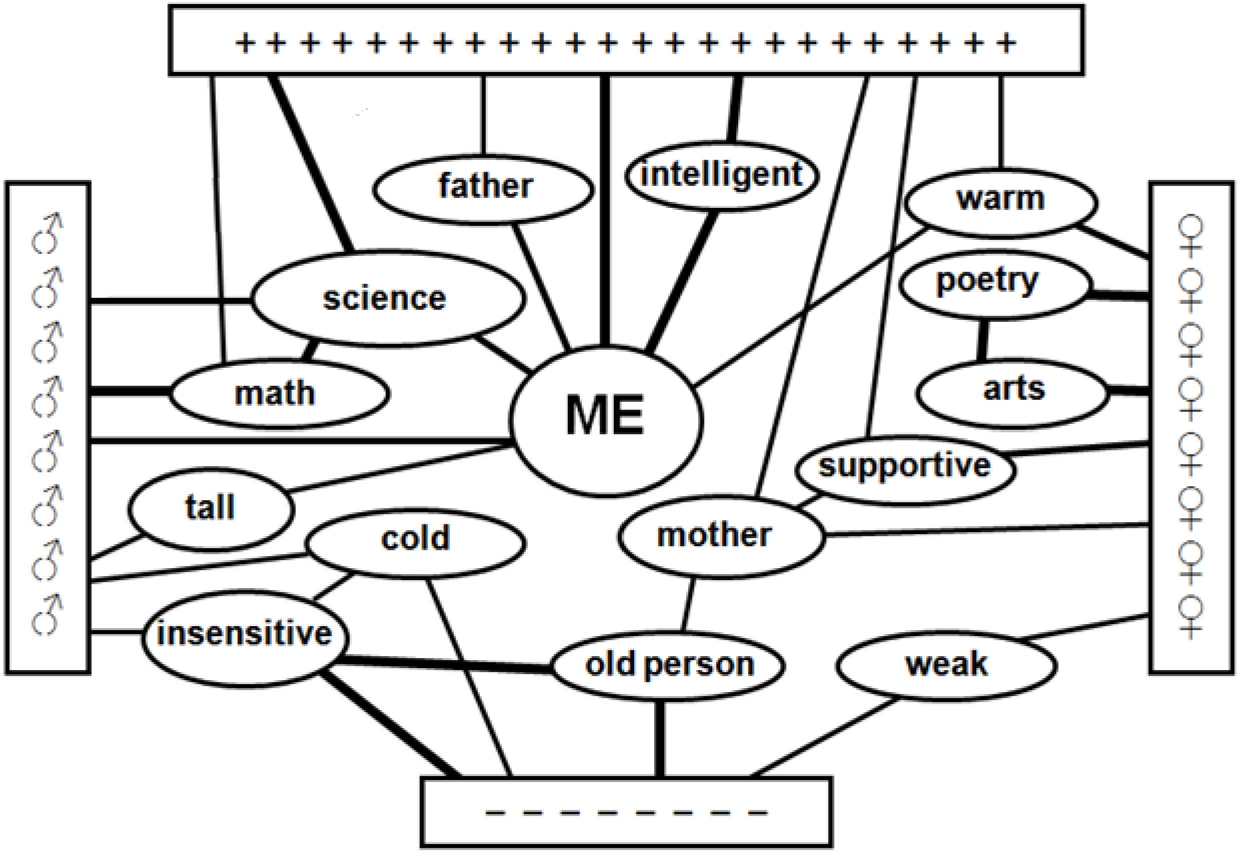
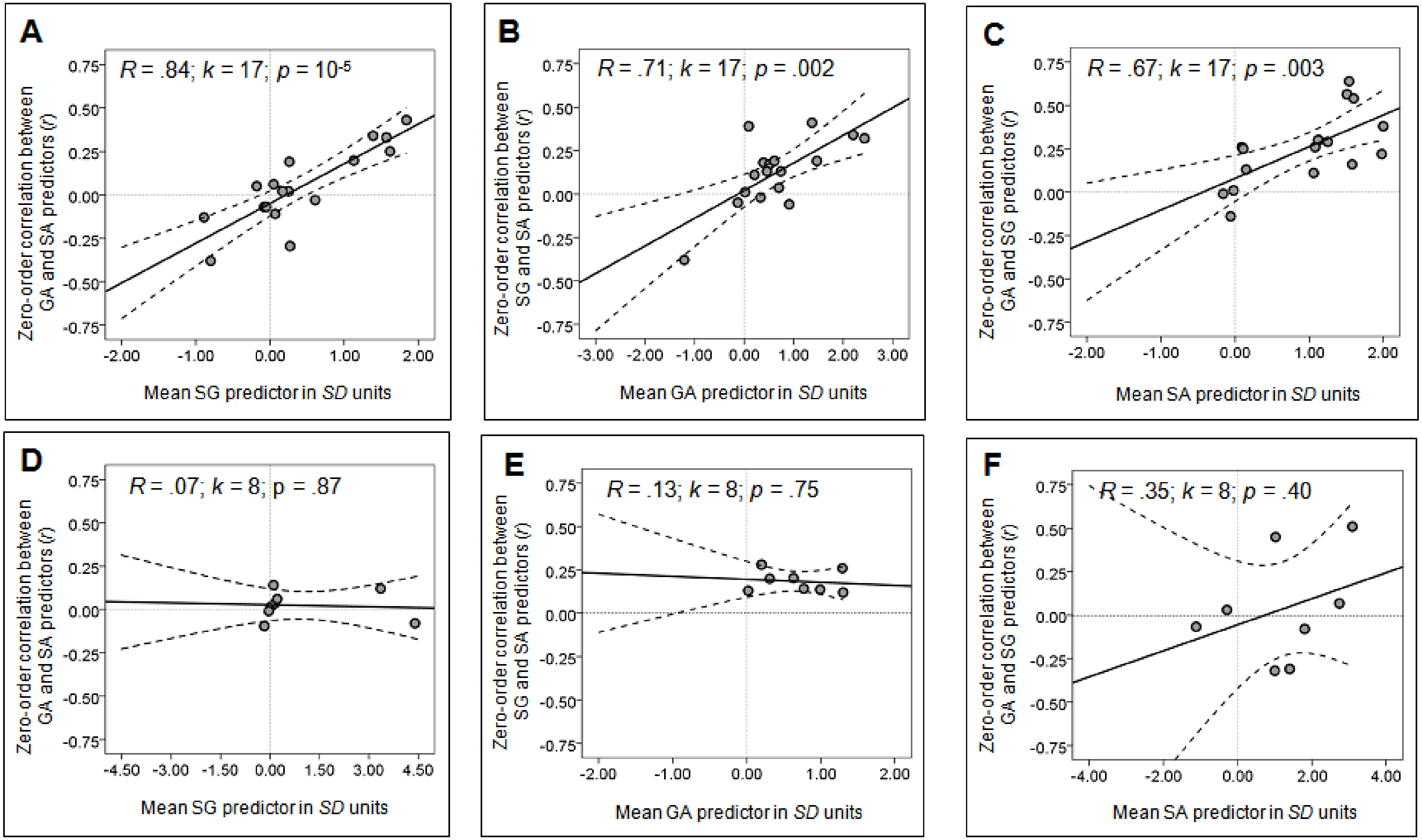

+ +
father
intelligent
warm
science
poetry
math
ME
arts
supportive
tall
cold
mother
insensitive
old person
weak
♂ ♂ ♂ ♂ ♂ ♂ ♂ ♂
♀ ♀ ♀ ♀ ♀ ♀ ♀ ♀
– – – – – – – –

Figure 2.


A
R = .84; k = 17; p = 10-5
Zero-order correlation between GA and SA predictors (r)
Mean SG predictor in SD units
B
R = .71; k = 17; p = .002
Zero-order correlation between SG and SA predictors (r)
Mean GA predictor in SD units
C
R = .67; k = 17; p = .003
Zero-order correlation between GA and SG predictors (r)
Mean SA predictor in SD units
D
R = .07; k = 8; p = .87
Zero-order correlation between GA and SA predictors (r)
Mean SG predictor in SD units
E
R = .13; k = 8; p = .75
Zero-order correlation between SG and SA predictors (r)
Mean GA predictor in SD units
F
R = .35; k = 8; p = .40
Zero-order correlation between GA and SG predictors (r)
Mean SA predictor in SD units