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Integration of the Big Five and Circumplex Approaches to Trait Structure

Willem K. B. Hofstee and Boele de Raad
University of Groningen
Groningen, The Netherlands

Lewis R. Goldberg
University of Oregon and Oregon Research Institute
Eugene, Oregon

To integrate the 5-dimensional simple-structure and circumplex models of personality, the Abridged Big Five Dimensional Circumplex (AB5C) taxonomy of personality traits was developed, consisting of the 10 circumplexes that can be formed by pitting each of the Big Five factors against one another. The model maps facets of the Big Five dimensions as blends of 2 factors. An application to data consisting of 636 self-ratings and peer ratings on 540 personality trait adjectives yielded 34 well-defined facets out of a possible 45. The AB5C solution is compared with simple-structure and lower dimensional circumplex solutions, and its integrative and corrective potential are discussed, as well as its limitations.

Goldberg (1981) has stated a need for a taxonomy of personality traits comparable in function to the periodic table of chemical elements. Two kinds of taxonomic models have recently become quite popular. One is the Big Five factor structure, which subsumes most personality traits within five broad bipolar dimensions: (I) Extraversion or Surgency, (II) Agreeableness, (III) Conscientiousness, (IV) Emotional Stability, and (V) Intellect or Openness to Experience (Goldberg, 1990; John, 1989; McCrae, 1990; Ostendorf, 1990). The other is the circumplex model, in which traits are characterized by their angular positions in a two-dimensional factor space. The most familiar circumplex is the Interpersonal Circle (see Wiggins, 1982), which is based on Big Five Factors I and II (McCrae & Costa, 1989; Trapnell & Wiggins, 1990). Another circumplex model has been provided by Peabody and Goldberg (1989), consisting of two connected circular structures that are based on Factors I, II, and III. In this article, we develop an integration of the Big Five and circumplex models and present an empirical illustration using data sets from Goldberg (1990).

The superiority of the Big Five model over circumplex models resides in the fact that the latter cover only a subset of the trait space. Five broad dimensions have been found across language domains (for an overview, see John, Goldberg, & Angleitner, 1984), in adjectival and in questionnaire formats (Digman & Inouye, 1986; Costa & McCrae, 1985), in internal judgments of the conceptual relations among traits and in external judgments of the extent to which traits are descriptive of actual people (Peabody & Goldberg, 1989), and across methods of analysis (Goldberg, 1990). However, the interpretation of the Big Five factors is far from being unequivocal. John (1990), for example, referred to "the perception that there is no *single* Big Five; this perception is evident in questions such as '*which* Big Five?' or '*whose* Big Five?" (p. 78; italics in the original). The reason, to be argued more fully later in this article, is that trait descriptors do not fit perfectly into simple-structure models, which provide the rationale for procedures such as varimax rotation. Trait names tend to represent blends of factors. Consequently, the factor locations are unstable, and unequivocal interpretive labels are hard to find. Circumplex models, by their nature, provide much more opportunity for identifying clusters of traits that are semantically cohesive.

A full integration of five-factor and circumplex models would consist of a five-dimensional circumplex. As a first step in envisaging this structure, one might take a sphere with just three axes, for example, I. Extraversion, II. Agreeableness, and III. Conscientiousness. This model would contain the Wiggins (1979) two-dimensional circumplex, the Peabody and Goldberg (1989) three-dimensional, double-circumplex structure, and the two-dimensional circumplex that may be constructed on the basis of Factors II and III. Viewed from its center, the sphere would look like a starry sky with a number of galaxies representing clusters of traits and with more or less empty spaces containing a few isolated stars (Goldberg, 1992). The full model would require the extension of this structure to the fourth and fifth dimensions.

Apart from elementary considerations of parsimony, there are substantive reasons to condense this representation into a simpler one. First of all, circumplexes, rather than showing an even spread of traits over angular locations, tend to leave empty spaces. Certain blends of the underlying dimensions are more likely to be registered by the language community than others, whether this is for reasons of collective simplicity or because of an objective behavioral state of affairs. This tendency for traits to cluster together may be seen, for example, in Figure 1 of Peabody and Goldberg (1989). Second, rotations to simple structure result in a configuration that minimizes the spread of trait variance over factors, even though it cannot achieve the kind of simple structure in which each trait is captured by one factor only. Instead of a full five-dimensional circumplex, we

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Correspondence concerning this article should be addressed to Willem K. B. Hofstee or Boele de Raad, Department of Psychology, University of Groningen, Grote Kruisstraat 2-I, 9712 TS Groningen, The Netherlands, or to Lewis R. Goldberg, Oregon Research Institute, 1899 Willamette Street, Eugene, Oregon 97401.

therefore propose a partial liberalization of simple structure. In this Abridged Big Five Dimensional Circumplex (AB5C), each trait is characterized by its loadings on a subset of two of the five factors. There are 10 such subsets; therefore, the AB5C model comprises the 10 two-dimensional circumplexes formed by taking as a base two factors at a time.

Further economy is achieved by partitioning the circumplex planes into a limited number of segments, rather than retaining the exact angular positions of the trait variables. Simple-structure models, which assign variables to the factor on which they load highest, amount to a partitioning of the planes into four segments, of which the factors are the bisectrices, and thus the boundaries of the segments are formed by a 45° rotation of the axes. This procedure therefore neglects secondary factor loadings that may run almost as high as the primary loadings. Wiggins's (1979) model uses octants, so that variables are grouped together that have an angle of less than 45°. Using octants amounts to adding the bisectrices of the quadrants as extra factors and assigning variables to the factor pole (out of eight) on which their projection is highest.

Here, we partition the circumplex planes into segments of 30° each, inserting additional factors at angles of 30° and 60° with each of the basic factors. One reason for this finer partitioning is that valid distinctions are lost when using octants. For example, *helpful, cooperative,* and *considerate* in our analysis have a primary loading on Factor II+ and a secondary loading on Factor III+, whereas *responsible, dependable,* and *reliable* have a primary loading on III+ and a secondary loading on II+. Both clusters are distinct from their adjacent pure-factor clusters, which are *sympathetic, kind,* and *warm* for Factor II+ and *organized, neat,* and *orderly* for Factor III+. Many more examples could be given. More generally, the practice of neglecting secondary loadings (for example, loadings below .30 on other factors) in simple-structure solutions may be deceptive, especially when the primary loadings are of a modest size. Factor interpretation in terms of highest loading variables amounts to mentally constructing a weighted or unweighted mean of these variables. If the variables happen to have secondary loadings in common, the interpretation does not fit the factor but a rotation of it. This neglect of secondary loadings may be responsible for at least some of the disputes and unclarities in the factor-analytic literature. The AB5C approach guarantees that projections of traits on the bisectrix of the segment to which they are assigned are at least 3.73 times as large as their projections on the bisectrix orthogonal to it, because the angle between the trait vector and the segment bisectrix is at most 15° (cotangent = 3.73).

Another reason for using segments of 30° is that facets of factors can thus be written as modifications of these factors by other factors. It is generally acknowledged that the Big Five factors are too broad to be cohesive. Facets have been constructed by Costa and McCrae (1985) and Goldberg (1990). These specifications follow a hierarchical conceptual design, in which a separate concept is needed for each specification. The present, more parsimonious, approach is to construct a conceptual matrix with the Big Five factors as both row and column entries. Using unipolar trait variables, the procedure provides a maximum of eight facets (namely, the positive and negative poles of the four other factors) per factor pole in addition to the pure-factor facets. The approach amounts to partitioning each of the circumplex planes into 12 segments of 30°.

The algorithm for assigning traits to segments starts with the varimax-rotated loadings of the variables. Only the two highest loadings of a variable are considered. If the primary loading is at least 3.73 as large as the secondary loading, the variable is assigned to the pure-factor segment associated with the primary loading. For example, *extraverted,* with its highest loading of .65 on Factor I and its highest secondary loading of .09 on Factor II, would be assigned to the I+I+ segment. The remaining traits are assigned to mixed factor segments according to their primary and secondary loadings, taking their signs into account. For example, *domineering,* with its primary loading of .43 on Factor I and its secondary loading of −.29 on Factor II, is assigned to the I+II− segment.

