

Unifying the Aspects of the Big Five, the Interpersonal Circumplex, and Trait Affiliation

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Abstract

Objective: Two dimensions of the Big Five, Extraversion and Agreeableness, are strongly related to interpersonal behavior. Factor analysis has indicated that each of the Big Five contains two separable but related aspects. The present study examined the manner in which the aspects of Extraversion (Assertiveness and Enthusiasm) and Agreeableness (Compassion and Politeness) relate to interpersonal behavior and trait affiliation, with the hypothesis that these four aspects have a structure corresponding to the octants of the interpersonal circumplex. A second hypothesis was that measures of trait affiliation would fall between Enthusiasm and Compassion in the IPC.

Method: These hypotheses were tested in three demographically different samples ($N = 469; 294; 409$) using both behavioral frequency and trait measures of the interpersonal circumplex, in conjunction with the Big Five Aspect Scales (BFAS) and measures of trait affiliation.

Results: Both hypotheses were strongly supported.

Conclusions: These findings provide a more thorough and precise mapping of the interpersonal traits within the Big Five and support the integration of the Big Five with models of interpersonal behavior and trait affiliation.

Keywords: Interpersonal circumplex, Big Five, Extraversion, Agreeableness, Affiliation

Early in the history of the prominent Five-Factor Model of personality, or Big Five, psychologists noted that two of the five dimensions were strongly related to social behavior. Many of the traits subsumed by Extraversion (e.g., outgoing, sociable, talkative) and Agreeableness (e.g., kind, sympathetic, polite) clearly reflect interpersonal tendencies. In keeping with this observation, multiple studies have demonstrated that a two-dimensional space defined by Extraversion and Agreeableness corresponds to the interpersonal circumplex (IPC; McCrae & Costa, 1989; Pincus, 2002; Wiggins & Pincus, 1994). The IPC is a widely used structural model classifying styles of social interaction according to their correlations with two orthogonal dimensions, typically labeled Status, Agency, or Dominance and Love, Communion, or Nurturance (Gurtman, 2009; Wiggins, 1979). Because the Big Five and IPC are two of the most important and pervasive structural models in personality and social psychology, their integration is potentially of great utility to the field. The present work attempts to accomplish this integration with a degree of precision higher than was possible based on previous research, utilizing a recent development in understanding

of the structure of the Big Five (DeYoung, Quilty, & Peterson, 2007).

In the IPC, shown in Figure 1a, Status defines the vertical axis running from Assured-Dominant to Unassured-Submissive, whereas Love defines the horizontal axis running from Warm-Agreeable to Cold-Hearted. Extraversion and Agreeableness can be considered rotational variants of these axes, typically falling near 60° and 330°, respectively, in the IPC (McCrae & Costa, 1989; Pincus, 2002; Wiggins & Pincus, 1994). Locations in the IPC are commonly specified in degrees, starting with 0° at Warm-Agreeable and proceeding counter-clockwise.

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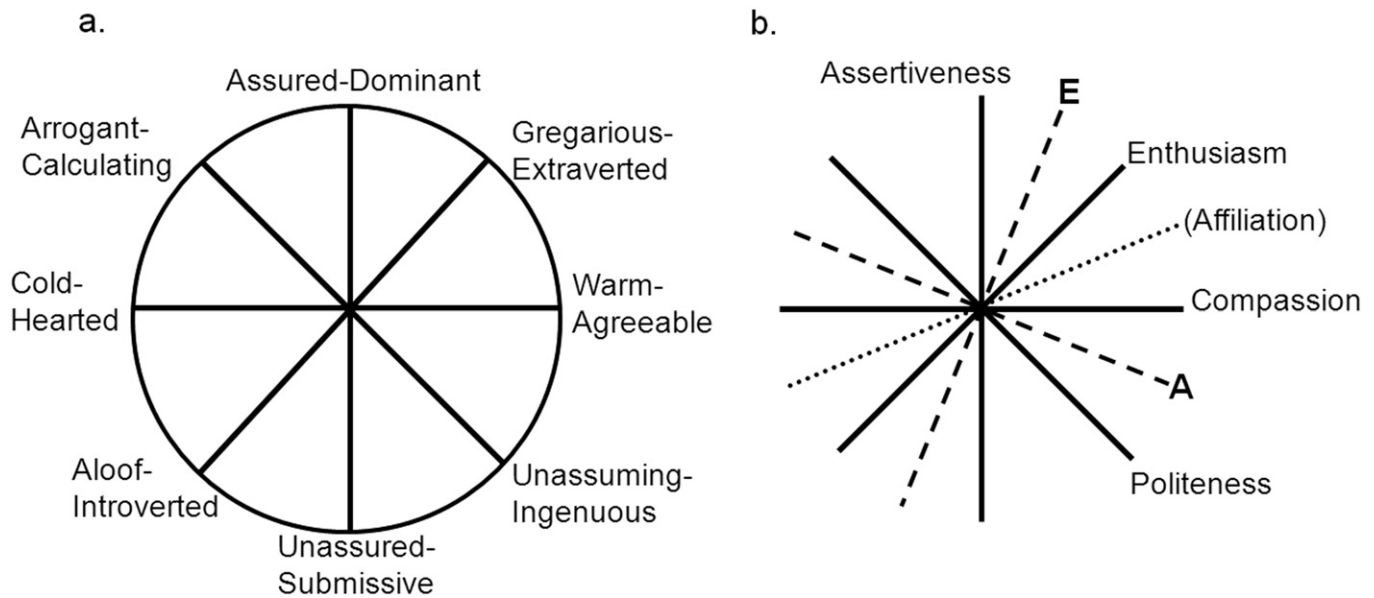


Figure 1 a. The Interpersonal Circumplex. b. The circumplex organization of the aspects of Extraversion (E) and Agreeableness (A), plus the hypothesized location of a dimension of trait affiliation.

