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Evaluating the Circumplexity of Interpersonal Traits and the Manifestation of Interpersonal Traits in Interpersonal Trust

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Two studies assessed the goodness of fit of ideal, quasi-, and noncircumplex models of interpersonal traits. Study 1 ($N = 132$) represents a secondary data analysis using J.S. Wiggins's (1979) original Interpersonal Adjectives Scales (IAS) and reported by J.S. Wiggins, J.H. Steiger, and L. Gaelick (1981). Study 2 ($N = 401$) represents a primary data analysis using Wiggins's revised IAS (J.S. Wiggins, P. Trapnell, & N. Phillips, 1988). Results of both studies indicated that a quasi-circumplex model provided a better fit to the correlational data than did either ideal or noncircumplex models. Also, in Study 2, results for a subsample ($n = 113$) indicated that an ideal circumplex model yielded a significant positive path coefficient from Nurturance to interpersonal trust (J.K. Rempel, J.G. Holmes, & M.P. Zanna, 1985) but not from Dominance to interpersonal trust, whereas a quasi-circumplex model yielded significant positive paths from both Dominance and Nurturance to interpersonal trust.

> Validation always requires empirical investigations, the nature of the evidence required depending on the type of validity. Validity is a matter of degree rather than an all-or-none property, and validation is an unending process. Whereas measures of length and of some other simple physical attributes may have proved their merits so well that no one seriously considers changing to other measures, most measures should be kept under constant surveillance to see if they are behaving as they should. New evidence may suggest modifications of an existing measure or the development of a new and better approach to measuring the attribute in question, e.g., the measurement of anxiety, intelligence, or the temperature of stars. (Nunnally, 1967, pp. 75–76)

In 1957, Timothy Leary translated Sullivan's (1953) interpersonal theory of personality into a conceptually rich, empirically falsifiable model regarding the domain of interpersonal traits. In the resulting circumplex model of personality, Leary (1957) proposed that the set of personality traits most relevant to social behavior can be arrayed in an equidistant, circular order around the orthogonal psychological axes of Dominance and Nurturance. Using Dominance as the vertical axis and Nurturance as the horizontal axis, Leary hypothesized that one could start with the managerial–autocratic trait at the 12 o'clock position and work one's way counterclockwise around the circumplex, encountering the remaining seven interpersonal traits (i.e., competitive–narcissistic, aggressive–sadistic, rebellious–distrustful, self-effacing–masochistic, docile–dependent, cooperative–overconventional, and responsible–hypernormal) at 45° angles around the circumplex (for reviews, see Carson, 1979; Shaver & Hazan, 1985; Snyder & Ickes, 1985; Wiggins, 1980).

Although Leary's (1957) latent psychological axes have been replicated in a variety of subsequent studies of personality, Wiggins (1979) reported that the interpersonal traits that Leary listed around the circumplex failed to conform to the criterion of equidistant spacing at 45° angles. That is, certain pairs of traits were clustered much closer together, whereas other pairs of traits were clustered much farther apart, than Leary's circumplex model would have predicted. In contrast, Wiggins concluded that his own interpersonal trait measures (derived from resource exchange theory; Foa & Foa, 1974) conformed closely to the ideal of an equidistant circular array across several samples. Starting with ambitious–dominant at the 12 o'clock position, one could work one's way counterclockwise around Wiggins's (1979) circumplex, encountering the remaining seven

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interpersonal traits (i.e., arrogant–calculating, cold–quarrelsome, aloof–introverted, lazy–submissive, unassuming–ingenuous, warm–agreeable, and gregarious–extraverted) at 45° angles around the circumplex. Thus, Wiggins concluded that, even though he used the same psychological axes (i.e., Dominance and Nurturance) as did Leary, Wiggins's eight interpersonal traits met the empirical criterion of equidistant spacing around those psychological axes, whereas Leary's eight interpersonal traits did not meet that empirical criterion (see also Wiggins & Holzmuller, 1978).[1]

As the introductory quote from Nunnally (1967) indicates, Wiggins (1979) was justified in subjecting Leary's (1957) measures to the most rigorous statistical analyses available at the time. Given that Leary's original factor analyses were conducted during the "golden age" of hand-rotated factors (Bernstein, Garbin, & Teng, 1988), it is not surprising that Wiggins's computer-generated factor analyses simultaneously uncovered a lack of equidistant spacing among Leary's measured interpersonal traits and near-perfect spacing of Wiggins's own measured interpersonal traits along the circumplex. Just as the external validity of Leary's results was limited by the statistical tools available in the 1950s, however, it is possible that the external validity of Wiggins's results was limited by the statistical tools available in the 1970s. Specifically, Wiggins's influential study was published at about the same time that LISREL (Jöreskog & Sörbom, 1979), EQS (Bentler & Bonett, 1980), and related statistical packages began to gain popularity within covariance structural analysis (see Browne, 1992).

Since the late 1970s, covariance structural analysis packages have proven to be extremely powerful tools for testing the goodness of fit of measurement models (for reviews, see Breckler, 1990; Byrne, 1989; Coovert, Penner, & MacCallum, 1990; Loehlin, 1992; Long, 1983a, 1983b; Reis, 1982; Tanaka, Panter, Winborne, & Huba, 1990). As such, Wiggins's initial research on the interpersonal circumplex did not benefit from covariance structural analysis.[2] In the present studies we evaluated the degree to which Wiggins's original Interpersonal Adjectives Scales (IAS; Wiggins, 1979) and revised Interpersonal Adjectives Scales (IAS-R; Wiggins, Trapnell, & Phillips, 1988) yield interpersonal trait matrices that reproduce an ideal circumplex structure. In addition, we evaluated the extent to which ideal circumplex, quasi-circumplex, and noncircumplex trait models allow researchers to predict levels of interpersonal trust (Rempel, Holmes, & Zanna, 1985) within the context of close relationships.

In his pioneering article on the interpersonal circumplex, Wiggins (1979) offered a hypothetical correlation matrix that not only could be evaluated regarding circumplexity in itself but also could serve as the standard against which all actual interpersonal trait matrices can be evaluated. The hypothetical matrix, shown in Table 1, illustrates a general pattern of circumplexity. That is, (a) each trait is correlated strongly and negatively with the trait positioned 180° away (i.e., directly across), (b) each trait is correlated moderately and positively with the traits positioned 45° away on either side, (c) each trait is correlated moderately and negatively with the traits positioned 135° away on either side, and (d) each trait is uncorrelated with the traits positioned 90° away on either side.

Unfortunately, as readers acquainted with LISREL will quickly notice, the matrix contains several off-diagonal elements with absolute values of 1.00 and thus cannot be entered as data into LISREL 6 or earlier versions of LISREL (Jöreskog & Sörbom, 1989; Wothke, 1993). If one were to enter the hypothetical matrix from Table 1 into LISREL 6 (as we did in early analyses in Study 1), for example, one would receive an error message stating that the matrix is not positive definite (i.e., one or more off-diagonal elements have the same absolute value as one or more diagonal elements) and that, consequently, the analysis has been terminated. Paradoxically, then, any sample that generates a circumplex matrix (a) identical to Wiggins's (1979, Table 1) matrix—which we hereafter refer to as an *ideal circumplex matrix*—or (b) even approximating Wiggins's matrix—which we hereafter refer to as a *quasi-circumplex matrix*—would cause LISREL 6 (and, for that matter, all versions of EQS; Bentler & Bonett, 1980) to stop processing data because of errors.

An intriguing question arises: If circumplex models of personality cannot be empirically confirmed or disconfirmed because LISREL, EQS, and other structural equation programs are unable to estimate parameters from a given correlation matrix, of what scientific value are such models? Such a question potentially could be crucial, in part because the neo-Allportian roots

Table 1
Hypothetical Trait Correlation Matrix for Study 1

Variable	1	2	3	4	5	6	7	8
1. PA	—							
2. BC	.50	—						
3. DE	.00	.50	—					
4. FG	−.50	.00	.50	—				
5. HI	−1.00	−.50	.00	.50	—			
6. JK	−.50	−1.00	−.50	.00	.50	—		
7. LM	.00	−.50	−1.00	−.50	.00	.50	—	
8. NO	.50	.00	−.50	−1.00	−.50	.00	.50	—

Note. The hypothetical matrix was provided by Wiggins (1979). PA = ambitious–dominant; BC = arrogant–calculating; DE = cold–quarrelsome; FG = aloof-introverted; HI = lazy–submissive; JK = unassuming–ingenuous; LM = warm–agreeable; NO = gregarious–extraverted.

[1] An anonymous reviewer commented that "it is not the traits that meet circumplexity assumptions, it is the 'measures.' Indeed, it is difficult work to obtain measures that approximate circumplexity in large samples." Although we agree in principle with the first comment, Wiggins (1979) argued that the lower order traits plotted around Leary's (1957) psychological axes should be measured and conceptualized anew. As for the second comment, lower order trait correlation matrices whose higher order factor structure approximates the characteristics of an ideal circumplex would conform to Stevens's (1996) suggestion that higher order factors having at least two lower order factors with loadings above .60 in absolute value (and at least six lower order factors with loadings above .40 in absolute value) are likely to be reliable regardless of sample size.

[2] Wiggins and Trapnell (1996) cited Wiggins's (1995) *Interpersonal Adjective Scales: Professional Manual* as offering evidence regarding the goodness of fit of circumplex models. Nevertheless, Wiggins and Trapnell did not mention any published empirical articles that address the goodness of fit of circumplex models.

of trait theories in general (Ewen, 1993) have led to critiques that the survey items used by investigators often bear little resemblance to the terms that participants in trait studies typically use to describe themselves (e.g., Hogan, 1996). In addition, the neo-Freudian roots of circumplex models of personality in particular (Millon & Davis, 1996) already render such models susceptible to the charge that they exist only as figments in the minds of personality researchers (e.g., Nisbett & Ross, 1980; Ross, 1977). Thus, the "resiliency and perdurability [of circumplex models] in the face of changing conceptualizations and methodological innovations in the fields of personality, social, and clinical psychology" cited by Wiggins and Trapnell (1996, p. 89) cannot be taken for granted.