The extent to which the trait is represented by the model is indexed by the length of its projection on the bisectrix of the segment. The angle between the bisectrix and the factor on which the variable has its primary loading is 30°, and it is 60° with the secondary factor. Accordingly, the projection length h is

$$h = a_1 \cos(30°) + a_2 \cos(60°),$$

with a_1 and a_2 being the absolute values of the primary and secondary loadings, respectively. For example, *domineering* obtains a projection on the bisectrix of the I+II− segment of $.43 \times .866 + .29 \times .50 = .52$. Variables whose projections are below a threshold on their segment bisectrix are omitted. In view of the dependability of factor loadings based on several hundreds of observations, we are here using a threshold of .20.

A version of the above procedure that is less transparent but easier to program involves calculating the projections of each variable on all 90 segment bisectrices and assigning a variable to a segment according to its highest projection if it is above the threshold. The present procedure resembles the one used by Peabody (1984; Peabody & Goldberg, 1989) for finding the angular positions of variables. The difference is twofold: The AB5C algorithm assigns a variable to a segment bisectrix rather than retaining its exact angular position, and it gives the length of the projection of the variable (its loading) rather than extending each variable to unit length.

Method

We applied the AB5C procedure to data collected by Goldberg (1990); 320 college students described themselves using 587 trait-descriptive adjectives, and 316 of these subjects used the same terms to describe someone of their own age and sex whom they knew well and liked (Goldberg, 1990; p. 1222). In view of the fact that previous analyses failed to show systematic differences between the structures of self and peer ratings (Goldberg, 1990), we pooled both types of ratings into one data set. To remove all individual differences in the subjects' use of the rating scale, the ratings from each subject were standard (Z) scored across the 587 terms.

The set of 587 terms is described by Goldberg (1982). Of these terms, 47 amplifications (e.g., *overintelligent*) were omitted. Among the remaining 540 terms are the 100 unipolar factor markers described in Goldberg (1992). The matrix of the 636 self-ratings and peer ratings on

these 100 marker variables was subjected to principal-components analysis and varimax rotation. The factor loadings of the other 440 adjectives on the rotated factors were calculated by taking the correlations between each adjective and the five factor scores. The reason for this preferential treatment of the marker variables was to maintain the connection with the solution reported by Goldberg (1992). The AB5C algorithm was then applied to the 540 × 5 matrix of factor loadings.

Results

The AB5C Solution

Of the 540 trait terms, 84 loaded less than .20 on all varimax factors; 40 of these, however, had projections of at least .20 on one of the inserted factors, and thus only 44 of the 540 terms are not included in the AB5C analysis. Many of these 44 terms are difficult (e.g., *acquisitive, austere, doleful, jaded, malleable, morose,* and *urbane*) or ambiguous (e.g., *crafty; curious, liberal,* and *nonchalant*); some are very specific (e.g., *cosmopolitan* and *superstitious*). The high reliability of the data is illustrated by the fact that even many of the lowest loadings make sense. *Subjective,* for example, which had the lowest AB5C projection of all (.06), would have been assigned to the III–IV– segment (highest loading on the negative pole of Factor II, with its secondary loading on the negative pole of Factor IV) together with *inconsistent, scatterbrained, unstable, erratic, forgetful, impulsive,* and *frivolous.*

Of the remaining 456 terms, 259 loaded .20 or higher on only one rotated factor, illustrating the power of the varimax procedure; however, only 67 of these 259 terms had negligible secondary loadings in the present model and are thus considered pure factor markers. Moreover, 180 variables had two loadings of .20 and higher, whereas only 17 had three such loadings. These findings demonstrate that the AB5C model aptly compromises between a simple-structure model and the full five-dimensional circumplex. On the one hand, the number of terms with nonnegligible secondary loadings is sizable; on the other, the varimax algorithm does succeed in minimizing the number of terms deserving a three-dimensional representation. There were no terms with four or five loadings of at least .20.

A complete list of the factor loadings and the highest projections of all terms is available from the authors. Also available is the full matrix with the 10 factor poles as row and column entries and the cells of the matrix containing the terms assigned to that segment in the order of the sizes of their projections. The number of terms per cell is necessarily 0 for the 10 combinations of the positive and the negative poles of the same factor. For the remaining 90 cells, the number of terms per cell varies from 0 for 6 cells to 24 for the II+IV+ cell.

The 10 two-dimensional circumplexes into which the terms have been projected are presented in Figure 1. The figure gives both the location of the terms within the circle, as defined by their angular positions and distances from the origin, and their locations on the circumference after extension to equal length. When two or more terms are located in approximately the same position on the circle, the label applies to the term with the highest projection length. The triangles in Figure 1 indicate the locations of the factor-univocal terms, which by definition have very low secondary loadings, in each of the four planes other than the one containing their actual secondary loadings. Table 1 provides the terms in each of the facets with projections of at least .20; when more than 10 terms are associated with a facet, the 10 with the highest projections are listed.

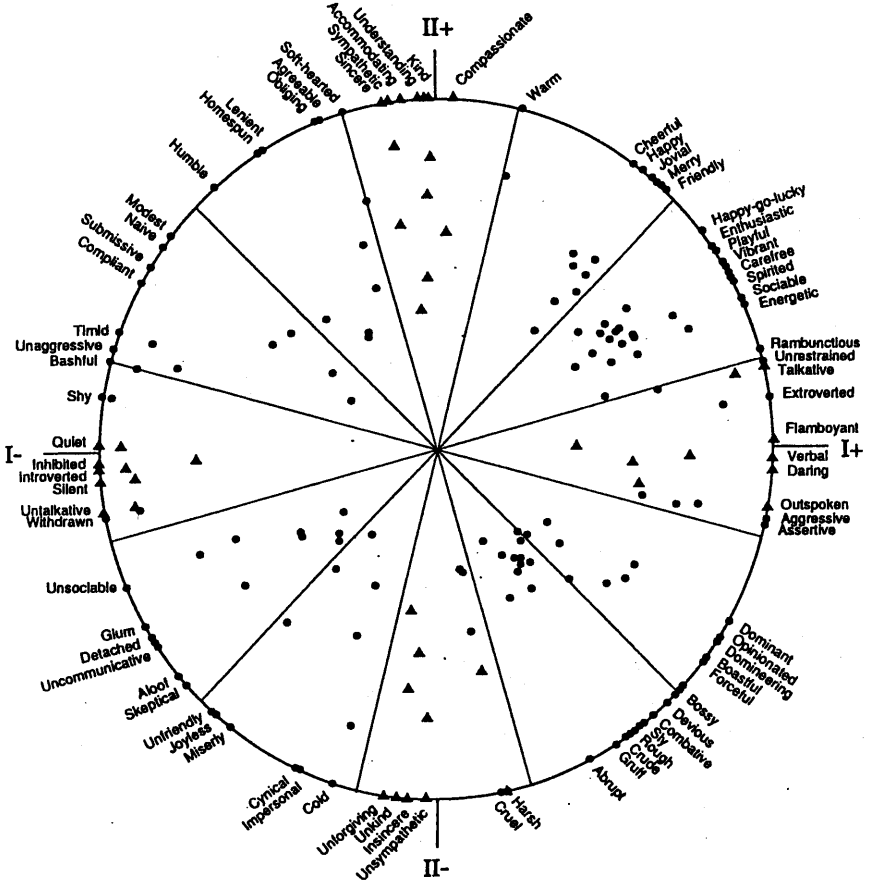
Of the 10 circumplexes, those for Factors I × II and II × IV include the largest numbers of trait terms. The I × II interpersonal circle (Wiggins, 1979) shows a more even spread of terms than the II × IV configuration, which shares a southwest versus northeast orientation with all other plots except the I × III circumplex. A temptation may arise to apply oblique rotation procedures to these configurations. However, Goldberg (1990) has shown that the factor orientations hardly shift on oblique rotation to simple structure. Moreover, in an analysis of Dutch data (Hofstee & de Raad, 1991), the II × IV rather than the I × II circumplex was the most complete of all. Finally, in an analysis of German terms by F. Ostendorf (personal communication, June 17, 1991), the I × II circumplex includes fewer terms than the II × III and I × V plots. A generalizable finding, however, is that the factor poles are not indiscriminate in their promiscuity; a number of possible facets do not eventuate, or are represented by only a few terms, in all three languages.