The IPC provides a rich descriptive system that goes beyond a simple two-dimensional structure by characterizing each of the eight octants defined by the two poles of the Status and Love axes and their 45° rotations or diagonals. These diagonals can be described as additional axes or dimensions of the IPC, corresponding to bipolar trait dimensions (importantly, however, the IPC is not exclusively a model of traits, as it can be used to describe any instance of social behavior). In contrast, the Big Five model provides additional resolution beyond a simple five-dimensional structure by modeling traits as a hierarchy, in which each dimension is broken down into multiple, correlated sub-traits, typically called “facets.” The present work addresses the question of whether any systematic correspondence exists between the Big Five and IPC at a level of the personality hierarchy below the broad domains of Extraversion and Agreeableness.

Two previous studies have mapped facet-level traits onto the IPC (McCrae & Costa, 1989; Pincus, 2002). Both found that facets of Extraversion fall in two groups in terms of angular position in the IPC, rather than clustering around the position of global Extraversion scores near 60°. The Gregariousness, Positive Emotions, and Warmth facets fall close to Gregarious-Extraverted (45°), whereas the Assertiveness, Activity, and Excitement Seeking facets fall closer to Assured-Dominant (90°). Only one of these studies examined facets of Agreeableness, but here again the facets were spread out, ranging from 2.3° for Altruism to 295.7° for Modesty (Pincus, 2002).

These results suggest the relevance of research demonstrating the existence of two correlated but separable factors within the facets of each of the Big Five (DeYoung et al., 2007). The

relevance is particularly obvious for Extraversion because one subfactor of this domain was marked by Assertiveness and Activity and the other by Gregariousness, Positive Emotions, and Warmth. This research into the factor structure of facets was inspired by behavioral genetic research in twins, which indicated that two genetic factors are necessary to explain the covariance among the six facets in each Big Five domain as measured by the NEO PI-R (Jang, Livesley, Angleitner, Riemann, & Vernon, 2002). If the Big Five were the next level of the personality hierarchy above the facets, only one genetic factor would be necessary for each domain. To extend this finding, we factor-analyzed 15 facet scales within each Big Five domain and found evidence for the existence of exactly two factors in each of the Big Five (DeYoung et al., 2007). These factors corresponded closely enough to the previously reported genetic factors to suggest that both studies might be describing the same intermediate level of structure within the Big Five hierarchy, a level between facets and domains. Thus, we have a three-level hierarchy of personality traits, in which each Big Five domain (top level) subsumes two aspects (middle level) and each aspect subsumes a number of facets (bottom level). (Other work suggests the possibility of adding an additional level above the Big Five, but this level is irrelevant to the present investigation; DeYoung, 2006.)

The discovery of the aspect level of personality structure is important in part because it provides an empirically derived substructure for the Big Five. One problem with facet-level traits is that no consensus exists as to the number and identity of the facets in any domain. Different instruments contain different collections of facets, which were intuitively or algorithmically, rather than empirically, derived (DeYoung et al.,

2007). The 10 aspects of the Big Five thus provide a less arbitrary system for investigating patterns of association with personality traits at a lower level than the Big Five. This finer-grained approach is crucial when the two aspects in a given Big Five domain differentially predict other variables, as these associations are then obscured by utilizing only the domain-level score (e.g., DeYoung, Grazioplene, & Peterson, 2012; Hirsh, DeYoung, Xu, & Peterson, 2010). Our hypotheses in the present study were based on the implication from the studies of facets in the IPC (described above) that different aspects of Extraversion and Agreeableness are differentially related to the axes of the IPC.

After determining that each of the Big Five contains two related but separable aspects, we characterized these traits by correlating factor scores with over 2000 items from the International Personality Item Pool (IPIP), in order to identify the central content of each aspect and to create the Big Five Aspect Scales (BFAS) to measure the ten aspect-level factors (DeYoung et al., 2007). On the basis of this analysis, the two aspects of Extraversion were labeled *Assertiveness* and *Enthusiasm*, and the two aspects of Agreeableness were labeled *Compassion* and *Politeness*. Assertiveness encompasses traits relating to leadership, dominance, and drive. Enthusiasm encompasses both outgoing friendliness or sociability and the tendency to experience and express positive emotion. Compassion reflects empathy, sympathy, and caring for others. Politeness reflects respect for others' needs and desires and a tendency to refrain from aggression.

The present study was based on the hypothesis that the aspect-level traits within Extraversion and Agreeableness could provide a more exact mapping of the correspondence between personality and the IPC than previously existing Big Five models. We hypothesized that Assertiveness would correspond to the IPC axis running from Assured-Dominant to Unassured-Submissive, whereas Enthusiasm would correspond to the axis running from Gregarious-Extraverted to Aloof-Introverted. We further hypothesized that Compassion would correspond to the axis running from Warm-Agreeable to Cold-Hearted, whereas Politeness would correspond to the axis running from Unassuming-Ingenuous to Arrogant-Calculating. The Extraversion and Agreeableness dimensions (each lying halfway between its two aspects) would thus be located at 67.5° and 337.5° (as shown in Figure 1b), very close to where they have previously been observed.

This scheme would provide a thorough mapping of interpersonal behavior onto the Big Five. It would also clarify the meaning of the strong correlation between Enthusiasm and Compassion reported in previous work (DeYoung et al., 2007; Weisberg, DeYoung, & Hirsh, 2011). The circumplex suggests that these two trait dimensions should be as strongly correlated with each other as they are with Assertiveness and Politeness, respectively, which was indeed what was previously found, despite the fact that Enthusiasm and Compassion fall within different Big Five domains.