Fortunately, in the years since Wiggins's early research, structural equation models have advanced so that LISREL 7 and subsequent versions of LISREL are equipped with a "ridge option" that allows the computer to compensate for nonpositive definite input matrices prior to estimating parameters for the structural equation model (Jöreskog & Sörbom, 1989; for discussions of ridge regression, see Schumacker & Lomax, 1996; Vinod & Ullah, 1981; Wothke, 1993).[3] Furthermore, Wiggins, Steiger, and Gaelick (1981) eventually published actual correlational data based on the original IAS trait measures. It is interesting that Wiggins et al. also provided an a posteriori hypothetical correlation matrix that (unlike the hypothetical matrix offered by Wiggins [1979]) was positive definite. However, Wiggins et al. did not comment on the utility of Wiggins's (1979) earlier, a priori hypothetical matrix.

One of the most useful features of a hypothetical trait matrix is that an ideal set of higher order factor loadings for the psychological axis of Dominance can be viewed as identical to the first row of correlations from that matrix.[4] From the set of factor loadings for Dominance, one can easily generate a similar set of factor loadings for Nurturance. In turn, an ideal circumplex model specifying the two sets of hypothetical factor loadings as fixed can be applied to an actual trait matrix and tested for goodness of fit. Even if an ideal circumplex model provides a reasonably good fit to the actual trait data, however, one might discover that a quasi-circumplex model (i.e., a model in which all nonzero factor loadings are freed but subject to certain equality constraints), or a noncircumplex model (i.e., a model in which all nonzero factor loadings are freed and in which no equality constraints are imposed), or both, provide(s) as good a fit (if not a better one) as that of the ideal circumplex model (Byrne, 1989; Loehlin, 1992; Long, 1983a, 1983b; Reis, 1982). That is, we can consider the absolute goodness of fit, along with the relative goodness of fit, of (a) ideal, (b) quasi-, and (c) noncircumplex models.

Aside from the issue of circumplexity per se we also might ask whether ideal, quasi- and noncircumplex models yield equally good *predictive validity* (Nunnally, 1967), specifically regarding levels of interpersonal trust (Rempel et al., 1985). Although Nunnally downplayed the importance of assessing predictive validity in basic psychological research, Snyder and Ickes (1985) pointed out that research on personality traits should not be viewed as an end-all but rather as a means toward the end of predicting individual differences in interpersonal behavior. Snyder and Ickes also observed that identification of those overt and covert behaviors that are most prototypic of the traits in question is essential to evaluating the overall utility of the accompanying trait constructs.[5]

In turn, according to Kelley (1980), interpersonal trust is a likely candidate for prototypicality regarding the manifestation of interpersonal traits in close relationship processes. Exactly how interpersonal traits are reflected in interpersonal trust, however, is unclear. Kelley suggested that individuals low in both Dominance and Nurturance would tend to distrust their relationship partners (thus implying that both Dominance and Nurturance are positively associated with trust), yet Kelley also suggested that individuals high in Nurturance and low in Dominance would tend to distrust their relationship partners.

In the present studies we compared the relative merits of ideal circumplex, quasi-circumplex, and noncircumplex models with regard to their ability to account for the pattern of zero-order correlations among interpersonal traits as reflected in actual data. In Study 1 we conducted a secondary analysis of data based on Wiggins's original IAS (Wiggins et al., 1981, Table 2) and using Wiggins's (1979, Table 1) a priori hypothetical matrix as the basis for factor loadings in the ideal circumplex model. In Study 2 we conducted an analysis of our own data based on Wiggins's revised IAS (Wiggins et al., 1988) and using a different a priori hypothetical matrix (Gurtman, 1992a, 1993) as the basis for factor loadings in the ideal circumplex model. Moreover, in Study 2, we assessed the extent to which scores on the latent interpersonal axes of Dominance and Nurturance were associated positively (or, perhaps, negatively) with scores on latent interpersonal trust (Rempel et al., 1985; see also Wrightsman, 1991).

Study 1

Method

Data for Study 1 were derived from Wiggins (1979) and reported by Wiggins et al. (1981, Table 2). A total of 132 individuals (57 men and

[3] An anonymous reviewer commented that "models of personality structure are good if they lead to predictions of high validity and verisimilitude—not because they can be tested with some program like LISREL." We agree that LISREL and other structural equation packages cannot prove the correspondence between circumplex models and reality. Nevertheless, structural equation models can be used to rule out circumplex models that are inconsistent with empirical data (Bollen, 1989). It is for the latter purpose that we advocate the use of structural equation models in the present article.

[4] We thank an anonymous reviewer for pointing out this property of ideal circumplex matrices. As a subsequent reviewer observed, however, this does not mean that one could conduct an exploratory factor analysis on the full correlation matrix and expect to generate factor loadings for Dominance identical to the first row of correlations.

[5] An anonymous reviewer observed that "the amazing comeback of trait models of personality [during the 1970s and 1980s] was facilitated by researchers who showed such variables to be highly related to important external variables—structural [equation] models played almost no role." We do not dispute such an assertion regarding the study of personality traits in general. However, as Gaines (1996) pointed out, surprisingly little research has been conducted on interpersonal traits as predictors of interpersonal resource exchange (Foa & Foa, 1974), even though (as was noted earlier in the present article), Wiggins's (1979) circumplex model was derived in part from resource exchange theory (Foa & Foa, 1974). Thus, the matter of external validity vis-à-vis interpersonal trait measures is far from resolved.

75 women) participated in the original study. All participants completed the 128-item IAS (Wiggins, 1979), designed to measure the domain of interpersonal traits. Each of eight traits (i.e., ambitious–dominant, arrogant–calculating, cold–quarrelsome, aloof–introverted, lazy–submissive, unassuming–ingenuous, warm–agreeable, and gregarious–extraverted) was measured by 16 items (see Wiggins, 1979, for the full set of items).

Each of the items was scored according to a 9-point, Likert-type scale (1 = *not at all characteristic of me*, 9 = *very much characteristic of me*). Reverse-scored items were recorded so that high scores on all items within a scale reflected the extent to which participants perceived themselves as possessing the trait in question. Measured traits scores thus were calculated by summing the 16 item scores within each scale, and the interpersonal trait matrix was derived from correlations among the eight measured trait scores. Wiggins (1979) reported that reliability coefficients for the eight scales were relatively high (i.e., .74 or higher). Thus, the IAS scales were judged to be internally consistent.

Results and Discussion

The matrix of actual correlations among interpersonal traits (presented in Table 2), taken from Wiggins et al. (1981), was entered into a series of structural equation models by means of LISREL 7 (Jöreskog & Sörbom, 1989) specifying two orthogonal higher order factors. In the initial model, all higher order factor loadings (shown in Table 3) were fixed and constrained to conform to a circumplex structure. (The hypothesized factor loadings were derived from the first column of correlations from Table 2.) This initial model, which allows for a direct test of the viability of Wiggins's (1979, Table 1) hypothesized correlation matrix as a source of factor loadings, hereafter will be labeled the *ideal circumplex* model.

We labeled this model the *ideal circumplex* because, first of all, (a) the latent-observed paths from Dominance to arrogant–calculating, from Dominance to gregarious–extraverted, from Nurturance to unassuming–ingenuous, and from Nurturance to gregarious–extraverted were equated; (b) the latent-observed paths from Dominance to aloof–introverted, from Dominance to unassuming–ingenuous, from Nurturance to arrogant–calculating, and from Nurturance to aloof–introverted were equated; (c) the latent-observed paths from Dominance to ambitious–dominant and from Nurturance to warm–agreeable were equated; and (d) the latent-observed paths from Dominance to lazy–submissive and from Nurturance to cold–quarrelsome were equated. Thus, the factor structure matrix was constructed to yield a circular or circumplex correlation matrix (consistent with Wiggins et al., 1981, Table 1). Moreover, we assigned a specific value to every element of the factor structure (i.e., latent-observed) matrix. Thus, not only was the factor structure matrix designed to yield a correlation matrix having a circular or circumplex pattern, but we knew what the value of every element of the correlation matrix should be (consistent with Wiggins, 1979, Table 1).

In the ideal circumplex model, measurement error paths were allowed to vary but were constrained to be equal across the eight first-order factors. The resulting model appeared to provide a satisfactory fit to the data, $\chi^2(35, N = 132) = 13.51$, *ns*; goodness-of-fit index = .98; and adjusted goodness-of-fit index = .97. However, the root mean square residual (.16) indicated that substantial error was associated with the circumplex model.[6]

The correlation matrix was subsequently entered into a "quasi-circumplex" model in which all hypothesized nonzero factor loadings that formerly were fixed in the "circumplex" model instead were freed but nonetheless were constrained to conform to a circumplex structure. Specifically, (a) the latent-observed paths from Dominance to arrogant–calculating, from Dominance to gregarious–extraverted, from Nurturance to unassuming–ingenuous, and from Nurturance to gregarious–ex-

Table 2
Actual Trait Correlation Matrix for Study 1 (N = 132)

Variable	1	2	3	4	5	6	7	8
1. PA	—							
2. BC	.40	—						
3. DE	.04	.51	—					
4. FG	−.50	.02	.43	—				
5. HI	−.78	−.33	.10	.56	—			
6. JK	−.44	−.71	−.29	.16	.49	—		
7. LM	.05	−.34	−.72	−.38	.03	.30	—	
8. NO	.51	−.06	−.49	−.74	−.41	−.03	.63	—

Note. The actual matrix was provided by Wiggins, Steiger, and Gaelick (1981). PA = ambitious–dominant; BC = arrogant–calculating; DE = cold–quarrelsome; FG = aloof-introverted; HI = lazy–submissive; JK = unassuming–ingenuous; LM = warm–agreeable; NO = gregarious–extraverted.