The 90 AB5C unipolar facets listed in Table 1 can be grouped into 45 bipolar facets, each of which will be here labeled by the antonym pair that elicited the highest average loading. Of the nine possible bipolar facets of Factor I, eight are well-defined: *talkative–silent, sociable–unsociable, dominant–submissive, competitive–uncompetitive, boisterous–restrained, courageous–cowardly; explosive–sedate,* and *adventurous–unadventurous.* The only facet that is insufficiently defined is I+V– versus I–V+. Factor II has seven well-defined facets: *sympathetic–unsympathetic, friendly–unfriendly; agreeable–rough, considerate–inconsiderate, generous–selfish, affectionate–unaffectionate,* and *tactful–tactless,* the latter being well-defined only at one pole. Factor III also has seven well-defined facets: *organized–disorganized, ambitious–unambitious, cautious–reckless, reliable–unreliable, consistent–inconsistent, perfectionistic–haphazard,* and marginally, *conventional–unconventional.* Factor IV, which functions predominantly as a modifier of other factors in the AB5C solution, has only five well-defined facets, namely, *unenvious–jealous, unselfconscious–insecure, unexcitable–excitable, patient–irritable,* and *unemotional–emotional.* Finally, Factor V has seven well-defined facets, two of which, however, are only well-defined at one pole: *creative–uncreative, inquisitive–uninquisitive, introspective, deep–shallow; individualistic–dependent, perceptive–unobservant,* and *intellectual.* In total, then, 34 of the 45 possible bipolar facets are well-defined.

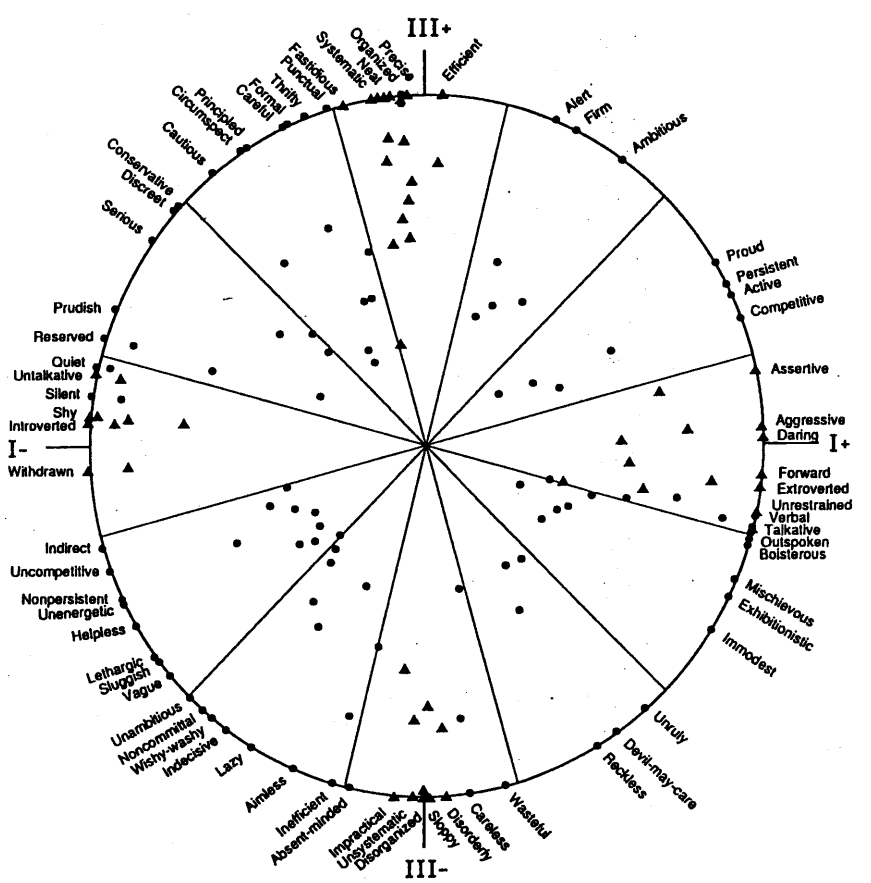
The facets resulting from the AB5C procedure differ from the ones that have been presented by Costa and McCrae (1985) and Goldberg (1990). The taxonomic difference is that these authors have used hierarchical approaches, whereas the AB5C strategy follows a matrix design using the same concepts as row and column entries. The matrix approach is thus both more restrictive and parsimonious. The price that is paid for parsimony is that the terms in a segment may be semantically heterogeneous. The I+I+ cell in Table 1, for example, on the one hand contains *talkative* and *verbal,* and on the other, *aggressive* and *assertive.* Slight differences in secondary loadings may be de-

(text continues on page 154)

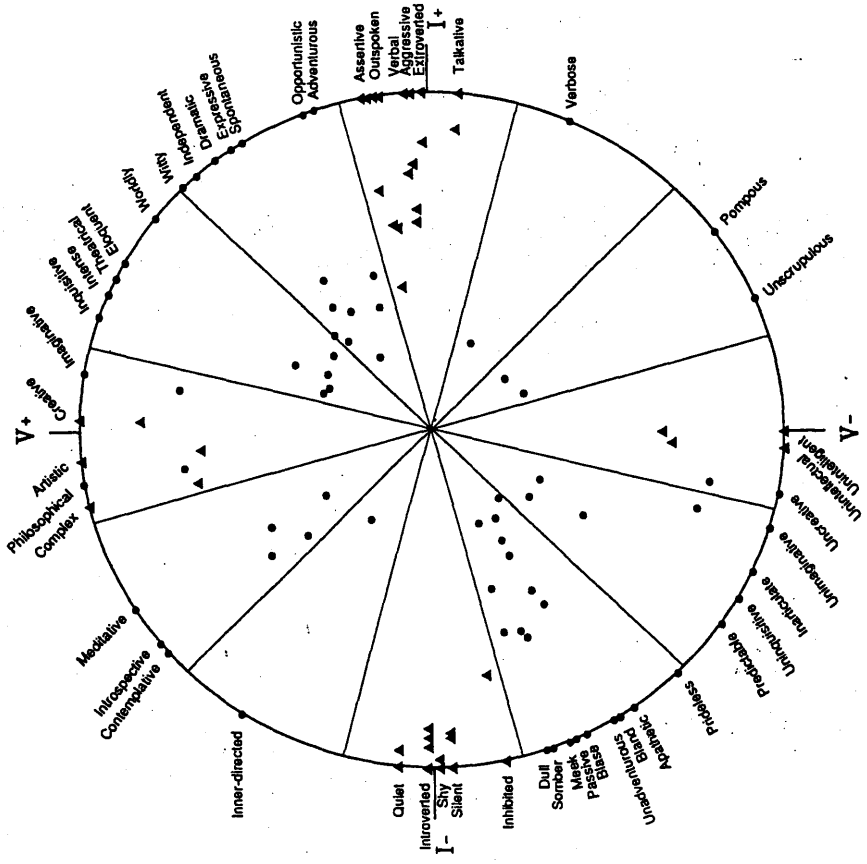
Figure 1. The 10 circumplexes formed by all combinations of the Big Five factors.



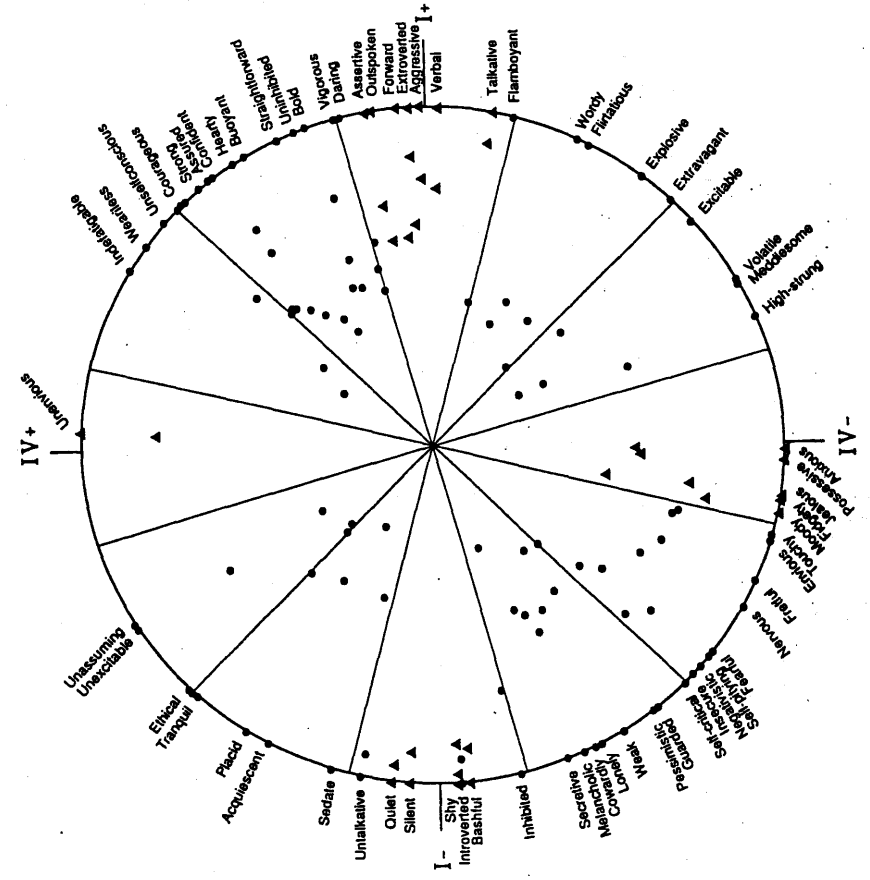
Factor I and Factor II.