Some regions of the five-dimensional personality space described by the Big Five have simpler structure than others. When pairs of Big Five dimensions are considered, some show sub-traits clustering primarily around the poles, whereas others are more circumplexical, with multiple sub-traits representing every blend of the two dimensions (Hofstee, de Raad, & Goldberg, 1992; Saucier, 1992). The high degree of circumplexity of the space described by Extraversion and Agreeableness has created ambiguity and confusion in personality research, which we hope the present investigation can help to alleviate. The proximity of Enthusiasm and Compassion in the circumplex may help to explain why the line between Extraversion and Agreeableness has always been a fuzzy one, conceptually and even statistically. Traits subsumed within Extraversion and Agreeableness sometimes group together in factor analysis, especially if an insufficient number of Agreeableness facets is included (e.g., Church, 1994; Church & Burke, 1994). This has led some researchers to describe Agreeableness as one component of Extraversion (e.g., Depue & Morrone-Strupinsky, 2005), though extensive research on the Big Five suggests otherwise.

Overlapping terminology further demonstrates the fuzzy line between Extraversion and Agreeableness: The NEO PI-R (Costa & McCrae, 1992) includes a "Warmth" facet in Extraversion, whereas another instrument, the Abridged Big Five Circumplex scales for the IPIP (AB5C-IPIP; Goldberg, 1999), includes a "Warmth" facet in Agreeableness. Neither facet appears to be misplaced, however, as the NEO Warmth facet has its primary loading on Extraversion and its secondary loading on Agreeableness, whereas the AB5C-IPIP Warmth facet has its primary loading on Agreeableness and its secondary loading on Extraversion (Goldberg, 1999; Johnson, 1994). The content of these two scales are obviously conceptually related, but nonetheless distinguishable: Items in NEO Warmth focus on outgoing friendliness, whereas items in AB5C-IPIP Warmth focus on empathy and caring for others. As a concept, "warmth" appears to characterize the space between Extraversion and Agreeableness (Saucier, 1992). Presumably, in the scheme depicted in Figure 1b, the two Warmth scales would fall between Enthusiasm and Compassion, with NEO Warmth closer to Enthusiasm and AB5C-IPIP Warmth closer to Compassion.

A circumplex based on the aspects of Extraversion and Agreeableness provides an opportunity to consider what psychological processes, associated with Warmth, might be represented by the shared variance of Enthusiasm and Compassion. As shown in Figure 1b, we hypothesized that the space between Enthusiasm and Compassion is the location of the dimension of trait affiliation. In their psychobiological model of trait affiliation, Depue and Morrone-Strupinsky (2005) described it as a tendency to engage in affiliative social bonding, elicited by a variety of affiliative stimuli. Warmth was one of two emotions identified by Depue and Morrone-Strupinsky (2005) as most characteristic of affiliation (the other being affection).

Although the IPC axis from Warm-Agreeable to Cold-Hearted has sometimes been labeled “Affiliation,” we suspected that affiliation relates equally strongly to the axis from Gregarious-Extraverted to Aloof-Introverted. Depue and Morrone-Strupinsky (2005) made a strong case that affiliation is functionally related to Extraversion and its associated processes of sensitivity to reward, particularly social reward. Because they presented a detailed and rigorous psychobiological model of affiliation as a trait, and because they explicitly related it to Depue and Collins’ (1999) psychobiological model of Extraversion, the ability to integrate their model of trait affiliation with the Big Five could be extremely useful for the field of personality neuroscience (DeYoung, 2010; DeYoung & Gray, 2009). With the increased emphasis in psychology on the development of explanatory models for both personality traits and social behavior, the creation of integrative structural models that bring together constructs from different subdisciplines is increasingly important and useful. Our goal in the present research was to provide a structural model that unifies the Big Five, the IPC, and trait affiliation.

In three samples, we tested the hypotheses implied graphically in Figure 1: first, that Extraversion, Agreeableness, and their aspects are associated with each other and with interpersonal behaviors in a manner consistent with the IPC; second, that affiliation, as conceived by Depue and Morrone-Strupinsky (2005), can be located between Compassion and Enthusiasm within the circumplex. To test the first hypothesis, we used, in addition to Big Five scales, multiple measures of the IPC, including a measure that assesses the recent frequency of behaviors located at the four poles of the major axes of the IPC. To test the second hypothesis we used measures of several traits that Depue and Morrone-Strupinsky identified as markers of trait affiliation.

Method

Participants

Sample 1. The first sample consisted of 469 undergraduates (294 female, 174 male, 1 with no gender reported) from two universities in Ontario, Canada. They ranged in age from 17 to 61 years ($M = 19.32$, $SD = 3.33$) and had diverse ethnic backgrounds (45% White; 34% East Asian; 9% South Asian, 3% Black; 3% Middle Eastern; 1% Hispanic; 5% unknown). All participants received course credit for completing the study via the World Wide Web. This group was a subset of the sample used by DeYoung et al. (2007) in their Study 2, selected for the present study because they had completed all the measures of interest.

Sample 2. The second sample consisted of 294 participants (161 female, 133 male) recruited via Amazon’s Mechanical Turk. They ranged in age from 13 to 67 years ($M = 30.55$, $SD = 10.33$). The majority of participants identified as White (49%) or Asian (32%), with 5% or less reporting other eth-

nicities (3.7% Black, 3.1% Hispanic, .3% Native Hawaiian, 2.7% mixed ethnicity, and 3.4% other). All participants received payment for completing the online study.

Sample 3. The third sample comprised 409 members (243 female, 166 male) of the Eugene-Springfield community sample (ESCS; Goldberg, 1999), ranging in age from 22 to 85 years ($M = 52.79$, $SD = 12.51$). After being recruited by mail from lists of homeowners, they agreed to complete questionnaires by mail, for pay, over a period of years beginning in 1994. The sample covered all levels of educational attainment, with an average of 2 years of post-secondary schooling. Most participants identified as White (97%), and 1% or less (for each category) identified as Hispanic, Asian American, Native American, or did not report their ethnicity.

Measures

Big Five. All three samples completed the Big Five Aspect Scales (BFAS) and the Big Five Inventory (BFI). The BFAS measures the 10 aspects of the Big Five, including Assertiveness, Enthusiasm, Compassion, and Politeness. Each aspect is assessed by 10 IPIP items using a 5-point Likert scale. The BFAS has been validated against other measures of the Big Five and is highly reliable (DeYoung et al., 2007). The BFI (John, Naumann, & Soto, 2008) is a widely used and well validated 44-item measure of the Big Five.