Table 3
Higher Order Factor Loadings for Circumplex Models, Study 1

Trait	Ideal circumplex axis: Dom	Ideal circumplex axis: Nur	Quasi-circumplex axis: Dom	Quasi-circumplex axis: Nur	Non-circumplex axis: Dom	Non-circumplex axis: Nur
PA	1.00	.00	.82	.00	.83	.00
BC	.50	−.50	.54	−.59	.54	−.60
DE	.00	−1.00	.00	−.82	.00	−.81
FG	−.50	−.50	−.59	−.59	−.63	−.51
HI	−1.00	.00	−.82	.00	−.82	.00
JK	−.50	.50	−.59	.54	−.64	.47
LM	.00	1.00	.00	.82	.00	.81
NO	.50	.50	.54	.54	.54	.65

Note. Higher order factor loadings for the ideal circumplex model were fixed as input data and entered into LISREL. Higher order factor loadings for the quasi-circumplex and noncircumplex models were freed and were estimated by LISREL. Dom = dominance; Nur = nurturance. PA = ambitious–dominant; BC = arrogant–calculating; DE = cold–quarrelsome; FG = aloof–introverted; HI = lazy–submissive; JK = unassuming–ingenuous; LM = warm–agreeable; NO = gregarious–extraverted.

[6] Although researchers using structural equation models have reached a broad consensus regarding acceptable levels of the goodness-of-fit and adjusted goodness-of-fit statistics (i.e., .90 or higher), no such consensus has emerged regarding the root mean square residual (Schumacker & Lomax, 1996). In the present article we defined acceptable levels of root mean square residuals as .10 or lower.

traverted were freed and equated; (b) the latent-observed paths from Dominance to aloof–introverted, from Dominance to unassuming–ingenuous, from Nurturance to arrogant–calculating, and from Nurturance to aloof–introverted were freed and equated; (c) the latent-observed paths from Dominance to ambitious–dominant and from Nurturance to warm–agreeable were freed and equated; and (d) the latent-observed paths from Dominance to lazy–submissive and from Nurturance to cold-quarrelsome were freed and equated. Unlike the ideal circumplex model (in which a priori values for all factor structure elements were provided; Wiggins, 1979, Table 1), we allowed LISREL to solve for any factor structure matrix (and, by extension, any correlation matrix) that conformed to a circular or circumplex pattern (consistent with Wiggins et al., 1981, Table 1).

Aside from the differences just described, the quasi-circumplex model was identical to the ideal circumplex model. Results of structural equation analyses indicated that, as was true of the ideal circumplex model, the quasi-circumplex model provided a satisfactory fit to the data, χ^2 (31, N = 132) = 9.50, *ns*; goodness-of-fit index = .98; adjusted goodness-of-fit index = .98; and root mean square residual = .08. However, the decrease in chi-square from circumplex to quasi-circumplex models (4.01, difference in df = 4, *ns*) indicated that the quasi-circumplex model did not provide a significantly better fit to the data than did the circumplex model.

Finally, the correlation matrix was entered into a "non-circumplex" model that was identical to the quasi-circumplex model except that all equality constraints among the higher-order factor loadings (i.e., latent-observed paths) were removed. In other words, the nonzero factor loadings were not constrained to fit any particular pattern. The resulting noncircumplex model provided a satisfactory fit to the data, χ^2 (23, N = 132) = 7.69, *ns*; goodness-of-fit index = .99; adjusted goodness-of-fit index = .98; and root mean square residual = .06. However, the decrease in chi-square from quasi-circumplex to noncircumplex models (1.91, difference in df = 8, *ns*) indicated that the noncircumplex model did not provide a significantly better fit to the data than did the quasi-circumplex model. In addition, the decrease in chi-square from ideal circumplex to noncircumplex models (7.69, difference in df = 12, *ns*) indicated that the noncircumplex model did not provide a significantly better fit to the data than did the ideal circumplex model.

The results of Study 1 thus suggest that the correlational data reported by Wiggins et al. (1981) were consistent with a "pure" or ideal circumplex model. Nevertheless, the results of Study 1 are vulnerable to criticism in certain respects. First, some experts in structural equation analysis (e.g., Bentler, 1990; Marsh, Balla, & McDonald, 1988) would contend that the sample size in Study 1 is so small that none of the models can be rejected, although other experts (e.g., Breckler, 1990; Loehlin, 1992) have argued that the term *small* is best applied to sample sizes of fewer than 100 subjects. Second, one might argue (as did reviewers of an earlier version of this article) that our use of Wiggins's (1979, Table 1) hypothesized matrix as the source of ideal factor loadings was arbitrary. Finally, the results of Study 1 do not tell us whether circumplexity of interpersonal traits (or lack thereof) is in any way reflected in the ability of interpersonal traits to predict indicators of specific interpersonal processes, such as interpersonal trust (Gurtman, 1992b; Kelley, 1980).[7]

The latter point regarding interpersonal traits and interpersonal trust raises an interesting conceptual issue. Kelley (1980) concluded that (a) trust as a generalized tendency corresponds to the unassuming–ingenuous trait and that (b) Machiavellianism (i.e., the tendency to manipulate others for one's personal gain; Christie & Geis, 1970) essentially is the polar opposite of trust and, hence, corresponds to the arrogant–calculating trait from Wiggins's (1979) circumplex. However, Wrightsman (1991) argued that Machiavellianism "reflects a rather perverse type of trust; that is, a confidence that other[s] can be influenced or changed by a combination of techniques employed by the manipulator" (p. 374), thus suggesting that trust and the arrogant–calculating trait might be positively correlated. Still another interpretation of the link between trust and the interpersonal circumplex was offered by Gurtman (1992b), who indicated that (a) low trust could be located somewhere between the assured–dominant and cold–quarrelsome portions but that (b) high trust could not be located anywhere between the unassured–submissive and warm–agreeable portions of Wiggins's circumplex.

In contrast to the aforementioned perspectives on trust and the interpersonal circumplex, Holmes and Rempel (1989)—who conceptualized the development of trust as a relationship-specific process rather than as a generalized trait per se—contended that interpersonal trust is negatively related to negative agency (i.e., a tendency to place one's own needs before those of others, or the cold–quarrelsome circumplex trait) and is negatively related to negative communion (i.e., a tendency to place others' needs before those of oneself, or the unassured–submissive circumplex trait; see Gaines, 1995; Spence, Helmreich, & Holahan, 1979; Wiggins, 1991). Therefore, the findings reported by Holmes and Rempel would place trust along the same dimension as the gregarious–extraverted trait. Similarly, Carson's (1979) suggestion that persons high in "affiliative dominance" (i.e., gregarious–extraverted) would be particularly likely to give relationship partners the benefit of the doubt in potentially problematic situations is consistent with the description of high-trust individuals provided by Holmes and Rempel. Oddly enough, such a prediction also is consistent with Kelley (1980), if one assumes that the polar opposite of the aloof–introverted trait ("distrusts others") really is gregarious–extraverted. The problem is that Kelley viewed interpersonal trust as limited to persons low in dominance to begin with (i.e., unassured–ingenuous persons were most likely to trust others, whereas aloof–introverted persons were least likely to trust others).

If Holmes and Rempel (1989) and Carson (1979) were correct, then we would expect both Dominance and Nurturance to contribute positively to individuals' experience of interpersonal trust. This prediction explicitly contrasts with that made by

[7] An anonymous reviewer suggested that we use the term *trust in partner* (ostensibly a more narrowly defined construct) instead of *interpersonal trust*. However, given that we used the same measure of interpersonal trust as did Rempel et al. (1985), who used the term *interpersonal trust*, we opted to use the same term in the absence of a compelling need to do otherwise.

Gurtman (1992b), who noted that the problem of where to locate trust along the interpersonal circumplex has plagued trait researchers for many years. However, it is noteworthy that Gurtman attempted to place the trait of trust within an interpersonal behavior circumplex, whereas we are attempting to predict scores on the relationship-specific variable of trust using Wiggins's (1979) interpersonal traits. Moreover, Gurtman's finding that high-trust persons did not have substantial interpersonal problems corresponds to the conclusions drawn by Holmes and Rempel regarding high-trust individuals (i.e., persons high in positive agency and positive communion).

In Study 2 we addressed each of the major questions raised by Study 1. Using a sample that we collected independently, we were in a position to attempt to replicate the results of Study 1 with a sample sufficiently large (i.e., greater than 400) to offset criticism about the goodness of fit of any of the models as reflecting an artifact of sample size. We also used a different ideal correlation matrix (presented in Table 4), based on cosine functions (see Gurtman, 1992a, 1993) rather than on the multiples of .50 provided by Wiggins (1979, Table 1).[8] Moreover, using the IAS-R (Wiggins et al., 1988), we were able to use a version of the IAS designed to yield a pattern of correlations among interpersonal traits that approximates an ideal circumplex even more precisely than that available to Wiggins et al. (1981). Finally, among a subsample of the participants in Study 2, we examined the extent to which latent scores on the underlying interpersonal trait axes (i.e., Dominance and Nurturance; Wiggins, 1979; Wiggins & Holzmuller, 1978) predict latent scores on overall interpersonal trust (Rempel et al., 1985; see also Wrightsman, 1991).

Study 2

Method

A total of 401 individuals (111 men and 290 women) participated in Phase 1 of a two-phase study on dispositions and personal relationship processes (see Gaines et al., 1997). A subsample of 113 individuals (24 men and 89 women) also participated in Phase 2 of the two-phase study. Individuals were recruited from introductory psychology classes at the University of North Carolina at Chapel Hill and Pomona College.