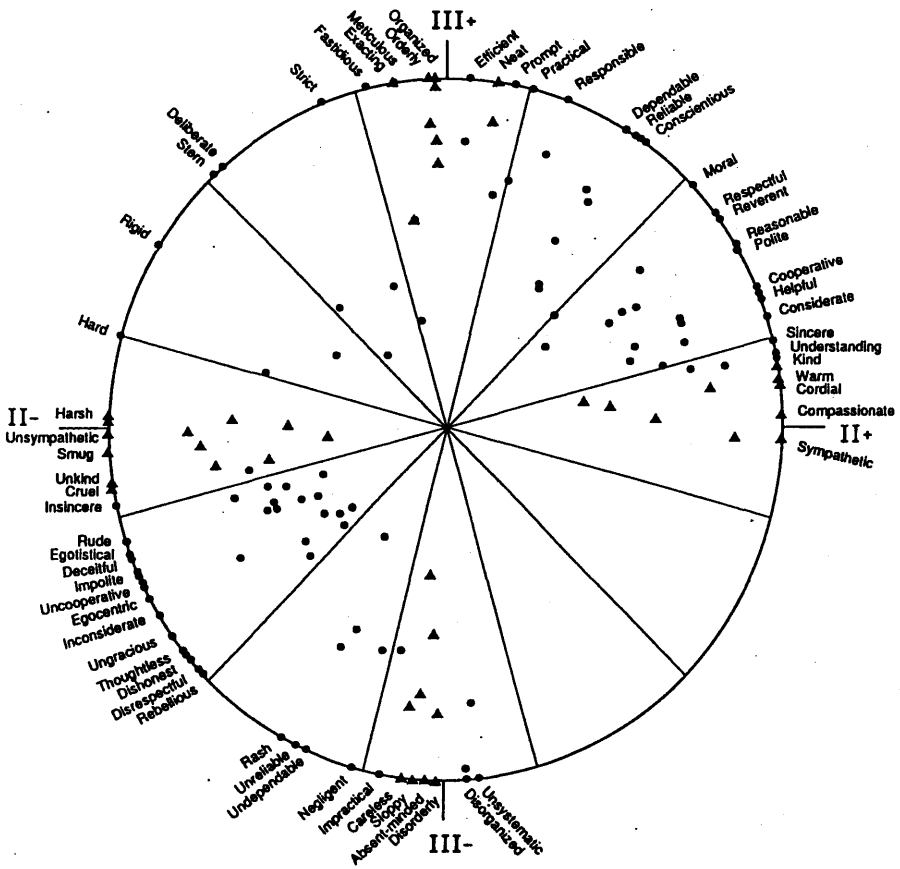
Factor I and Factor III.



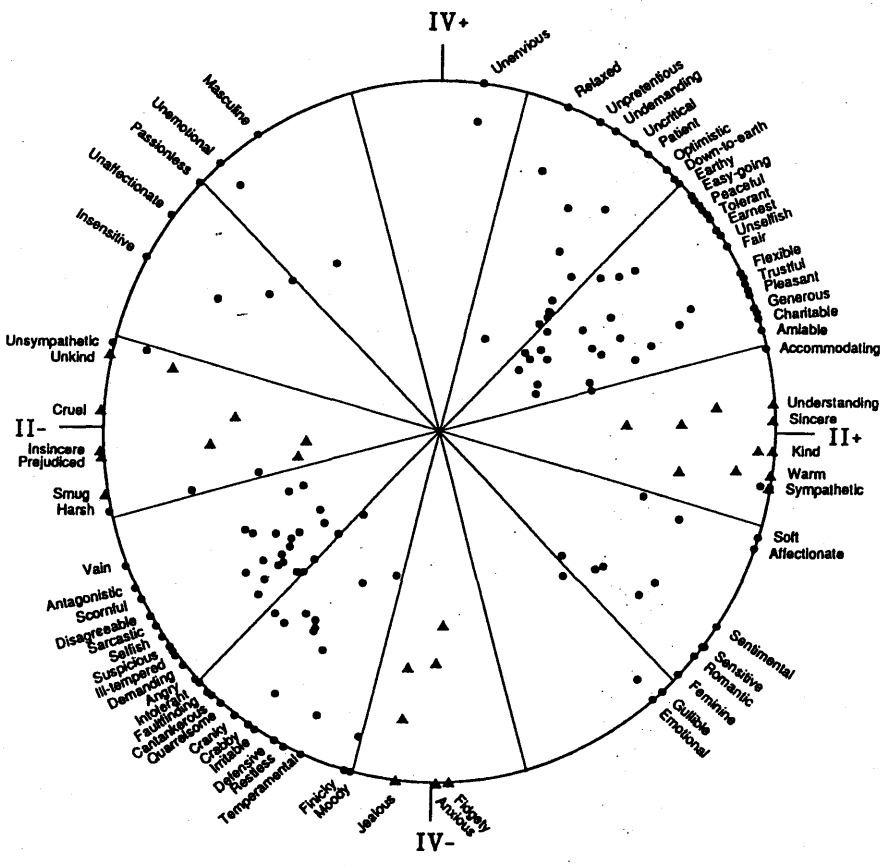
Factor I and Factor V.



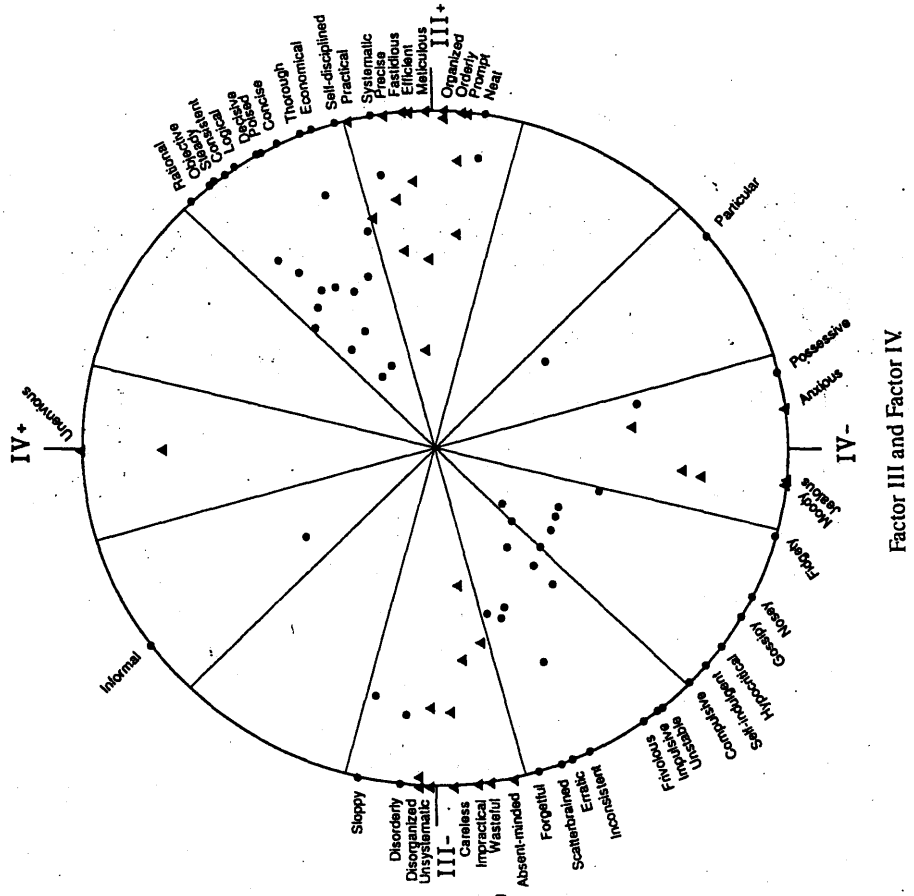
Factor I and Factor IV.