Interpersonal Circumplex. In Sample 1 the Social Behavior Inventory (SBI) was used to assess recent interpersonal behavior (Moskowitz, 1994). Participants indicated how frequently they had engaged in 46 interpersonal behaviors over the past month, using a 6-point Likert scale ranging from 1 = *never* to 6 = *almost always*. This instrument yields scores for four types of behavior corresponding to the positive and negative poles of the primary axes of the IPC: Dominance corresponds to Assured-Dominant (e.g., “I assigned someone to a task”); Submissiveness corresponds to Unassured-Submissive (e.g., “I spoke only when I was spoken to”); Agreeableness corresponds to Warm-Agreeable (e.g., “I showed sympathy”), and Quarrelsomeness corresponds to Cold-hearted (e.g., “I made a sarcastic comment”). We reserve the label “Agreeableness” for the Big Five domain, and refer to the SBI variable as “SBI Agr.” The SBI maps very well onto other measures of the IPC, and has demonstrated good reliability and validity (Mongraine, Vettesse, Shuster, & Kendal, 1998; Moskowitz, 1994; Moskowitz & Cote, 1995). Because there are no negatively keyed items in the SBI, scores were ipsatized to correct for idiosyncrasies in the use of the response scale (such as acquiescence bias); each subject’s mean for all responses was subtracted from each response (Moskowitz, 1994).

In Sample 2, participants completed not only the SBI but also a more thorough measure of the IPC, the Interpersonal Adjective Scales–Revised (IAS-R; Wiggins, 1995; Wiggins, Trapnell, & Phillips, 1988). The IAS-R measures traits located

at each of the eight octants of the IPC. The IAS-R consists of 64 interpersonal adjectives rated on how accurately they describe the self, on a scale of 1 (very inaccurate) to 8 (very accurate). Each adjective is presented with a short definition. Eight items are used to measure each octant labeled in Figure 1. The IAS-R octant scales are traditionally labeled with letter-pairs starting with the positive pole of Status (PA) and progressing counter-clockwise (BC, DE, etc.). As with the SBI, the IAS-R lacks negatively keyed items, and scores were therefore ipsatized.

In Sample 3, the IPC octants were measured by the IPIP-IPC scales (Markey & Markey, 2009). This measure uses 32 IPIP items describing interpersonal behaviors and has been validated using observations of social behavior in addition to correlations with the IAS-R (Markey, Anderson, & Markey, 2012). Participants rate how accurately each phrase describes themselves on a scale of 1 (*very inaccurate*) to 5 (*very accurate*). Four items constitute the scale for each octant of the IPC. Scores were ipsatized because all items were positively keyed. Both the BFAS and the IPIP-IPC scales utilize IPIP items, and we identified two items that were included in both instruments. To avoid inflating correlations by including redundant data in two of our measures, we removed two items from the BFAS that were also included in the IPIP-IPC. We chose to shorten the BFAS because its scales are longer than those for the IPIP-IPC. Hence, BFAS Compassion scores in this sample were based on 8 items rather than 10. The correlation between the 8- and 10-item versions of Compassion was $r = .98$.

Affiliation. In Samples 1 and 2, we included the item, “Feel affectionate toward people,” which was administered in the pool of items from which the BFAS was created, but was not included in the BFAS. Depue and Morrone-Strupinsky (2005) identified “warm” and “affectionate” as prototypical descriptors of trait affiliation and used ratings of feelings of warmth and affection as a dependent variable in their experiments on affiliation. In Sample 3, we included the Warmth facet scales from both the NEO PI-R and the AB5C-IPIP. Two items were excluded from the AB5C-IPIP Warmth scale because they were identical to BFAS items, leaving 9 items. The correlation between the 9- and 11-item versions of AB5C Warmth was $r = .98$. Also in Sample 3, we included the 21-item Social Closeness scale from the Multidimensional Personality Questionnaire (MPQ; Tellegen & Waller, 2008). Depue and Morrone-Strupinsky (2005) used Social Closeness as a marker of trait affiliation and found that it predicted variation in opiate functioning in response to affiliative stimuli. This finding is important because the opiate system is known to be critical for affiliative bonding.

Other MPQ Scales. In Sample 3, we included two additional scales from the MPQ, Social Potency (25 items) and Aggression (19 items). Both scales describe social traits; Social Potency should be most similar to Assertiveness, whereas Aggression should describe the negative end of Agreeableness,

particularly its Politeness aspect. We included them in our factor analysis to aid in integrating research on interpersonal behavior using the MPQ with research using the Big Five and IPC.

Analysis

In order to assess the circumplex structure of all measures in each sample, we utilized Tucker’s congruence coefficients in the manner outlined by Terracciano, McCrae, Hagemann, and Costa (2003). This method involves comparing empirical factor loadings to a target circular structure using the congruence coefficient, which quantifies the similarity of two vectors. It is analogous to a correlation, ranging from -1 to 1 , with higher absolute values indicative of greater similarity (computationally, it is the cosine of the angle between the two vectors). In each sample, we extracted two factors using principle axis factoring and then used Procrustes rotation (Schönemann, 1966) to align each solution to the target matrix. Our target matrix represented a circular structure where the positive pole of Status (represented in the BFAS by Assertiveness) loaded 0 on the first factor and $.8$ on the second ($.8$ was chosen instead of 1.0 to account for measurement error; no variable is likely to have a perfect loading on either factor). All other measures were then assigned loadings corresponding to their hypothesized location in the circumplex (per Figure 1). The target loading matrix is shown beside the rotated observed loadings in Table 1.