Table 4
Hypothetical Trait Correlation Matrix for Study 2

Variable	1	2	3	4	5	6	7	8
1. PA	—							
2. BC	.71	—						
3. DE	.00	.71	—					
4. FG	−.71	.00	.71	—				
5. HI	−1.00	−.71	.00	.71	—			
6. JK	−.71	−1.00	−.71	.00	.71	—		
7. LM	.00	−.71	−1.00	−.71	.00	.71	—	
8. NO	.71	.00	−.71	−1.00	−.71	.00	.71	—

Note. The hypothetical matrix was provided by reviewers of an earlier version of this article. PA = ambitious–dominant; BC = arrogant–calculating; DE = cold–quarrelsome; FG = aloof-introverted; HI = lazy–submissive; JK = unassuming–ingenuous; LM = warm–agreeable; NO = gregarious–extraverted.

Each participant received partial credit toward satisfying his or her course requirements in exchange for taking part in the study.

Phase 1 participants completed the 64-item IAS-R (Wiggins et al., 1988), designed to measure the domain of interpersonal traits. Each of eight interpersonal traits (i. e., assured–dominant, arrogant–calculating, cold–quarrelsome, aloof–introverted, unassured–submissive, unassuming–ingenuous, warm–agreeable, and gregarious–extraverted) was measured by eight items, with each item scored according to a 9-point, Likert-type scale (0 = *not at all characteristic of me,* 8 = *very much characteristic of me*). In turn, the scores for items within a particular scale were averaged to create an overall scale score.

Detailed information regarding the psychometric properties associated with each of the IAS-R scales is available from the authors. Generally, each factor accounted for 40–60% of the variance among item scores within a given scale. Reliability coefficients for all scales were high, with values in the .75–.90 range. Furthermore, loadings for all items exceeded .30 for each of the scales. Therefore, we concluded that the IAS-R scales were internally valid and internally consistent.

In addition to the aforementioned trait scales, participants in Phase 2 completed a 12-item version of the Trust Scale (Rempel et al., 1985), designed to measure interpersonal trust. Three components of interpersonal trust were measured: (1) predictability (i.e., the extent to which individuals view their relationship partners' behavior as consistent), (2) dependability (i.e., the extent to which individuals believe that their relationship partners can be relied on in times of need), and faith (i.e., the extent to which individuals believe that their partners will continue to be responsive in the future despite unforeseen problems; Wrightsman, 1991). In all, five predictability items, three dependability items, and four faith items comprised the Trust Scale, with each item scored according to a 9-point, Likert-type scale (0 = *agree not at all,* 8 = *agree completely*). In turn, the scores for items within a particular scale were averaged to create an overall scale score.

Detailed information regarding the psychometric properties associated with the Trust Scale is available from the authors. Generally, each factor accounted for 40–60% of the variance among item scores within a given scale. Reliability coefficients for all scales were high, with values in the .75–.90 range. Furthermore, loadings for all items exceeded .30 for each of the scales. Therefore, we concluded that the Predictability, Dependability, and Faith subscales of the Trust Scale were internally valid and internally consistent.

In general, 10–40 individuals participated in a given session, with two or more members of the research team present at each session. At the beginning of each session, a member of the research team instructed participants to read an informed consent sheet (specifying participants' rights as well as the general purpose of the study) and to sign two copies of the sheet (one to return to the research team and the other to keep) prior to completing the study. Participants subsequently answered a "Dispositions Questionnaire" that included the IAS-R along with several individual-difference measures (e.g., social desirability, attachment style) not discussed in the present article. After completing the survey, participants were given a debriefing form specifying the goals of the study in greater detail.

Before dismissing participants, one of the members of the research team informed all participants that they could receive additional research credit if (a) they currently had close relationships with someone of the opposite sex and (b) they were willing to return within a week to complete additional questions about their opposite-sex relationships. Those Phase 1 participants who were able and willing to participate in Phase 2 then returned approximately 1 week later and followed the same

[8] We thank an anonymous reviewer for initially suggesting the cosine matrix as an ideal correlation matrix. Such a matrix is identical to that implicitly suggested (but not formally presented) by Wiggins et al. (1981, p. 280).

general procedure in Phase 2 that they had followed in Phase 1. At the end of each session, participants were thanked, assigned research credit, and dismissed.

Results and Discussion

Comparison of goodness of fit of ideal circumplex, quasi-circumplex, and noncircumplex models to actual correlations among interpersonal traits. By using raw data in Study 2, we were able to determine whether a preponderance of extremely high or extremely low scores on the actual trait scales violated any assumptions regarding multivariate normality (Barnett & Lewis, 1984; Byrne, 1995; Hu & Bentler, 1995; Hu, Bentler, & Kano, 1992; West, Finch, & Curran, 1995). Using PRELIS (Jöreskog & Sörbom, 1989; SPSS, 1993), we examined the skewness and kurtosis of the actual trait scale scores at the univariate level. We also calculated a covariance matrix (rather than a correlation matrix) so that we could examine the kurtosis of the data at the multivariate level.

At the univariate level, the data appeared to be relatively free of discordant outliers (for the full sample, skewness did not exceed an absolute value of 1.00, and kurtosis did not exceed an absolute value of 1.20, for any of the interpersonal traits). At the multivariate level, the relative multivariate kurtosis likewise was very low (relative multivariate kurtosis = .0114261D + .01). Therefore, we concluded that the data were robust with regard to assumptions of multivariate normality. As an additional safeguard, using a sample of more than 200 participants, we tested the goodness of fit of the ideal circumplex, quasi-circumplex, and noncircumplex models by converting the covariance matrix into an asymptotic covariance matrix and testing each model by means of weighted least squares (thus reducing the dependence on multivariate normality necessitated by maximum likelihood solutions; Browne, 1992; Hu & Bentler, 1995; Hu, Bentler, & Kano, 1992; Jöreskog & Sörbom, 1989; SPSS, 1993; Yung & Bentler, 1994).

The matrix of correlations among the eight interpersonal traits measured by the IAS-R (Wiggins et al., 1988) is presented in Table 5. In the initial (i.e., "ideal circumplex") model, all higher order factor loadings (shown in Table 6) were fixed and constrained to conform to a circumplex structure. The factor loadings for the ideal circumplex were derived from the aforementioned matrix of cosine functions.

Table 5
Actual Trait Correlation Matrix for Study 2 (N = 401)

Variable	1	2	3	4	5	6	7	8
1. PA	—							
2. BC	.41	—						
3. DE	.21	.63	—					
4. FG	−.20	.22	.54	—				
5. HI	−.64	−.18	.04	.49	—			
6. JK	−.43	−.64	−.29	.07	.46	—		
7. LM	−.13	−.38	−.65	−.43	.12	.37	—	
8. NO	.33	−.06	−.35	−.76	−.38	.01	.49	—

Note. The actual full sample consisted of all participants who took part in Phase 1 ("dispositions") of study 2. PA = ambitious–dominant; BC = arrogant–calculating; DE = cold–quarrelsome; FG = aloof-introverted; HI = lazy–submissive; JK = unassuming–ingenuous; LM = warm–agreeable; NO = gregarious–extraverted.

Table 6
Higher Order Factor Loadings for Circumplex Models, Study 2

	Ideal circumplex axis		Quasi-circumplex axis		Non-circumplex axis	
Trait	Dom	Nur	Dom	Nur	Dom	Nur
PA	1.00	.00	.74	.00	.74	.00
BC	.71	−.71	.50	−.61	.43	−.63
DE	.00	−1.00	.00	−.79	.00	−.80
FG	−.71	−.71	−.61	−.61	−.53	−.66
HI	−1.00	.00	−.79	.00	−.78	.00
JK	−.71	.71	−.61	.50	−.60	.44
LM	.00	1.00	.00	.74	.00	.76
NO	.71	.71	.50	.50	.54	.60

Note. Higher order factor loadings for the ideal circumplex model were fixed as input data and entered into LISREL. Higher order factor loadings for the quasi-circumplex and noncircumplex models were freed and were estimated by LISREL. Dom = dominance; Nur = nurturance. PA = ambitious–dominant; BC = arrogant–calculating; DE = cold–quarrelsome; FG = aloof–introverted; HI = lazy–submissive; JK = unassuming–ingenuous; LM = warm–agreeable; NO = gregarious–extraverted.

In the ideal circumplex model, measurement error paths were allowed to vary but were constrained to be equal across the eight first-order factors. The resulting model appeared to provide a satisfactory fit to the data, as assessed by goodness-of-fit index (.94) and adjusted goodness-of-fit index (.94). However, the root mean square residual (.31) indicated that substantial error was associated with the ideal circumplex model. Moreover, the chi-square associated with the model ($\chi^2[35, N = 401] = 89.44$, $p < .01$) was quite high, although some experts would conclude that the latter statistic was inflated by the sheer size of the sample (see Bentler & Bonett, 1980; Coovert et al., 1990; Marsh et al., 1988).

Next, the correlation matrix was entered into a "quasi-circumplex" model in which all hypothesized nonzero factor loadings that formerly were fixed in the ideal circumplex model instead were freed but nonetheless were constrained to conform to a circumplex structure. The resulting quasi-circumplex model provided a satisfactory fit to the data, as assessed by goodness-of-fit index (.97), adjusted goodness-of-fit index (.97), and root mean square residual (.10). In addition, the chi-square value ($\chi^2[31, N = 401] = 42.85, p < .10$) was acceptable (Bentler & Bonett, 1980), albeit marginally significant. Furthermore, the decrease in chi-square from circumplex to quasi-circumplex models (46.59, difference in $df = 4$, $p < .01$) indicated that the quasi-circumplex model provided a significantly better fit to the data than did the circumplex model.