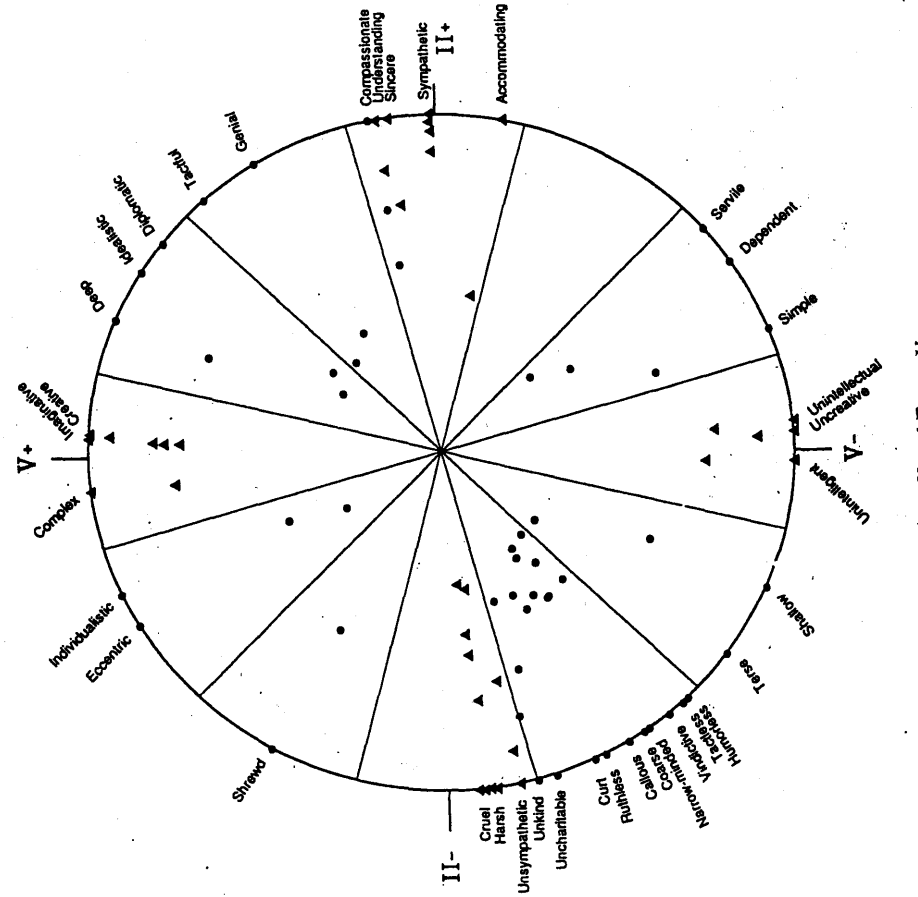
Factor II and Factor III.



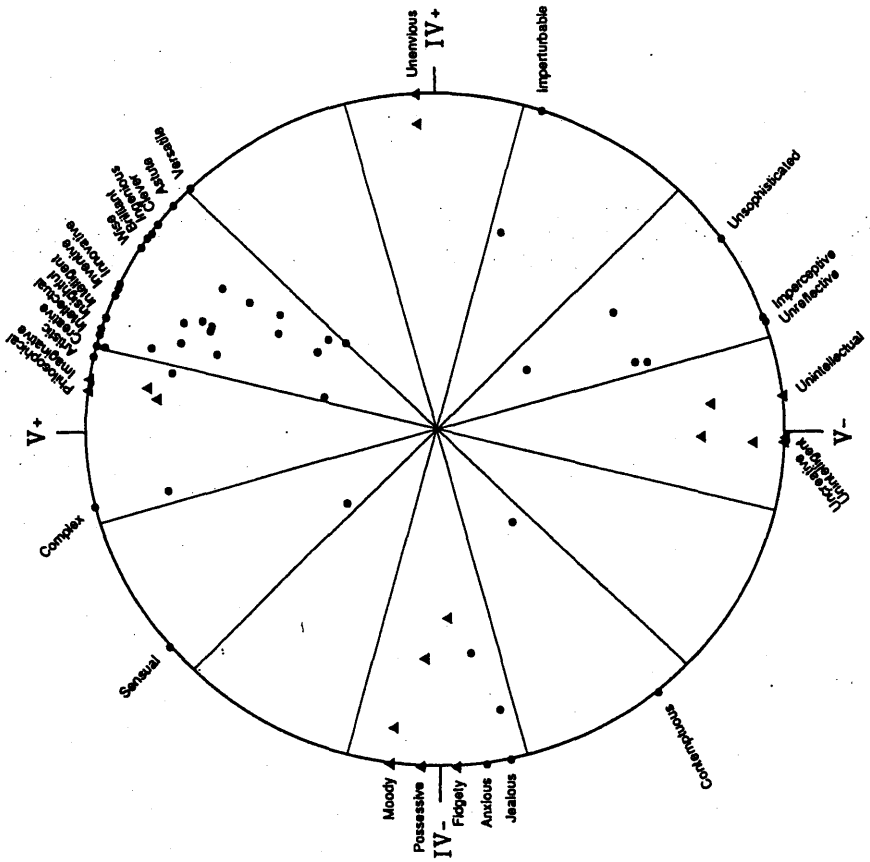
Factor II and Factor IV.



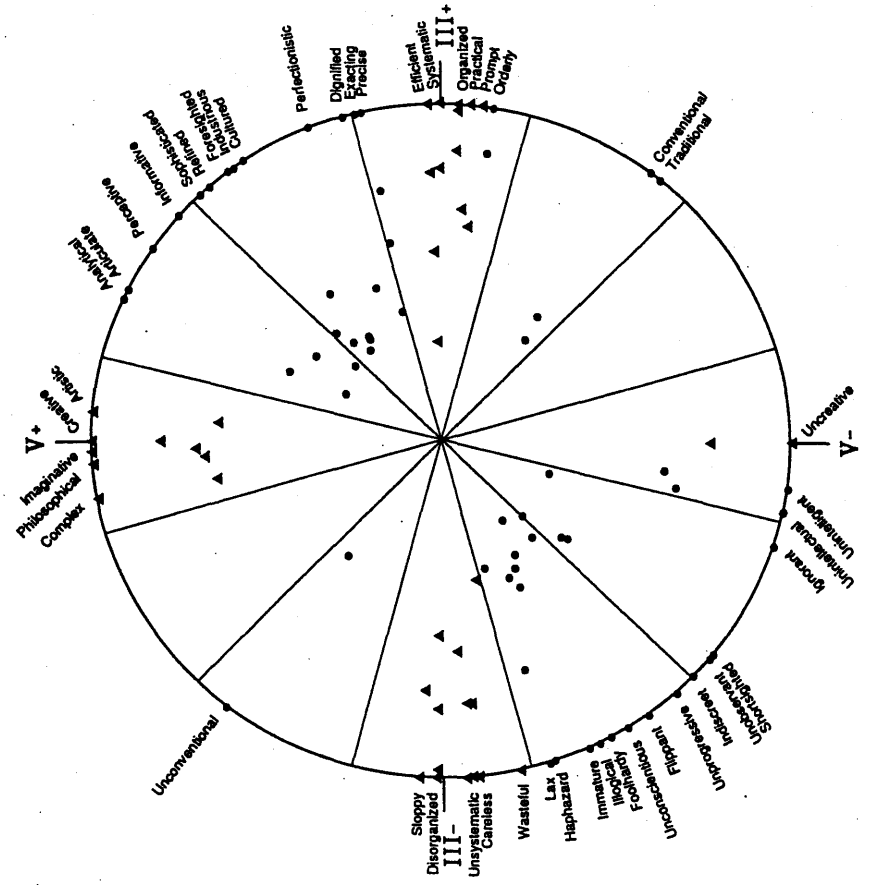
Factor III and Factor IV.



Factor II and Factor V.