Once each rotated factor solution was acquired, it was compared to the target loadings overall (the full factor loading matrix), by column (the Status and Love axes), and by row (the individual variables). Congruence coefficients greater than $.85$ are typically considered evidence of similarity, and those greater than $.95$ are evidence of replication (Lorenzo-Seva & Ten Berge, 2006). Assessment of circumplex structure using this method has been found to correspond better to expert judgments than other commonly used methods (Terracciano et al., 2003). Additionally, this method has the advantage that it does not limit our analyses to exactly one variable at each octant. In order to test our hypotheses, we needed to be able to specify (a) that multiple variables were located at the same point on the circumplex, (b) that some octants were empty in Sample 1, and (c) that some variables were located between two octants. Most other analyses of circumplexity are not flexible enough to accommodate all of these requirements.

Results

Table 1 shows the target matrices and observed rotated factor loadings for each sample, and the observed loadings are plotted in Figure 2 for ease of visual comparison with the hypothesized structure in Figure 1. Table 1 also shows the predicted and observed angular projections for each variable. Tucker congruence coefficients are presented in Table 2. The

Table 1 Target and Rotated Factor Matrices With Corresponding IPC Angles

	Target Matrix			Sample 1			Sample 2			Sample 3		
	F1	F2	θ	Rotated Matrix			Rotated Matrix			Rotated Matrix		
				F1	F2	θ	F1	F2	θ	F1	F2	θ
Assertiveness	.00	.80	90	.21	.82	76.02	.17	.78	77.92	.20	.66	72.92
Enthusiasm	.57	.57	45	.56	.55	44.76	.51	.58	48.97	.71	.43	31.02
Compassion	.80	.00	0	.75	.09	6.52	.82	.06	4.11	.71	-.02	358.38
Politeness	.57	-.57	315	.63	-.34	331.53	.73	-.39	331.96	.61	-.54	318.87
Extraversion	.31	.74	67.5	.26	.74	70.83	.19	.85	77.50	.42	.74	60.38
Agreeableness	.74	-.31	337.5	.79	-.06	355.45	.83	.06	4.17	.68	-.28	337.34
SBI Dom.	.00	.80	90	.00	.74	90.01	.16	.61	75.29			
SBI Agr.	.80	.00	0	.85	.07	4.62	.78	.03	2.03			
SBI Sub.	.00	-.80	270	-.14	-.88	260.69	-.19	-.70	254.79			
SBI Quar.	-.80	.00	180	-.70	.31	156.30	-.73	.15	168.07			
PA	.00	.80	90				.10	.85	83.17	-.14	.74	100.42
NO	.57	.57	45				.69	.56	38.65	.49	.55	48.29
LM	.80	.00	0				.91	-.02	358.53	.77	.04	2.61
JK	.57	-.57	315				.63	-.42	326.52	.40	-.41	314.35
HI	.00	-.80	270				-.22	-.86	255.50	.04	-.76	273.24
FG	-.57	-.57	225				-.64	-.58	222.06	-.43	-.73	239.24
DE	-.80	.00	180				-.86	.13	171.27	-.45	-.10	193.06
BC	-.57	.57	135				-.72	.38	152.46	-.53	.47	138.14
"Affectionate"	.74	.31	22.5	.61	.26	22.97	.43	.15	19.81			
NEO Warmth	.74	.31	22.5							.77	.30	21.47
AB5C Warmth	.74	.31	22.5							.66	.02	1.82
Social Closeness	.74	.31	22.5							.58	.36	31.54
Social Potency	.00	.80	90							.06	.73	85.41
Aggression	-.57	.57	135							-.38	.28	144.22

Note. Target matrix is based on the hypothesized circumplex structure shown in Figure 1.

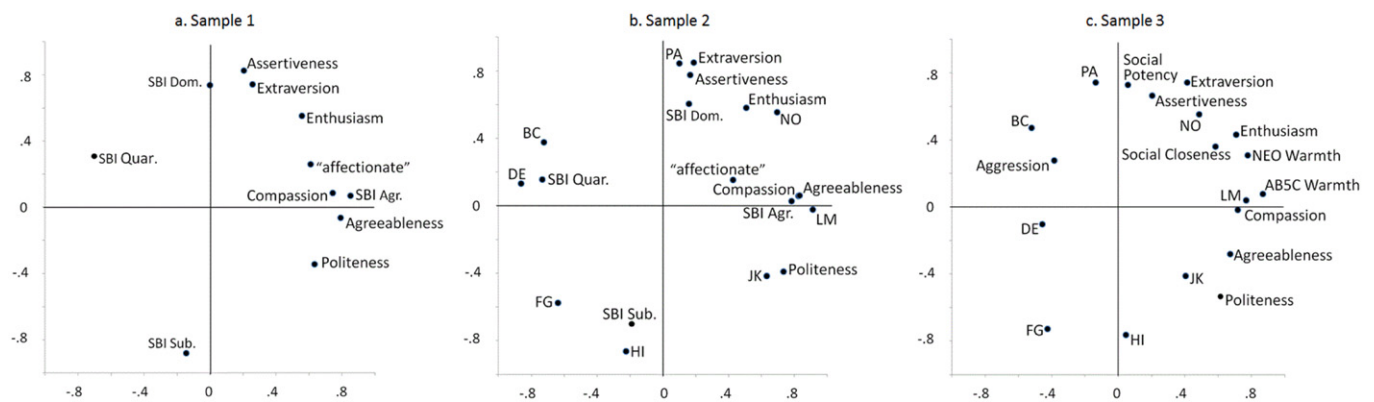


Figure 2 Factor loading plots for Extraversion and Agreeableness and their aspects, measures of the IPC, and trait affiliation. SBI = Social Behavior Inventory; Quar. = Quarrelsomeness; Dom. = Dominance; Agr. = Agreeableness; Sub. = Submissiveness; "affectionate" = ratings of the item "Feel affectionate toward people."

coefficients for overall circumplex structure and for each of the two major axes of the IPC were above .95, indicating replication of the hypothesized structure. Of the coefficients for individual variables, all but two were above .95, and those two were for variables that had high congruence in one or two other samples. Slight deviations in a single sample may simply reflect sampling variability. Most importantly for our first

hypothesis, the four BFAS variables lined up well with the markers of the IPC in right half of the circumplex. This was true whether the IPC indicators were measures of recent behavioral frequencies (SBI) or of traits (IAS-R and IPIP-IPC).