Finally, the correlation matrix was entered into a "noncircumplex" model that was identical to the quasi-circumplex model except that all equality constraints among the higher order factor loadings (i.e., latent-observed paths) were removed. Therefore, the nonzero factor loadings were not constrained to conform to any particular pattern. The resulting noncircumplex model provided a satisfactory fit to the data, as assessed by goodness-of-fit index (.98), adjusted goodness-of-fit index (.96), and root mean square residual (.09). However, the chi-square ($\chi^2[23, N = 401] = 37.96$, $p < .05$) was sufficiently high to reject the model. Moreover, the decrease in chi-square from quasi-circumplex to noncircumplex models (4.89, difference in $df = 8$, *ns*) indicated that the noncircumplex model did not provide a significantly better fit to the data than did the quasi-circumplex model. Nonetheless, the decrease in chi-square from ideal circumplex to noncircumplex (51.48, difference in $df = 12$, $p < .01$) suggested that the noncircumplex model—like the quasi-circumplex model—fit the data significantly better than did the ideal circumplex model.

If chi-square were the only measure of the adequacy of each model in explaining correlations among the first-order factors, it might be tempting to conclude that (a) all of the models were supported in Study 1, whereas (b) none of the models were supported in Study 2. However, an inspection of $\chi^2{:}df$ ratios (Byrne, 1989; Loehlin, 1992; Marsh et al., 1988) suggests a different interpretation of the results. In particular, the $\chi^2{:}df$ ratios for all three models in Study 1 (.39 for the ideal circumplex model, .31 for the quasi-circumplex model, and .33 for the noncircumplex model) were so low (i.e., below 1.0) as to raise the possibility that even with a moderately large sample size, the results capitalized on chance to some extent. In contrast, the $\chi^2{:}df$ ratio (2.56) accompanying the ideal circumplex model in Study 2 was so high (i.e., above 2.0) that the model could be dismissed rather easily as a valid representation of the pattern of first-order factor correlations. Finally, the $\chi^2{:}df$ ratios accompanying both the quasi-circumplex and noncircumplex models in Study 2 (1.38 and 1.65, respectively) were well within the range (i.e., greater than 1.0 but less than 2.0) commonly recommended in structural equation analysis (Loehlin, 1992).

Given that the quasi-circumplex model not only represented a significant improvement over the circumplex model but also was more parsimonious (i.e., yielded greater degrees of freedom without sacrificing significantly greater error) than the noncircumplex model, we concluded that in Study 2 (unlike Study 1), the quasi-circumplex model provided an optimal fit to the data, as compared with the other two models. Taking the results of Studies 1 and 2 together, the fact that the ideal and noncircumplex models were not rejected with a sample size of less than 200 but *were* rejected with a sample size of greater than 200 indicates that the ideal and noncircumplex models are false (Marsh et al., 1988). In contrast, the fact that the quasi-circumplex model was not rejected—regardless of sample size—indicates that the quasi-circumplex model is not false.

Quasi-circumplex data: Unsuitable for predicting interpersonal trust? Overall, a quasi-circumplex model (rather than an ideal circumplex or noncircumplex model) fits the data for the full samples of Studies 1 and 2 quite well. But does less-than-perfect circumplexity in itself influence the degree to which interpersonal traits are predictive of relationship-specific processes such as interpersonal trust? As Steiger (1989) observed, even though one of the earliest studies of circumplex models (Guttman, 1954) produced a correlation matrix with significantly less-than-ideal circumplexity (Jöreskog, 1978), the wealth of research accumulated since the 1950s offers vast empirical support for a model of personality that at least approaches circumplexity.[9] However, the dearth of research specifically using interpersonal traits as predictors of interpersonal relationship processes (for an exception, see Gaines, 1996) leaves open the question of whether quasi-circumplexity impedes the ability of the interpersonal trait circumplex to predict interpersonal behavior (Gurtman, 1992a, 1992b, 1993).

In attempting to determine whether the interpersonal trait data collected in Study 2 could be used to predict scores on the three components of interpersonal trust (i.e., predictability, dependability, and faith; Rempel et al., 1985), we compared the goodness of fit of ideal circumplex, quasi-circumplex, and noncircumplex factor analysis models subsumed within regression analyses (Loehlin, 1992). Unfortunately, because only a portion of the full sample completed measures of interpersonal traits along with measures of interpersonal trust, the resulting subsample was too small (i.e., less than 200) to create an asymptotic covariance matrix and, hence, to test the competing models by means of weighted least squares (Jöreskog & Sörbom, 1989; SPSS, 1993). Thus, we calculated a correlation matrix and tested the models by means of maximum likelihood. To calculate maximum likelihood solutions, we found that it was necessary to control for multicollinearity by applying a ridge constant prior to estimating parameters for the models (Jöreskog & Sörbom, 1989).

The size of the subsample prevented us from examining the multivariate kurtosis of the subsample (Jöreskog & Sörbom, 1989; SPSS, 1993). Nevertheless, because we entered raw data, we were able to test for univariate skewness and kurtosis of the subsample. Both skewness and kurtosis proved to be relatively low (for skewness, no absolute value exceeded 1.40; for kurtosis, no absolute value exceeded 2.00), thus eliminating discordant outliers as possible sources of univariate non-normality (Barnett & Lewis, 1984).

A matrix of correlations (a) among the eight interpersonal traits, (b) among the three components of interpersonal trust, and (c) between the eight interpersonal traits and the three components of interpersonal trust for the subsample of individuals who participated in Phases 1 and 2 is presented in Table 7.[10]

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[9] We are indebted to an anonymous reviewer for bringing this point to our attention.

[10] An anonymous reviewer expressed concern that the means and/or correlations among the eight interpersonal traits would differ significantly as a function of the selection criteria that we used. Indeed, results of a multivariate analysis of variance indicated that, overall, mean scores differed significantly among (a) Phase 1 individuals who were not involved in close relationships with members of the opposite sex (and thus were ineligible for participation in Phase 2), (b) Phase 1 individuals who were involved in close relationships with members of the opposite sex yet did not participate in Phase 2, and (c) Phase 1 individuals who not only were involved in close relationships with members of the opposite sex but also participated in Phase 2. Post-hoc Scheffé tests revealed that (a) Phase 2 participants scored significantly higher on the ambitious–dominant trait than did individuals who were not eligible for Phase 2; (b) individuals who were eligible yet did not participate in Phase 2 scored significantly higher on the arrogant–calculating trait than did individuals who were not eligible for Phase 2; and (c) Phase 2 individuals scored significantly lower on the lazy–submissive trait than did individuals who were ineligible for Phase 2. However, subsequent discriminant analyses indicated that the correlations among the three aforementioned subgroups in Study 2 did not differ significantly. Therefore, the significant differences involving Phase 2 participants were

Table 7
Correlations Among Interpersonal Trait and Interpersonal Trust Dimensions Among Subsample in Study 2 (n = 113)

Variable	1	2	3	4	5	6	7	8	9	10	11
Interpersonal trait dimensions											
1. PA	—										
2. BC	.53	—									
3. DE	.32	.66	—								
4. FG	−.09	.24	.54	—							
5. HI	−.60	−.30	−.10	.43	—						
6. JK	−.39	−.64	−.28	.08	.52	—					
7. LM	−.14	−.38	−.61	−.34	.22	.29	—				
8. NO	.31	−.01	−.33	−.70	−.42	−.04	.37	—			
Interpersonal trust dimensions											
9. Pred	.05	−.06	.01	−.13	−.17	−.01	−.06	.14	—		
10. Depend	.06	−.16	−.18	−.18	−.17	−.04	.08	.18	.49	—	
11. Faith	.05	−.18	−.16	−.29	−.15	.02	.09	.25	.57	.61	—

Note. The subsample consisted of participants who took part in both Phase 1 ("dispositions") and Phase 2 ("close relationships") of Study 2. PA = ambitious–dominant; BC = arrogant–calculating; DE = cold–quarrelsome; FG = aloof–introverted; HI = lazy–submissive; JK = unassuming–ingenuous; LM = warm–agreeable; NO = gregarious–extraverted; Pred = predictability; Depend = dependability.

Consistent with the assumption that faith is the most central component of interpersonal trust (Rempel et al., 1985; Wrightsman, 1991), faith was the only component of trust that was correlated with any of the interpersonal traits with an absolute value of .20 or higher. Also, consistent with the assumption that "affiliative dominance" (i.e., the gregarious–extraverted trait) was especially conducive to interpersonal trust (Carson, 1979), gregarious–extraverted was the strongest positive covariate of faith, whereas aloof–introverted was the strongest negative covariate of faith.

We subsequently conducted a series of structural equation analyses to determine whether the latent variables of Dominance and Nurturance were related meaningfully to the latent variable of trust, under the assumptions of factor loadings for interpersonal traits conforming to (a) an ideal circumplex model, (b) a quasi-circumplex model, and (c) a noncircumplex model. In each causal model, measurement error was freed and equated across all first-order factors. Latent-observed paths linking the dimensions of predictability and dependability with the latent variable of interpersonal trust were freed, whereas the latent-observed path from the second-order factor of interpersonal trust to the first-order factor of faith was fixed and assigned a starting value of 1.0 (consistent with the previous finding that faith is the most central component of trust; Rempel et al., 1985; Wrightsman, 1991). Causal paths from the higher order traits of Dominance and Nurturance to interpersonal trust were freed; residuals associated with Dominance and Nurturance were fixed at 1.0, whereas the residual associated with trust was freed.

limited to mean trait scores (rather than trait correlations per se) that reflected higher Dominance among those participants than among individuals who were ineligible for Phase 2. It is interesting that there were no significant mean differences between Phase 2 individuals and individuals who were eligible yet did not participate in Phase 2.