Factor IV and Factor V.



Factor III and Factor V.

Table 1
Illustrative Terms (With Their Projections) in Each of the Abridged Big Five Dimensional Circumplex Facets

Facet	Projection	Term	Facet	Projection	Term
		Factor I			
I+I+	.68	talkative	I−I−	.75	shy
	.65	extraverted		.72	quiet
	.60	aggressive		.71	introverted
	.58	verbal		.69	silent
	.54	assertive		.69	untalkative
	.50	unrestrained		.68	bashful
	.47	forward		.67	withdrawn
	.47	outspoken		.55	inhibited
	.45	daring			
	.32	flamboyant			
I+II+	.62	sociable	I−II−	.58	unsociable
	.61	social		.53	uncommunicative
	.52	enthusiastic		.49	seclusive
	.51	communicative		.36	glum
	.51	spirited		.36	detached
	.50	energetic		.29	skeptical
	.49	vibrant		.28	aloof
	.48	magnetic		.25	wary
	.48	zestful			
		(+8 others)			
I+II−	.52	dominant	I−II+	.68	timid
	.52	domineering		.60	unaggressive
	.49	forceful		.44	submissive
	.40	bossy		.42	modest
	.35	boastful		.29	naive
	.30	opinionated		.22	compliant
	.27	cunning			
I+III+	.47	active	I−III−	.48	unenergetic
	.33	competitive		.37	uncompetitive
	.28	persistent		.36	sluggish
	.20	proud		.33	nonpersistent
				.32	indirect
				.32	vague
				.30	lethargic
				.29	helpless
I+III−	.39	boisterous	I−III+	.68	reserved
	.36	mischievous		.50	restrained
	.34	exhibitionistic		.41	serious
	.32	immodest		.34	conservative
	.29	gregarious		.30	discreet
	.24	demonstrative		.26	prudish
I+IV+	.60	confident	I−IV−	.48	lonely
	.58	bold		.44	weak
	.55	assured		.43	cowardly
	.44	uninhibited		.42	pessimistic
	.42	courageous		.41	melancholic
	.41	brave		.31	guarded
	.40	self-satisfied		.25	secretive
	.40	vigorous			
	.39	strong			
		(+6 others)			
I+IV−	.36	flirtatious	I−IV+	.38	tranquil
	.34	explosive		.36	sedate
	.30	wordy		.36	placid
	.23	extravagant		.26	ethical
				.24	impartial
				.21	acquiescent

tected: *Assertive* has a II–, III+, IV+, V+ pattern, whereas the opposite signs apply to *talkative.*

Goldberg (1990) used dictionaries and synonym finders to arrive at a finer grained clustering of terms. To form a cluster, terms had to be independently judged by lexicographers as synonyms and be similar in social desirability. However, a comparison of Goldberg's (1990, Table 3) 100 Revised Synonym Clusters with the AB5C solution reveals that only 13 of the 100 clusters are AB5C homogeneous; for example, the Gregariousness cluster consists of *extraverted* (I+I+), *gregarious* (I+III–), and *sociable* (I+III+). Some semantic clusters contain terms that have their primary loadings on different factors, for example, Humor, which consists of *humorous* (II+I+) and *witty* (I+V+).

There are several possible explanations for the lack of agreement between the AB5C and lexicographic clusters. One is that the external structure of trait terms (Peabody, 1991; Peabody & Goldberg, 1989), as derived from ratings of target persons, does not correspond perfectly with their internal structure, as exemplified by dictionaries and synonym finders. A second is that the synonymity data were based on too few observations (the intuitions of a few lexicographers who may not have proceeded completely independently). These explanations are to some extent contradicted by the size of the correlations among traits in a cluster, which are quite satisfactory. A third explanation is that the lexicographic approach captures small patches of common variance beyond the Big Five that are automatically discarded through the AB5C approach.

The extent to which external structure differs systematically from internal structure is exemplified by the positions of antonyms. Some 40% of the negations are not in the segment directly opposite that of their root. For example, *aggressive* is I+I+, but *unaggressive* is I–II+ (the difference is subtle; *aggressive* is slightly II–); *conscientious* is III+II+, but *unconscientious* is III–V–; *intellectual* and *intelligent* are both V+IV+, but their negations are purely V–. The frequency with which these discrepancies occur in the present large sample precludes an interpretation in terms of chance. However, the discrepancies are slight enough to discourage concerns about the meaning of bipolar scales.

Applications of the Solution

By integrating the simple-structure and circumplex approaches to trait structure, the AB5C procedure should provide a general framework into which many earlier conceptions can be fitted and through which the relations among these conceptions may be clarified. The following attempts to do so will be restricted to cases in which authors who write in American English use terms that have been included in the present set. Translation of other concepts into the ones provided here, even within this one language, requires consensual judgments by more than a handful of speakers, in view of the sizable idiosyncratic component that is reflected in the modest communalities of the trait terms. That undertaking is beyond the scope of this study, as is the much more difficult problem of fitting solutions between languages.

Factor labels. Tracing the more or less classical labels for the Big Five factors, one finds that Extraversion (I+I+) is quite appropriate but Agreeableness is II+I–, Conscientiousness is III+II+, and Emotional is IV–II+, and neither Culture (III+V+) nor Intellect (V+IV+) precisely captures the spirit of Factor V. Scores on these factors are thus to some extent habitually mislabeled.

John (1990) has attempted to create order in the "seemingly infinite supply of personality dimensions [that] comes from the ever-increasing number of commercially available questionnaires and inventories" (p. 88). Using the simple-structure Big Five model, John (1990, Table 3.4) assigned to Factor I the concepts of *dominant* (I+II–), *low ego control* (*controlled* is III+IV+), *activity* (I+III+), *ambition* (III+I+), *sociability* (I+II+), and other labels that are not included in the present set. Of the concepts assigned to Factor II, only *femininity* (II+IV–) versus *masculinity* (IV+II–) are included here. *High ego control* (III+IV+) was assigned to Factor III, as were the opposites of *impulsivity* (III–IV–), *orderliness* (III+III+), and *thinking introversion* (I–I– or *serious,* I–III+). Assigned to Factor IV were the opposites of *emotionality* (IV–II+), *dependence* (V–II+), and *neuroticism* (*nervous* is IV–I–). Factor V includes *independence* (I+V+), *rebelliousness* (II–III–), and *flexibility* (II+IV+). Thus, at least some of these scales have either been misassigned by John, or more probably, in view of the thoroughness of his procedures, been mislabeled by their authors. Furthermore, scale scores are not factor scores but typically unweighted sums of item scores. If the items have secondary loadings in common, as we would expect to be the case, the AB5C model is needed to classify these scales.

In personality questionnaires, concepts occur at three levels. At the item level, the conceptual coherence of the scale may be checked by assigning each item independently to one of the AB5C segments. In our experience, judges can do so with a high degree of consensus. At the next level, questionnaire authors typically provide a scale interpretation in terms of traits, to which the same treatment may be applied. At the third level, the scale label itself may be classified. Inconsistencies among the levels, which are a source of misunderstanding and incorrect application, may finally be traced.

Factor markers. Norman (1963) provided short-hand labels for the complex variables devised by Cattell (1947), and these labels in turn have been used as Big Five factor markers. These factor labels provide 25 trait terms that are included here. Of these, 6 are factor-pure: *talkative* and *silent* for Factor I, *careless* for Factor III, *anxious* for Factor IV, *imaginative* for Factor V, and *jealous* (which, however, marks the negative pole of Factor II instead of Factor IV). Five more adjectives have primary loadings on factors other than the one to which they were assigned; the remaining 14 marker terms are blends. Norman's factor tables also show similar secondary loadings for the terms in most of the marker scales.

In a study to be discussed more extensively below, Trapnell and Wiggins (1990) found a number of moderate correlations among marker scales for the Big Five factors and contrasted this finding with "the fact that the dimensions of the five-factor model are generally viewed as orthogonal to one another" (pp. 785–786). Except in the trivial sense that principal components and factors are by definition uncorrelated, that view is incorrect, and Trapnell and Wiggins's findings are representative. We note earlier in this article that most of the configurations

depicted in Figure 1 have a southwest versus northeast orientation, meaning that blends between equally valenced factor poles are more likely to occur; the only exception is the I × III configuration, which shows the reverse tendency. Furthermore, the number of pure factor pole markers, according to the present criterion, ranged from 11 for III+ to only 1 for IV+; therefore, scales that are long enough to be reliable have to consist in part of items carrying secondary loadings. With the exception noted above, these secondary loadings will lead to positive correlations among marker scales if the item-selection procedure consists of taking the highest loading items, as some of these "exemplars" have more pronounced secondaries than other items with somewhat lower primary loadings. Only a careful balancing of secondary loadings can counteract the effect.