Raw correlations among all measures, as well as means, standard deviations, and internal consistencies (Cronbach's

Alpha) are presented in Tables 3–5. For the IPIP-IPC in Sample 3, three alpha values were well below .60. One contributor to low alpha values in this instrument is simply that each scale contains only four items and alpha is influenced by number of items. The low internal consistencies do not appear to have problematically distorted the circumplex structure of

these three scales, as all have high congruence coefficients and are close to their expected angular location.

Consistent with our second hypothesis, measures of trait affiliation fell between Enthusiasm and Compassion in the circumplex and did not significantly deviate from their hypothesized location. The affection item fell somewhat closer to the origin than other variables, but this is not surprising because a single-item measure will have lower reliability than multi-item scales, causing its correlations with all other variables to be somewhat attenuated. Nonetheless, its angular location was as predicted.

Tellegen et al. (1988) suggested that Social Potency and Social Closeness might reflect the two major axes of the IPC, and indeed Social Potency does appear to be a good marker of the Status axis in Sample 3. As just noted, however, Social Closeness may not be an ideal specific marker of the Love axis because it falls closer to the octant at 45° that is also marked by Enthusiasm (but see Hopwood et al., 2011). This is consistent with the finding that Social Closeness is a good marker of Extraversion (Markon, Krueger, & Watson, 2005). The third MPQ scale, Aggression, falls at the opposite end of the axis marked by Politeness, which makes sense given that the latter includes reversed items like “Seek conflict” and “Love a good fight.”

Discussion

Our results supported the proposed integration of the Big Five and the IPC. Factor analysis with targeted rotation demonstrated that Extraversion and Agreeableness and their four aspects have a two dimensional structure that corresponds very closely to the IPC. In all three samples, Assertiveness corresponded to markers of the positive pole of the Status axis (Assured-Dominant), and Compassion corresponded to markers of the positive pole of the Love axis (Warm-Agreeable). Enthusiasm corresponded to the IPC location of

Table 2 Congruence Coefficients for Comparisons of Target and Observed Factor Loadings in Table 1

	Sample 1	Sample 2	Sample 3
Overall Congruence	.98	.97	.98
Axis 1 (Status)	.99	.97	.97
Axis 2 (Love)	.96	.97	.98
BFAS Assertiveness	.97	.98	.96
BFAS Enthusiasm	1.00	1.00	.97
BFAS Compassion	.99	1.00	1.00
BFAS Politeness	.96	.96	1.00
BFI Extraversion	1.00	.98	.99
BFI Agreeableness	.95	.89	1.00
SBI Dominance	1.00	.97	
SBI Agreeableness	1.00	1.00	
SBI Submissiveness	.99	.97	
SBI Quarrelsomeness	.92	.98	
PA		.99	.98
NO		.99	1.00
LM		1.00	1.00
JK		.98	1.00
HI		.97	1.00
FG		1.00	.97
DE		.99	.98
BC		.95	1.00
“Affectionate”	1.00	1.00	
NEO PI-R Warmth			1.00
AB5C-IPIP Warmth			.95
MPQ Social Closeness			.99
MPQ Social Potency			1.00
MPQ Aggression			.99

Table 3 Correlations and Descriptive Statistics for Sample 1

	Ea	Ee	Ac	Ap	E	A	“Aff”	Dom.	Agr.	Sub.	Quar.
BFAS Assertiveness	—										
BFAS Enthusiasm	.53	—									
BFAS Compassion	.22	.46	—								
BFAS Politeness	-.15	.15	.45	—							
BFI Extraversion	.68	.69	.22	-.12	—						
BFI Agreeableness	.11	.42	.54	.62	.16	—					
“Affectionate”	.33	.54	.60	.19	.35	.44	—				
SBI Dominance	.67	.34	.02	-.23	.49	.00	.11	—			
SBI Agreeableness	.23	.49	.64	.50	.26	.62	.54	-.02	—		
SBI Submission	-.73	-.51	-.19	.16	-.62	-.07	-.28	-.78	-.29	—	
SBI Quarrelsomeness	.07	-.17	-.45	-.56	.08	-.61	-.31	.08	-.66	-.25	—
Mean	3.21	3.52	3.86	3.52	3.15	3.7	3.96	.14	8.30	-2.45	-6.09
Standard Deviation	0.71	0.73	0.65	0.67	0.74	0.58	0.92	5.50	5.56	7.50	5.37
Cronbach’s Alpha	.84	.81	.84	.76	.84	.76	—	.81	.83	.84	.76

Note. $N = 469$. All correlations above .11 in absolute value are significant at $p < .05$.