First, the ideal circumplex model (in which higher order factor loadings were fixed according to cosine functions) yielded goodness-of-fit (.94) and adjusted goodness-of-fit (.94) indices that suggested the model provided an acceptable fit to the data. The chi-square ($\chi^2[60, N = 113] = 33.73$, *ns*) and $\chi^2{:}df$ ratio (.56) indicated that the model fit the data so well as to be "too good to be true" (Loehlin, 1992). However, the root mean square residual (.25) associated with the model was quite high. As Figure 1a indicates, the path coefficient from Dominance to interpersonal trust was substantially lower than .20 (the cutoff point for statistical significance), whereas the path coefficient from Nurturance to interpersonal trust was substantially higher than .20.

Second, the quasi-circumplex model (in which higher order factor loadings were freed but constrained to be equal according to a circumplex structure) yielded goodness-of-fit (.97) and adjusted goodness-of-fit (.96) indices that were similar to those for the ideal circumplex model and that suggested the model provided an acceptable fit to the data. As was the case for the ideal circumplex model, the chi-square ($\chi^2[56, N = 113] = 18.51$, *ns*) and $\chi^2{:}df$ ratio (.33) were so low as to suggest that the model might have provided a fit to the data that was "too good to be true" (Loehlin, 1992). However, the root mean square residual (.10) associated with the quasi-circumplex model was much lower than that associated with the ideal circumplex model. Moreover, the decrease in chi-square from the ideal circumplex to quasi-circumplex models (15.21, difference in $df = 4$, $p < .01$) revealed that the quasi-circumplex model fit the data significantly better than did the ideal circumflex model. In addition, as Figure 1b indicates, path coefficients from both Dominance and Nurturance to Trust in the quasi-circumplex model were .20 or higher.

Third, the noncircumplex model (in which nonzero factor loadings were not constrained to fit any particular pattern) yielded goodness-of-fit (.97) and adjusted goodness-of-fit (.96) indices that were identical to those for the quasi-circumplex

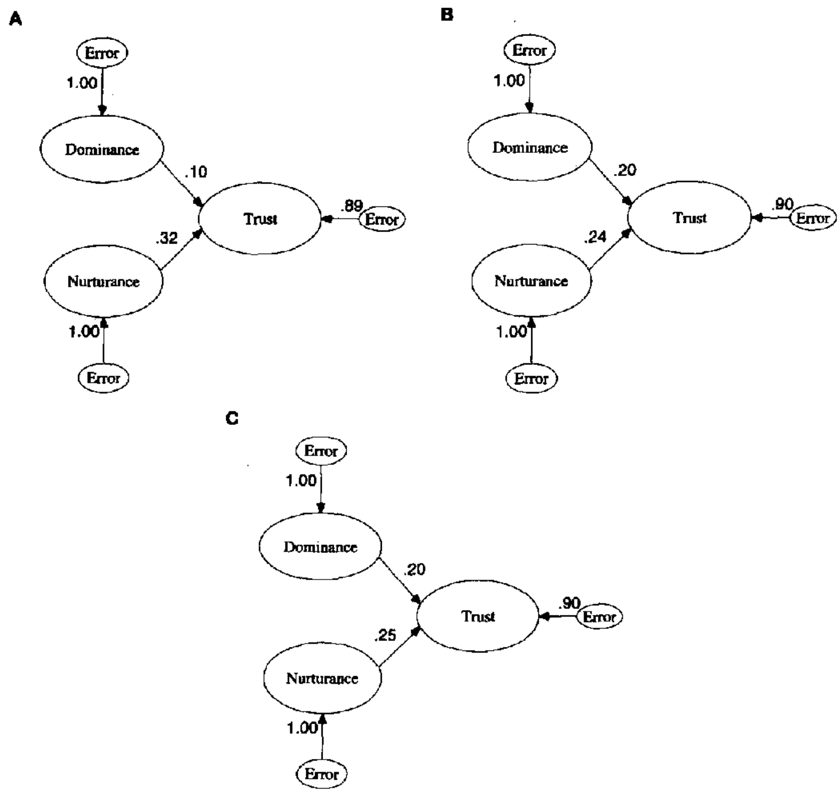

Figure 1. A: Causal relations among Dominance, Nurturance, and trust generated by ideal circumplex model, Study 2. B: Causal relations among Dominance, Nurturance, and trust generated by quasi-circumplex model, Study 2. C: Causal relations among Dominance, Nurturance, and trust generated by noncircumplex model, Study 2.

model and that suggested the model provided an acceptable fit to the data. Like the ideal circumplex and quasi-circumplex models, the chi-square (χ^2[48, N = 113] = 16.34, *ns*) and χ^2:*df* ratio (.34) associated with the noncircumplex model were so low as to suggest that the model might have provided a fit to the data that was "too good to be true" (Loehlin, 1992). However, the root mean square residual (.10) was identical to that associated with the quasi-circumplex model. The noncircumplex model failed to yield a significantly better fit to the data than did the quasi-circumplex model (difference in chi-square = 2.18, difference in df = 8, *ns*), nor did it yield a significantly better fit than did the ideal circumplex model (difference in chi-square = 17.39, difference in df = 12, *ns*). As Figure 1c indicates, path coefficients from both Dominance and Nurturance to Trust in the noncircumplex model were virtually identical to those in the quasi-circumplex (but not the ideal circumplex) model.

The results of Study 2 for the full sample as well as the subsample indicate that circumplexity (or lack thereof) vis-à-vis the latent-variable models influenced the ability of the higher order factors of Dominance and Nurturance to predict scores on the latent dimension of interpersonal trust. The same pattern of results found when the full Study 2 sample was compared with the full Study 1 sample also held true when the full Study 2 sample was compared with the Study 2 subsample. That is, the ideal circumplex and noncircumplex models proved to be false (i.e., accepted at sample sizes lower than 200 but rejected at sample sizes higher than 200), whereas the quasi-circumplex model proved not to be false (i.e., accepted at sample sizes higher and lower than 200; Marsh et al., 1988). Furthermore, the discrepancy between beta weights produced by ideal and quasi-circumplex models suggests that the ideal circumplex underestimated the impact of Dominance—and overestimated the impact of Nurturance—on interpersonal trust. It is interesting that the results for the ideal circumplex model (in which half of the latent-observed paths were nonzero and fixed) regarding Nurturance as more reliable than Dominance as a predictor of interpersonal trust are very similar to those typically reported in studies of interpersonal traits and other pro-relationship processes (i.e., Nurturance or positive femininity is a significant predictor, but Dominance or positive masculinity is not significant; see Ickes, 1985; Spence, Deaux, & Helmreich, 1985). However, the results for the quasi-circumplex model (in which half of the latent-observed paths were freed but constrained to be equal according to a circumplex structure and half of the latent-observed paths were fixed at 0.0) are more consistent with the view that Dominance and Nurturance are equally important as predictors of interpersonal trust (see Wiggins, 1991). The latter results regarding Dominance might partly reflect the higher levels of Dominance found among Phase 2 participants compared with those of individuals who were ineligible for Phase 2. Such an explanation, though, does not account for the lack of significance of differences in Dominance between Phase 2 participants and individuals who were eligible yet did not participate in Phase 2.

General Discussion

Taken together, Studies 1 and 2 provide evidence that actual correlational data generated by participants' scores on Wiggins's IAS—whether in original (Wiggins, 1979) or revised form (Wiggins et al., 1988)—conform better to a quasi-circumplex model than to an ideal circumplex model regarding the domain of interpersonal traits. In addition, the results of Study 2 indicate that distinctions between ideal and quasi-circumplex models can influence the conclusions that researchers are likely to make concerning the extent to which Dominance and Nurturance predict interpersonal trust. The ideal circumplex model yielded a significant path from Nurturance to interpersonal trust but not from Dominance to interpersonal trust, which is consistent with research on gender-related personality traits and partners' relationship satisfaction (see Ickes, 1985; Spence et al., 1985) but is not consistent with our finding that, when using the quasi-circumplex model, both Dominance and Nurturance were significant positive predictors of interpersonal trust.

Ironically, it was precisely such a concern with the ideal–quasi-circumplex distinction that originally guided our research. In fact, Wiggins's (1979) own research was motivated in part by the fact that correlational data based on Leary's (1957) measures of interpersonal traits departed substantially from an ideal circumplex structure. Given that Wiggins's circumplex model lends itself so well to verification by means of structural relations analyses (see Byrne, 1989; Coovert et al., 1990; Loehlin, 1992; Long, 1983a, 1983b; Reis, 1982; Tanaka et al., 1990), we were surprised that previous researchers had failed to note that (at least prior to the development of LISREL 7) the closer an actual correlation matrix approached Wiggins's ideal, the less likely it was to yield an interpretable solution. The same critique—specifically, that off-diagonal elements approaching 1.00 cause LISREL 6 and earlier versions of LISREL to stop processing the correlational data prior to reaching an interpretable solution—also applies to the hypothetical cosine matrix Gurtman (1992a, 1993) used. In all fairness, however, Gurtman assessed circumplexity by means of nonlinear estimation of construct correlation curve parameters. In contrast, in the present studies we assessed circumplexity by means of linear estimation of latent-observed path parameters.[11]

In any event, improvements in LISREL programming since the late 1980s (i.e., the addition of "ridge options" and "ridge constants"; Jöreskog & Sörbom, 1989) now allow researchers to enter nonpositive definite as well as positive definite matrices as input data. We emphasize these technical points because current research on circumplex models of personality often focuses on conceptual issues such as whether (and how) continuities between the interpersonal circumplex and the Big Five can be found (e.g., Hofstee, de Raad, & Goldberg, 1992; McCrae & Costa, 1989; Trapnell & Wiggins, 1990) and whether the interpersonal circumplex not only covers traits but also covers personality-related variables such as emotions and nonverbal behavior (e.g., Fisher, Heise, Bohrnstedt, & Lucke, 1985; Gifford & O'Connor, 1987). Without attending simultaneously to empirical measurement issues such as those raised in the present article (and also raised by Wiggins, 1979), many researchers may run the risk of taking Wiggins's (1979) circumplex model for granted without assessing the external validity of the model for themselves—just as many researchers had taken Leary's (1957) model for granted before Wiggins re-evaluated Leary's model.[12]