The quality of Goldberg's (1992) marker scales cannot be investigated here because these scales served as targets for the varimax rotation that preceded the AB5C procedure. Goldberg did attempt to balance the secondary loadings of the nonpure items. However, some regression toward positive manifold should be expected in fresh samples. From the present point of view, the recommended selection procedure is to supplement the pure items with those pairs of items with complementary angular positions that show the largest average projection on the factor in question, for example, a IV+I+ item paired with a IV+I– item as markers of IV+.

Circumplexes. Trapnell and Wiggins (1990) extended the Revised Interpersonal Adjective Scales (IAS-R; Wiggins, Trapnell, & Phillips, 1988) to include the remaining three Big Five factors. The result is a trait structure consisting of one circumplex (I × II) and three bipolar factor scales. The IAS-R is an integration of the simple-structured Big Five and the Interpersonal Circle representations; as such, it can be considered as a further simplification of the AB5C model. The rationale for subsuming only the I × II circumplex is of a theoretical nature and pertains to the 40-year conceptual history of the Interpersonal Circle.

If the Trapnell and Wiggins (1990) model is preferred for reasons of theory or parsimony, its implementation may still be improved by considering the model in the context of the AB5C structure. For, if only 1 of the possible 10 circumplexes is constructed, traits may be improperly assigned to that plane. The problem is exemplified by the adjectives *self-confident* and *self-assured,* which have their primary loading on Trapnell and Wiggins's Factor I and are thus assigned to the I × II circumplex by the authors' procedure; both terms, however, show large secondary loadings on Factor IV. Secondary loadings below .33 were disregarded by Trapnell and Wiggins, and terms were accepted with primary loadings as low as .33, so that angles up to 45° with the intended factor may result; indeed, they report the primary and secondary loadings of the two items in question as .53/.42 and .48/.45. Trapnell and Wiggins (1990; pp. 786–787) considered this anomaly at some length, but they concluded that conceptual explanations of the link between Factors I and IV were beyond the scope of their discussion. The problem that nonetheless remains is that their I × II plane is tilted with respect to the Factor IV axis. A prior AB5C analysis would have solved the problem by assigning such items to another plane. The same holds for the items *persistent* (I+III+), *meek* (I–V–), *charitable* (II+IV+), *ruthless* (II–V–), and *uncharitable* (II–V–) and probably for 1 or more of the 10 items that are not included here.

The question of the theoretical primacy of the Interpersonal Circle is more difficult to answer. Peabody and Goldberg (1989) have presented a I × II × III structure of traits in which the Interpersonal Circle is not expressly captured. Within the interpersonal domain, Griesinger and Livingston (1973) have developed a game-theoretical circumplex that pits profit to self against profit to the other person. Wiggins (1980) emphasized the fundamental correspondence between the interpersonal and game-theoretical circumplexes. Empirically, however, subjects' orientations in experimental games tend to range between cooperation (maximizing the sum of profits to self and other) and competition (maximizing the sum of own profit and other's loss; see, e.g., Liebrand, 1984; Liebrand & McClintock, 1988). "Abnormal" (Wiggins, 1980, p. 280) orientations like sadomasochism (maximizing the sum of loss to self and other) and martyrdom (maximizing the sum of own loss and other's profit) cannot be expected to correspond well with segments of the Interpersonal Circle (*aloof–introverted* and *unassuming–ingenuous,* respectively). Finally, the I × II × IV personality sphere provided by Saucier (1992) is a strong competitor of the Interpersonal Circle, in view of the apparent role of Factor IV in such concepts as status and power.

Peabody and Goldberg's (1989) model may be conceived of as a I × II × III sphere, rotated in such a way that its vertical axis is evaluation or social desirability; as there are few neutral traits, the equatorial band of the configuration is discarded and the traits are projected onto a vertical double cone whose center is at the origin. The poles of bipolar traits brought to unit length are represented as points on two circles. (These circles are located near the position of the tropics, but they need not be quite horizontal). For unipolar traits, the configuration can therefore be represented by two circumplexes, one for positive and one for negative trait terms. These circumplexes, however, are of a different origin than the AB5C circumplexes.

With respect to the I × II × III subset of the five-dimensional space, the Peabody and Goldberg (1989) model is more parsimonious and more restrictive than the AB5C structure, because one of the three dimensions is dichotomized. The algorithm used in their study does not provide the lengths of the projections of the variables onto the double cone, but a reasonable expectation is that these projections are somewhat shorter on the average than the AB5C projections. In the familiar trade-off between parsimony and empirical coverage, the gain of the Peabody and Goldberg model is that gaps arising in the AB5C representation are explained by the model, whereas the AB5C structure admits blends of a positive and a negative factor pole that tend to be of more neutral social desirability. The loss is that in the Peabody and Goldberg model the blends that do arise are not as well accounted for, including I+II–/I–II+ (*dominant–submissive,* which is one of the axes of the Interpersonal Circle), I+III–/I–III+ (*boisterous–restrained*), II+I–/II–I+ (*agreeable–rough*), and III+I–/III–I+ (*cautious–reckless*), together with the smaller III+II– (*stern/strict*) and II–III+ (*hard/rigid*) clusters.

The double-cone model cannot be carried to the fourth and fifth dimensions as easily as the AB5C structure. Peabody and

(*text continues on page 161*)

Table 1 (*continued*)

Facet	Projection	Term	Facet	Projection	Term
		Factor I (*continued*)			
I+V+	.41	expressive	I−V−	.51	passive
	.37	adventurous		.49	meek
	.35	dramatic		.48	dull
	.32	spontaneous		.46	bland
	.30	opportunistic		.42	unadventurous
	.29	witty		.38	somber
	.27	independent		.29	docile
	.20	candid		.24	apathetic
				.23	blasé
				.20	prideless
I+V−	.22	verbose	I−V+	.23	inner-directed
		Factor II			
II+II+	.66	sympathetic	II−II−	.59	unsympathetic
	.64	kind		.52	unkind
	.60	warm		.49	harsh
	.56	understanding		.45	insincere
	.49	sincere		.40	cruel
	.48	compassionate		.36	unforgiving
	.38	cordial		.27	smug
	.31	accommodating		.26	prejudiced
II+I+	.54	merry	II−I−	.63	cold
	.53	cheerful		.49	unfriendly
	.50	happy		.45	impersonal
	.49	friendly		.34	joyless
	.46	effervescent		.33	cynical
	.42	jovial		.23	miserly
	.33	humorous			
II+I−	.55	soft-hearted	II−I+	.38	rough
	.47	agreeable		.37	abrupt
	.38	obliging		.33	crude
	.37	humble		.33	combative
	.30	lenient		.32	bullheaded
	.29	homespun		.31	sly
				.30	manipulative
				.28	gruff
				.27	devious
					(+2 others)
II+III+	.58	helpful	II−III−	.54	inconsiderate
	.57	cooperative		.51	rude
	.56	considerate		.45	impolite
	.54	respectful		.43	distrustful
	.50	polite		.43	uncooperative
	.47	reasonable		.42	abusive
	.45	courteous		.41	disrespectful
	.43	thoughtful		.41	thoughtless
	.43	loyal		.39	egotistical
	.33	moral			(+7 others)
II+III−			II−III+	.42	hard
				.29	rigid
II+IV+	.56	trustful	II−IV−	.47	demanding
	.53	pleasant		.46	selfish
	.49	tolerant		.44	ill-tempered
	.46	peaceful		.43	antagonistic
	.45	generous		.43	bitter
	.43	easy-going		.42	scornful
	.41	fair		.40	greedy
	.41	charitable		.40	critical
	.40	flexible		.38	disagreeable
		(+15 others)			(+9 others)

(*table continues*)

Table 1 (*continued*)