Table 4 Correlations and Descriptive Statistics for Sample 2

	Ea	Ee	Ac	Ap	E	A	"Aff"	Dom.	Agr.	Sub.	Quar.	PA	NO	LM	JK	HI	FG	DE	BC	
BFAS Assertiveness	—																			
BFAS Enthusiasm	.50	—																		
BFAS Compassion	.27	.45	—																	
BFAS Politeness	-.18	.14	.59	—																
BFI Extraversion	.69	.69	.19	-.21	—															
BFI Agreeableness	.12	.51	.67	.63	.21	—														
"affectionate"	.15	.40	.43	.17	.25	.41	—													
SBI Dominance	.55	.33	.14	-.06	.45	.18	.10	—												
SBI Agreeableness	.17	.43	.71	.53	.19	.59	.34	.02	—											
SBI Submission	-.65	-.46	-.22	.10	-.59	-.14	-.18	-.74	-.29	—										
SBI Quarrelsomeness	.02	-.26	-.61	-.60	.02	-.63	-.28	-.14	-.68	-.11	—									
PA	.73	.44	.13	-.26	.66	.09	.12	.64	.09	-.68	.05	—								
NO	.46	.75	.54	.29	.65	.65	.37	.36	.53	-.42	-.43	.50	—							
LM	.13	.41	.77	.66	.15	.78	.37	.09	.68	-.13	-.65	.05	.64	—						
JK	-.17	.04	.47	.67	-.25	.44	.20	-.08	.49	.09	-.49	-.26	.12	.51	—					
HI	-.73	-.56	-.23	.16	-.76	-.26	-.17	-.59	-.19	.61	.06	-.83	-.66	-.21	.19	—				
FG	-.48	-.75	-.50	-.22	-.67	-.59	-.39	-.34	-.48	.41	.37	-.54	-.90	-.60	-.15	.62	—			
DE	-.06	-.29	-.74	-.66	.00	-.68	-.35	-.11	-.66	.13	.63	-.04	-.51	-.86	-.63	.05	.43	—		
BC	.13	-.09	-.53	-.72	.21	-.54	-.19	.04	-.55	-.03	.54	.16	-.28	-.67	-.82	-.18	.20	.68	—	
Mean	3.25	3.33	3.84	3.61	3.02	3.63	3.81	0.15	0.59	-0.14	-0.52	0.28	0.82	1.16	0.67	-0.22	-0.54	-1.17	-1.00	
Standard Deviation	0.67	0.64	0.68	0.64	0.81	0.65	0.95	0.47	0.50	0.53	0.44	0.83	0.99	0.96	0.80	0.90	0.96	0.84	0.85	
Alpha	.83	.79	.79	.76	.85	.78	—	.57	.65	.68	.65	.82	.88	.88	.72	.88	.92	.93	.92	

Note. $N = 294$. All correlations above .11 in absolute value are significant at $p < .05$.

Table 5 Correlations and Descriptive Statistics for Sample 3

	Ea	Ee	Ac	Ap	E	A	NEO	AB5C	SP	SC	AG	PA	NO	LM	JK	HI	FG	DE	BC	
BFAS Assertiveness	—																			
BFAS Enthusiasm	.40	—																		
BFAS Compassion	.11	.47	—																	
BFAS Politeness	-.28	.19	.42	—																
BFI Extraversion	.66	.61	.22	-.09	—															
BFI Agreeableness	-.02	.38	.44	.54	.12	—														
NEO PI-R Warmth	.34	.72	.52	.33	.55	.46	—													
AB5C-IPIP Warmth	.25	.63	.71	.46	.38	.52	.72	—												
MPQ Social Potency	.75	.30	-.02	-.36	.59	-.15	.24	.13	—											
MPQ Social Closeness	.30	.64	.42	.16	.49	.31	.58	.51	.27	—										
MPQ Aggression	.08	-.11	-.28	-.40	.05	-.44	-.22	-.26	.21	-.14	—									
PA	.40	.20	-.06	-.48	.47	-.27	.14	-.08	.50	.19	.17	—								
NO	.41	.62	.29	.01	.65	.16	.56	.41	.42	.49	-.03	.24	—							
LM	.20	.53	.62	.47	.33	.45	.56	.77	.05	.43	-.26	-.11	.32	—						
JK	-.11	.13	.29	.50	-.14	.45	.17	.27	-.20	.06	-.25	-.42	-.11	.21	—					
HI	-.45	-.30	.06	.42	-.53	.23	-.20	-.01	-.54	-.22	-.23	-.72	-.44	-.04	.25	—				
FG	-.53	-.65	-.28	.09	-.74	-.06	-.56	-.39	-.51	-.51	-.01	-.52	-.69	-.39	.10	.50	—			
DE	-.08	-.31	-.56	-.16	-.21	-.21	-.36	-.46	-.05	-.36	.13	-.11	-.34	-.44	-.18	-.01	.20	—		
BC	.12	-.18	-.27	-.62	.10	-.58	-.26	-.38	.22	-.07	.38	.43	-.12	-.38	-.54	-.40	-.18	-.03	—	
Mean	3.38	3.63	4.15	4.12	3.28	4.09	22.68	4.08	34.01	33.95	21.15	-.91	.18	1.12	.69	.40	-.11	-.33	-1.06	
Standard Deviation	.68	.68	.54	.52	.78	.56	4.54	.57	6.01	4.87	2.20	.76	.83	.56	.51	.68	.81	.56	.69	
Alpha	.85	.81	.79	.75	.87	.80	.80	.80	.89	.86	.72	.69	.73	.63	.37	.49	.67	.40	.69	

Note. $N = 409$. All correlations above .09 in absolute value are significant at $p < .05$.

Gregarious-Extraverted, and Politeness to the IPC location of Unassuming-Ingenuous. Thus, a model of the Big Five focusing on the aspect-level traits, which fall between facets and domains, appears to provide a more precise understanding

of how the IPC relates to the Big Five than was previously available.

This finding highlights the utility of a model of the Big Five that includes the aspect-level traits, which provide an empiri-

cally derived substructure that the facets currently do not. The aspects are likely to be a parsimonious representation of the most important distinctions for discriminant validity within each Big Five domain. This conjecture is supported, in relation to interpersonal behavior, by the fact that the aspects of Extraversion and Agreeableness align exactly with the octants of the IPC. A study of personality development recently demonstrated how distinguishing among IPC octants may help to explain inconsistencies in Big Five research—in this case regarding whether mean levels of Extraversion change in adulthood. Wright, Pincus, and Lenzenweger (2012) found that scores on Assured-Dominant increased in young adulthood, but scores on Gregarious-Extraverted did not. This was consistent with previous findings that subcomponents of Extraversion equivalent to Assertiveness (“social dominance”) and Enthusiasm (“social vitality”) showed the same differential pattern (Roberts, Walton, & Viechtbauer, 2006). Our model depicted in Figure 1 would predict exactly this correspondence between Big Five and IPC research.