Some critics would argue that covariance structure analysis itself is vulnerable to a variety of problems (Breckler, 1990; Hu et al., 1992; Jackson & Chan, 1980; Marsh et al., 1988). In the present article we have addressed some of the potential problems with structural equation analysis (e.g., dependence of ability to reject models on sample size, sensitivity of certain parameter estimation methods to violations of multivariate normality, possible inaccuracies in the calculation of goodness-of-fit statistics using certain parameter estimation methods). Nevertheless, the results of structural equation analyses in Studies 1 and 2 together reveal that the quasi-circumplex model provides a superior fit to interpersonal trait correlation data when compared with the fit provided by either ideal circumplex or noncircumplex models. Moreover, the unique ability of structural equation analysis to carry out factor analysis and regression analysis simultaneously (as evident from analyses of interpersonal trait and interpersonal trust data from a subsample in Study 2) allowed us to examine the circumplexity of the interpersonal trait data even as we assessed the different implications of ideal circumplex, quasi-

[11] Extracting uncorrelated latent variables from a matrix of correlated measured variables can be an exceedingly difficult task, largely because basic assumptions regarding linearity of multivariate data are violated in the process (Browne, 1992; Tracey & Rounds, 1992). After early versions of LISREL proved unable to correct sufficiently for nonlinearity in multivariate data, some authors reported success with linear transformation methods such as stochastic analysis (Browne, 1992) and log-linear analysis (Tracey & Rounds, 1992). However, beginning with LISREL 7, Jöreskog and Sörbom (1989) made linear transformations possible. In addition to the ridge option and ridge constant that were added directly to the LISREL package, Jöreskog and Sörbom introduced a companion package known as PRELIS that enables researchers to correct for nonlinearity before a correlation matrix reaches the LISREL stage of analysis (SPSS, 1993).

[12] An anonymous reviewer expressed concern that "the use of structural equation modeling muddies the interpretation of scale interrelationships. For example, it is clear that the slight differences in the measurement model have an effect on the structural parameters." We respectfully disagree with these concerns, for two reasons. First, as Bollen (1989) noted, one of the biggest advantages of confirmatory factor analysis (performed by LISREL) and exploratory factor analysis (performed by more conventional statistics packages such as SAS [1992] and SPSS [1993]) is the "detailed and identified initial model" (p. 228) required in confirmatory factor analysis that is neither required nor possible in exploratory factor analysis. Second, confirmatory factor analysis is especially useful in "situations in which a strong theory and/or empirical base exits" (Stevens, 1996, p. 390)—precisely the situations made possible by previous conceptual and empirical evaluations of Wiggins's (1979) interpersonal trait circumplex. Just as the issue of the orthogonality of the Big Five personality traits is anything but trivial (see Stevens, 1996), so too is the issue of the circumplexity of lower order interpersonal traits far from trivial.

circumplex, and noncircumplex models, respectively, for the prediction of interpersonal trust. All in all, we conclude that the advantages offered by covariance structure analysis—particularly with regard to the evaluation of circumplex models of personality—far outweigh the disadvantages.

Our conclusions regarding the inability of LISREL to reject the quasi-circumplex model at sample sizes of either 132 (Study 1) or 401 (Study 2) must be tempered by the acknowledgment that, conceivably, "any model can be rejected if the sample size is large enough" (Marsh et al., 1988, p. 391). In fact, in Study 2, the chi-square value associated with the quasi-circumplex model just missed conventional levels of significance. Moreover, the fact that the quasi-circumplex model provided a significantly better fit than did the ideal circumplex model in Study 2 might be due in part to the large sample size. Nonetheless, the quasi-circumplex model offered an important advantage over the ideal circumplex model: Unlike the ideal circumplex model (which provided a significantly worse fit than did the noncircumplex model in Study 2), the quasi-circumplex model was more parsimonious than the noncircumplex model in both studies (i.e., the negligible reduction in chi-square in shifting from a quasi-circumplex to a noncircumplex model was not worth the loss in degrees of freedom). Therefore, even a conservative interpretation of the results would not merit attributing the superior results for the quasi-circumplex model solely to sample size artifacts.

Just as conventional factor analysis during the computer era has come to define personality theories in which each measured variable is hypothesized to load on only one latent factor (see Millon & Davis, 1996), so too does structural equation analysis have the potential to define personality theories in which one or more measured variables are hypothesized to load on more than one latent factor (see Wiggins & Pincus, 1992). Interpersonal theory in general (Sullivan, 1953) and circumplex models of personality in particular (Leary, 1957; Wiggins, 1979) clearly present problems for conventional factor analysis. In fact, exploratory factor analyses of the ideal correlation matrices from Tables 1 and 4 (available from the authors) using the PROMAX procedure in SAS (1992) yielded factor structure matrices in which every first-order trait loaded on both higher order factors with magnitudes of .30 or greater—a situation that violates the usual rules of interpretation used by factor theorists (i.e., no first-order trait would be retained as a measure of second-order factors) and in the rules used by circumplex theorists (i.e., no first-order trait would be dropped as a measure of second-order factors). Conversely, structural equation analysis allows researchers to distinguish a priori between those first-order traits that are to load only on one second-order factor and those first-order traits that are to load on both factors—a property that makes it especially well suited for circumplex models of personality.

Future research on the interpersonal trait circumplex should focus on the manifestations of interpersonal traits in non-self-reported behavioral variables.[13] In the present article we used self-reported interpersonal traits as predictors of self-reported interpersonal trust; the quasi-circumplex model provided a more adequate fit to the correlational data than did the ideal circumplex model. However, Gaines (1996) found that even when the ideal circumplex model is all that can be tested (e.g., when the researcher collects data only on traits along the psychological axes), it is possible to construct a structural equation model in which self-reported interpersonal traits in general (and Nurturance in particular) serve as positive, significant predictors of other-reported displays of affection and respect. Unfortunately, it is not clear whether a quasi-circumplex model would provide an adequate fit to the data when the predictor variables are self-reported and the criterion variables are other-reported.

In closing, we return to the theme of validation that Nunnally (1967) articulated so well. With each new generation of researchers in personality and social psychology comes a fresh set of conceptual perspectives and methodological capabilities (see Wiggins & Trapnell, 1996). It is fitting, therefore, that the circumplex model developed by Leary in the 1950s and updated by Wiggins in the 1970s should be subjected anew to efforts at validation (as was the case in the present article) using the most sophisticated analytical techniques available in the 1990s. Moreover, it is a tribute to Leary (1957), Wiggins (1979), and other circumplex theorists that the interpersonal axes assumed to anchor the interpersonal circumplex have been replicated consistently during the decades since Leary first drew on Sullivan's (1953) interpersonal theory of personality in developing a measure of interpersonal traits (which Sullivan himself never would have attempted, given Sullivan's neo-Freudian background; Carson, 1969; Ewen, 1993; Wiggins, 1991). Finally, keeping in mind Nunnally's admonition that the difference between conceptual intuition and empirical reality can lead to disastrous consequences in personality research, the results of the present article suggest that, at least to some extent, the ideal–quasi-circumplex distinction appears to influence the ability of the underlying psychological axes to predict levels of interpersonal trust.

[13] We are indebted to an anonymous reviewer for initially making this recommendation.

References

Barnett, V., & Lewis, T. (1984). *Outliers in statistical data* (2nd ed.). Chichester, England: Wiley.

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin 107*, 238–246.

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin, 88*, 588–606.

Bernstein, I. H., Garbin, C. P., & Teng, G. K. (1988). *Applied multivariate analysis.* New York: Springer-Verlag.

Bollen, K. A. (1989). *Structural equations with latent variables.* New York: Wiley.

Breckler, S. J. (1990). Applications of covariance structure modeling in psychology: Cause for concern? *Psychological Bulletin, 107*, 260–273.

Browne, M. W. (1992). Circumplex models for correlation matrices. *Psychometrika, 57*, 469–497.

Byrne, B. M. (1989). *A primer of LISREL: Basic applications and programming for confirmatory factor analytic models.* New York: Springer-Verlag.

Byrne, B. M. (1995). One application of structural equation modeling from two perspectives: Exploring the EQS and LISREL strategies. In

R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 138–157). Thousand Oaks, CA: Sage.

Carson, R. C. (1969). *Interaction concepts of personality.* Chicago: Aldine.

Carson, R. C. (1979). Personality and exchange in developing relationships. In R. L. Burgess & T. L. Huston (Eds.), *Social exchange in developing relationships* (pp. 247–269). New York: Academic Press.

Christie, R., & Geis, F. L. (1970). *Studies in Machiavellianism.* New York: Academic Press.

Coovert, M. D., Penner, L. A., & MacCallum, R. (1990). Covariance structure modeling in personality and social psychological research: An introduction. In C. Hendrick & M. S. Clark (Eds.), *Research methods in personality and social psychology* (pp. 185–216). Newbury Park, CA: Sage.

Ewen, R. B. (1993). *An introduction to theories of personality* (4th ed.). Hillsdale, NJ: Erlbaum.

Fisher, G. A., Heise, D. R., Bohrnstedt, G. W., & Lucke, J. F. (1985). Evidence for extending the circumplex model of personality trait language to self-reported moods. *Journal of Personality and Social Psychology, 49,* 233–242.

Foa, U. G., & Foa, E. B. (1974). *Societal structures of the mind.* Springfield, IL: Charles C Thomas.

Gaines, S. O., Jr. (1995). Classifying dating couples: Gender as reflected in traits, roles, and resulting behavior. *Basic and Applied Social Psychology, 16,* 75–94.

Gaines, S. O., Jr. (1996). Impact of interpersonal traits and gender-role compliance on interpersonal resource exchange among dating and engaged/married couples. *Journal of Social and Personal Relationships, 13,* 241–261.

Gaines, S. O., Jr., Reis, H. T., Summers, S., Rusbult, C. E., Cox, C. L., Wexler, M. O., Marelich, W. D., & Kurland, G. J. (1997). Impact of attachment style on responses to dissatisfaction in close relationships. *Personal Relationships, 4,* 93–113.

Gifford, R., & O'Connor, B. (1987). The interpersonal circumplex as a behavior map. *Journal of Personality and Social Psychology, 52,* 1019–1026.

Gurtman, M. B. (1992a). Construct validity of interpersonal personality measures: The interpersonal circumplex as a nomological net. *Journal of Personality and Social Psychology, 63,* 105–118.

Gurtman, M. B. (1992b). Trust, distrust, and interpersonal problems: A circumplex analysis. *Journal of Personality and Social Psychology, 62,* 989–1002.

Gurtman, M. B. (1993). Constructing personality tests to meet a structural criterion: Application of the interpersonal circumplex. *Journal of Personality, 61,* 237–263.

Guttman, L. (1954). A new approach to factor analysis: The radex. In P. R. Lazarsfeld (Ed.), *Mathematical thinking in the social sciences* (pp. 258–348). Glencoe, IL: Free Press.

Hofstee, W. K. B., de Raad, B., & Goldberg, L. R. (1992). Integration of the Big Five and circumplex approaches to trait structure. *Journal of Personality and Social Psychology, 63,* 146–163.

Hogan, R. (1996). A socioanalytic perspective on the Five-Factor Model. In J. S. Wiggins (Ed.), *The five-factor model of personality: Theoretical perspectives* (pp. 163–179). New York: Guilford Press.

Holmes, J. G., & Rempel, J. K. (1989). Trust in close relationships. In C. Hendrick (Ed.), *Close relationships* (pp. 187–220). Newbury Park, CA: Sage.

Hu, L., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 76–99). Thousand Oaks, CA: Sage.

Hu, L., Bentler, P. M., & Kano, Y. (1992). Can test statistics in covariance structure analysis be trusted? *Psychological Bulletin, 112,* 351–362.

Ickes, W. (1985). Sex-role influences on compatibility in relationships. In W. Ickes (Ed.), *Compatible and incompatible relationships* (pp. 187–208). New York: Springer-Verlag.

Jackson, D. N., & Chan, D. W. (1980). Maximum-likelihood estimation in common factor analysis: A cautionary note. *Psychological Bulletin, 88,* 502–508.

Jöreskog, K. G. (1978). Structural analysis of covariance and correlation matrices. *Psychometrika, 43,* 443–477.

Jöreskog, K. G., & Sörbom, D. (1979). *Advances in factor analysis and structural equation models,* Cambridge, MA: Abt Books.

Jöreskog, K. G., & Sörbom, D. (1989). *LISREL 7: A guide to the program and applications* (2nd ed.). Chicago: SPSS.

Kelley, H. H. (1980). The situational origins of human tendencies: A further reason for the formal analysis of structures. *Personality and Social Psychology Bulletin, 9,* 8–30.

Leary, T. (1957). *Interpersonal diagnosis of personality.* New York: Ronald Books.

Loehlin, J. C. (1992). *Latent variable models: An introduction to factor, path, and structural analysis* (2nd ed.). Hillsdale, NJ: Erlbaum.

Long, J. S. (1983a). *Confirmatory factor analysis: A preface to LISREL.* Beverly Hills, CA: Sage.

Long, J. S. (1983b). *Covariance structure models: An introduction to LISREL.* Beverly Hills, CA: Sage.

Marsh, H. W., Balla, J. R., & McDonald, R. P. (1988). Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. *Psychological Bulletin, 103,* 391–410.

McCrae, R. R., & Costa, P. T., Jr. (1989). The structure of interpersonal traits: Wiggins's circumplex and the five-factor model. *Journal of Personality and Social Psychology, 56,* 586–595.

Millon, T., & Davis, R. D. (1996). *Disorders of personality: DSM-IV and beyond.* New York: Wiley.

Nisbett, R. E., & Ross, L. (1980). *Human inference: Strategies and shortcomings of social judgment.* Englewood Cliffs, NJ: Erlbaum.

Nunnally, J. C. (1967). *Psychometric theory,* New York: McGraw-Hill.

Reis, H. T. (1982). An introduction to the use of structural equations: Prospects and problems. In L. Wheeeler (Ed.), *Review of personality and social psychology* (3rd ed., pp. 255–287). Beverly Hills, CA: Sage.

Rempel, J. K., Holmes, J. G., & Zanna, M. P. (1985). Trust in close relationships. *Journal of Personality and Social Psychology, 49,* 95–112.

Ross, L. (1977). The intuitive scientist and his shortcomings: Distortions in the attribution process. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 10, pp. 174–221). New York: Academic Press.

SAS, Inc. (1992). *SAS/STAT user's guide* (Release 6.03 ed.). Cary, NC: Author.

Schumacker, R. E., & Lomax, R. G. (1996). *A beginner's guide to structural equation modeling.* Mahwah, NJ: Erlbaum.

Shaver, P., & Hazan, C. (1985). Incompatibility, loneliness, and "limerence." In W. Ickes (Ed.), *Compatible and incompatible relationships* (pp. 163–184). New York: Springer-Verlag.

Snyder, M., & Ickes, W. (1985). Personality and social behavior. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology* (3rd ed., Vol. 2, pp. 883–947). New York: Random House.

Spence, J. T., Deaux, K., & Helmreich, R. L. (1985). Sex roles in contemporary American society. In G. Lindzey & E. Aronson (Eds.), *Handbook of social psychology* (3rd ed., Vol. 2, pp. 149–178). New York: Random House.

Spence, J. T., Helmreich, R. L., & Holahan, C. K. (1979). Negative and positive components of psychological masculinity and femininity and their relationships to self-reports of neurotic and acting-out behavior. *Journal of Personality and Social Psychology, 37,* 1673–1682.

SPSS, Inc. (1993). *SPSS/PC+ LISREL 7 and PRELIS.* Chicago: Author.

Steiger, J. H. (1989). *EzPATH causal modeling: A supplementary module for SYSTAT and SYSGRAPH.* Evanston, IL: SYSTAT, Inc.

Stevens, J. (1996). *Applied multivariate statistics for the social sciences* (3rd ed.). Mahwah, NJ: Erlbaum.

Sullivan, H. S. (1953). *The interpersonal theory of psychiatry.* New York: Norton.

Tanaka, J. S., Panter, A. T., Winborne, W. C., & Huba, G. J. (1990). Theory testing in personality and social psychology with structural equation models: A primer in 20 questions. In C. Hendrick & M. S. Clark (Eds.), *Research methods in personality and social psychology* (pp. 217–242). Newbury Park, CA: Sage.

Tracey, T. J., & Rounds, J. (1992). Evaluating the RIASEC circumplex using high-point codes. *Journal of Vocational Behavior, 41,* 295–311.

Trapnell, P. D., & Wiggins, J. S. (1990). Extension of the Interpersonal Adjective Scales to include the Big Five dimensions of personality. *Journal of Personality and Social Psychology, 59,* 781–790.

Vinod, H. D., & Ullah, A. (1981). *Recent advances in regression methods.* New York: Marcel Dekker.

West, S. G., Finch, J. F., & Curran, P. J. (1995). Structural equation models with nonnormal variables: Problems and remedies. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 56–75). Thousand Oaks, CA: Sage.

Wiggins, J. S. (1979). A psychological taxonomy of trait-descriptive terms: The interpersonal domain. *Journal of Personality and Social Psychology, 37,* 395–412.

Wiggins, J. S. (1980). Circumplex models of interpersonal behavior. In L. Wheeler (Ed.), *Review of personality and social psychology* (Vol. 1, pp. 265–294). Beverly Hills, CA: Sage.

Wiggins, J. S. (1991). Agency and communion as conceptual coordinates for the understanding and measurement of interpersonal behavior. In W. M. Grove & D. Cicchetti (Eds.), *Thinking clearly about psychology* (Vol. 2, pp. 89–113). Minneapolis: University of Minnesota Press.

Wiggins, J. S. (1995). *Interpersonal Adjective Scales: Professional Manual.* Odessa, FL: Psychological Assessment Resources.

Wiggins, J. S., & Holzmuller, A. (1978). Psychological androgyny and interpersonal behavior. *Journal of Consulting and Clinical Psychology, 46,* 40–52.

Wiggins, J. S., & Pincus, A. L. (1992). Personality: Structure and assessment. *Annual Review of Psychology, 43,* 473–504.

Wiggins, J. S., Steiger, J. H., & Gaelick, L. (1981). Evaluating circumplexity in personality data. *Multivariate Behavioral Research, 16,* 263–289.

Wiggins, J. S., & Trapnell, P. D. (1996). A dyadic-international perspective on the five-factor model. In J. S. Wiggins (Ed.), *The five-factor model of personality: Theoretical perspectives* (pp. 88–162). New York: Guilford Press.

Wiggins, J. S., Trapnell, P., & Phillips, N. (1988). Psychometric and geometric characteristics of the Revised Interpersonal Adjective Scales (IAS-R). *Multivariate Behavioral Research, 23,* 517–530.

Wothke, W. (1993). Nonpositive definite matrices in structural modeling. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 256–293). Newbury Park, CA: Sage.

Wrightsman, L. S. (1991). Interpersonal trust and attitudes toward human nature. In J. P. Robinson, P. R. Shaver, & L. S. Wrightsman (Eds.), *Measures of personality and social psychological attitudes* (pp. 373–412). San Diego: Academic Press.

Yung, Y., & Bentler, P. M. (1994). Bootstrap-corrected ADF test statistics in covariance structure analysis. *British Journal of Mathematical and Statistical Psychology, 47,* 63–84.

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