Our model goes beyond hierarchical personality models to provide a coherent structural account of the complex situation in which some aspects of Extraversion and Agreeableness (Enthusiasm and Compassion) are positively related, whereas others (Assertiveness and Politeness) are negatively related. Whether global measures of Extraversion and Agreeableness are found to be orthogonal or correlated, therefore, is likely to be influenced by whether they contain unbalanced numbers of items associated with their different aspects. (Judging by our results, BFI Extraversion may be biased toward Assertiveness and BFI Agreeableness toward Compassion.) In the same vein, the model also explains longstanding confusion in Big Five research over whether personality traits labeled “Warmth” should be located within Extraversion or Agreeableness (Saucier, 1992). Clearly, the answer is “both” because Warmth is interstitial between Extraversion and Agreeableness in the circumplex. The exact wording of Warmth items will determine whether they fall closer to Extraversion or closer to Agreeableness. These structural issues cannot be properly understood by relying exclusively on a hierarchical Big Five model that depicts simple structure. The circumplex nature of the aspects of Extraversion and Agreeableness must be taken into account.

As personality psychology moves beyond merely descriptive models toward the development of explanatory theories, it is increasingly important to be able to reconcile and unify theories developed using different models. The structural model developed in the present research allows thorough integration of the most broadly used model of personality trait structure with the most broadly used model of interpersonal behavior. This integration should facilitate development of theories of the nature and sources of different social behaviors and also individual differences in those behaviors.

Our second hypothesis, regarding the location of trait affiliation, represents an attempt to bring our structural model to bear on an explanatory personality theory that provides a

mechanistic account of the psychobiological basis of trait affiliation (Depue & Morrone-Strupinsky, 2005). As hypothesized, markers of affiliation, relating to interpersonal warmth and affection, fell in the space between Enthusiasm and Compassion, traits that are adjacent in the circumplex despite being from different Big Five domains. The Big Five model groups Enthusiasm with Assertiveness and Compassion with Politeness, but one meaningful alternative might be to describe Enthusiasm and Compassion as two aspects of a domain labeled “Affiliation,” with its position as labeled in Figure 1b. Based on item content, Enthusiasm is related to positive affect and outgoing friendliness, whereas Compassion is related to empathy and concern for others (DeYoung et al., 2007). All of these qualities are conceptually important for affiliation, and anyone researching affiliation as a trait would be well advised to measure both Enthusiasm and Compassion.

Our hypothesis that affiliation is located at 22.5° in the IPC, rather than being identical with the Love axis at 0°, constitutes a slight modification of standard IPC theory, and further research will be needed before one can be confident in its utility. We employed only four markers of affiliation, one of which consisted of a single item. Further, the location we hypothesized for these markers is close rotationally to the horizontal axis, and it would be relatively easy to argue that all of the affiliation variables in our study are simply markers of the Love axis. Nonetheless, the utility of circumplex models is that one can be precise about angular position rather than merely assigning markers to one factor or another. From a theoretical perspective, it is important if markers of affiliation always fall above the horizontal axis, as this supports the theory that the reward processes associated with Extraversion are fundamentally important in affiliation (Depue & Morrone-Strupinsky, 2005).

The fact that traits within Extraversion and Agreeableness have a circumplex structure, which is not true of most other pairs of Big Five domains (Saucier, 1992), may provide insight useful for understanding the mechanisms involved in these traits. From a mathematical perspective, only two axes are necessary to describe a circumplex; thus, the diagonal axes could be considered merely blends of the two major axes. Two causal forces would be sufficient to produce individuals with traits at all angles of the circumplex. Someone might be enthusiastic or gregarious, for example, merely because he or she was both assertive and compassionate. However, existing evidence from personality neuroscience suggests the existence of separate causal forces associated with Enthusiasm and Politeness, potentially distinct from those that cause Assertiveness and Compassion (DeYoung, 2010). This would mean that Enthusiasm and Politeness cannot be considered mere blends from an explanatory standpoint, and that more than two axes of the circumplex in Figure 1b represent causal forces.

To illustrate: Depue and Morrone-Strupinsky (2005) demonstrated that Social Closeness predicted variation in opiate function in response to affiliative stimuli, and Figure 2c indicates that Social Closeness is most similar to Enthusiasm. On

this basis, Enthusiasm has been hypothesized to reflect the sensitivity to hedonic reward and pleasure associated with opiate function (DeYoung, 2010). In contrast, Assertiveness appears to reflect the sensitivity to incentive reward and drive associated with dopamine (Depue & Collins, 1999; DeYoung, 2010; Wacker, Mueller, Hennig, & Stemmler, 2012). Whereas Enthusiasm may be related to sensitivity to the reward value of social affiliation, Compassion may reflect some other processes involved in affiliation, such as the empathy necessary for recognition of affiliative stimuli. Compassion might be related to variations in oxytocin, as this neuropeptide is involved in affiliative bonding (Depue & Morrone-Strupinsky, 2005; Feldman, Weller, Zagoory-Sharon, & Levine, 2007). Finally, testosterone would be a likely candidate as the cause of negative covariation between Assertiveness and Politeness, as testosterone has been implicated in both dominance and aggression (Netter, 2004; Zuckerman, 2005), and prenatal exposure to testosterone appears to be negatively associated with Agreeableness (Luxen & Buunk, 2005). The existence of separate mechanisms that incline people toward the diagonal octants of the IPC could explain why interpersonal traits show circumplex rather than simple structure—that is, why interpersonal traits do not simply cluster near the poles of Status and Love.

A limitation of this study is that it used only self-reports to assess both personality and interpersonal behavior. Future research may investigate their association in more detail, using behavioral and biological measures in addition to questionnaires. Hopefully, the thorough mapping of the Big Five onto interpersonal behavior allowed by the aspect-level traits of the BFAS will be useful in both behavioral and biological research. The replication of our results across three quite different samples suggests that this mapping is likely to be robust. We believe the structural integration presented here is a necessary starting point for any comprehensive theory of personality and interpersonal behavior.

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