Facet	Projection	Term	Facet	Projection	Term
		Factor II (*continued*)			
II+IV−	.53	sentimental	II−IV+	.51	insensitive
	.52	affectionate		.42	unaffectionate
	.51	sensitive		.40	passionless
	.43	soft			
	.42	passionate			
	.41	romantic			
	.35	feminine			
II+V+	.28	genial	II−V−	.43	uncharitable
	.24	tactful		.35	ruthless
				.35	coarse
				.34	narrow-minded
				.33	callous
				.33	tactless
				.31	curt
				.31	bigoted
				.28	vindictive
					(+3 others)
II+V−			II−V+	.40	shrewd
		Factor III			
III+III+	.77	organized	III−III−	.76	disorganized
	.67	neat		.62	disorderly
	.67	orderly		.61	careless
	.63	systematic		.60	unsystematic
	.62	efficient		.57	sloppy
	.58	precise		.49	impractical
	.54	practical		.45	absent-minded
	.50	prompt		.32	wasteful
	.46	exacting			
	.44	meticulous			
	.23	fastidious			
III+I+	.43	alert	III−I−	.61	inefficient
	.38	ambitious		.47	lazy
	.34	firm		.42	indecisive
	.33	purposeful		.34	aimless
				.34	wishy-washy
				.30	noncommittal
				.27	unambitious
III+I−	.52	careful	III−I+	.43	reckless
	.50	cautious		.33	unruly
	.43	punctual		.33	devil-may-care
	.34	formal			
	.34	thrifty			
	.24	principled			
	.21	circumspect			
III+II+	.62	responsible	III−II−	.53	unreliable
	.60	dependable		.49	negligent
	.58	reliable		.49	undependable
	.47	mannerly		.28	rash
	.36	conscientious			
	.36	mature			
III+II−	.33	stern	III−II+		
	.32	strict			
	.20	deliberate			

Table 1 (*continued*)

Facet	Projection	Term	Facet	Projection	Term
		Factor III (*continued*)			
III+IV+	.62	thorough	III−IV−	.55	inconsistent
	.55	steady		.41	scatterbrained
	.50	consistent		.40	unstable
	.50	self-disciplined		.40	erratic
	.44	logical		.39	forgetful
	.43	decisive		.34	impulsive
	.41	economical		.28	frivolous
	.40	controlled			
	.40	concise			
		(+5 others)			
III+IV−			III−IV+		
III+V+	.42	industrious	III−V−	.55	haphazard
	.38	perfectionistic		.38	illogical
	.33	sophisticated		.35	immature
	.30	dignified		.34	foolhardy
	.29	refined		.31	lax
	.29	cultured		.31	unconscientious
	.28	progressive		.30	unprogressive
	.25	foresighted		.23	flippant
III+V−	.36	conventional	III−V+	.34	unconventional
	.30	traditional			
		Factor IV			
IV+IV+	.60	unenvious	IV−IV−	.59	moody
				.55	jealous
				.44	possessive
				.44	anxious
				.37	fidgety
IV+I+	.49	unselfconscious	IV−I−	.59	self-pitying
	.29	weariless		.55	insecure
	.22	indefatigable		.54	fretful
				.53	touchy
				.53	envious
				.51	nervous
				.46	fearful
				.42	negativistic
				.31	self-critical
IV+I−	.52	unexcitable	IV−I+	.45	high-strung
	.28	unassuming		.37	excitable
				.28	meddlesome
				.22	volatile
IV+II+	.54	patient	IV−II−	.60	irritable
	.53	relaxed		.60	temperamental
	.50	undemanding		.48	defensive
	.42	uncritical		.47	quarrelsome
	.39	optimistic		.47	faultfinding
	.34	conceitless		.46	impatient
	.31	down-to-earth		.45	grumpy
	.20	unpretentious		.44	crabby
				.44	cranky
					(+6 others)
IV+II−	.61	unemotional	IV−II+	.62	emotional
	.38	masculine		.37	gullible

(*table continues*)

Table 1 (*continued*)

Facet	Projection	Term	Facet	Projection	Term
		Factor IV (*continued*)			
IV+III+			IV−III−	.32	hypocritical
				.32	compulsive
				.31	nosey
				.31	gossipy
				.23	lustful
				.20	self-indulgent
IV+III−	.35	informal	IV−III+	.31	particular
IV+V+	.23	versatile	IV−V−	.23	contemptuous
IV+V−	.40	imperturbable	IV−V+		
		Factor V			
V+V+	.63	creative	V−V−	.60	uncreative
	.54	imaginative		.52	unintellectual
	.53	philosophical		.50	unintelligent
	.50	complex			
	.50	artistic			
V+I+	.33	theatrical	V−I−	.59	unimaginative
	.27	worldly		.38	uninquisitive
	.26	eloquent		.26	inarticulate
	.24	inquisitive		.26	predictable
	.24	intense			
V+I−	.44	introspective	V−I+	.22	unscrupulous
	.41	meditative		.20	pompous
	.36	contemplating			
	.27	self-examining			
V+II+	.48	deep	V−II−	.42	shallow
	.26	diplomatic		.22	terse
	.22	idealistic			
V+II−	.32	individualistic	V−II+	.43	simple
	.21	eccentric		.30	dependent
				.23	servile
V+III+	.37	analytical	V−III−	.36	shortsighted
	.34	perceptive		.35	unobservant
	.26	informative		.24	ignorant
	.24	articulate		.24	indiscreet
V+III−			V−III+		
V+IV+	.55	intellectual	V−IV−		
	.52	inventive			
	.50	intelligent			
	.49	brilliant			
	.48	innovative			
	.47	smart			
	.47	knowledgeable			
	.43	bright			
	.43	ingenious			
		(+5 others)			
V+IV−	.21	sensual	V−IV+	.42	unreflective
				.41	unsophisticated
				.40	imperceptive
				.21	provincial

Goldberg's (1989) rationale for focusing on the first three dimensions was that Factors IV and V are relatively small. However, in the Dutch data (Hofstee & de Raad, 1991) on the basis of a somewhat different selection of adjectives favoring traits with temperamental connotations, the varimax-derived Factor IV was larger than Factor III; in an analysis of temperament questionnaires, Angleitner and Ostendorf (1991) found to their surprise that Factor V was the largest of all. A counterargument of a different nature was provided by Saucier (1992), who found that the II × IV plane is the most circumplexical (as opposed to simple structured) of all, which corresponds well with the Dutch findings. Neither the Peabody and Goldberg model nor the Interpersonal Circle includes these II × IV blends.

In sum, the Peabody and Goldberg (1989) model has the attractive feature of accounting for the southwest versus northeast orientation of most of the 10 circumplexes in Figure 1 and is more parsimonious than the AB5C model, at a cost that may be judged modest. However, its generalization to five dimensions is problematical. Perhaps the set of AB5C facets provided in Table 1, with the nearly empty facets omitted, comes closest to an economical representation of the trait domain.

Among the many other circumplexes that could be examined is Holland's (1985) hexagonal structure. Holland (1985, p. 29) stated that the relations among his six types, represented as the vertices of a hexagon, are inversely proportional to their distances, which implies that the structure is two-dimensional and can be viewed as a circumplex in which the types are 60° apart. For each type, Holland (1985) listed 15 trait adjectives to characterize its "special heredity and experiences" (p. 19ff). The typology is widely used in job counseling and personnel psychology.

To determine the position of a type (or, generally, an aggregate of adjectives or statements that have been translated into adjectives) in the AB5C space, we assumed that the type score is the unweighted sum of the standardized adjective scores; that is, we postulated that this aggregation procedure is an adequate approximation of the manner in which a string of adjectives is interpreted. From this assumption, it follows that the loadings of the type on the five factors are proportional to the sums of the adjective loadings. Somewhat crudely, we assigned two points for a primary loading and one for a nonnegligible secondary loading; for example, the V+III+ adjective *analytical* received two points on Factor V and one on Factor III, corresponding roughly to the proportional lengths of the two projections of a vector at an angle of 30° with the first factor.

The set of adjectives that characterizes a type may be more or less homogeneous. For example, the Investigative type is characterized by the adjectives *independent* (I+V+) and *reserved* (I–III+), among other traits. For this pair, the primary loadings balance. A crude index of homogeneity and interpretative ease is the sum of the absolute values of the sums per factor divided by the sum of all single absolute values; the index reaches a maximum of 1 if all loadings are in the same direction and a minimum of 0 if these loadings balance perfectly.

Applying the above procedure to Holland's (1985) types, in clockwise order, gives the following results: The Conventional type, of which 11 adjectives were included here, is III+I– with a homogeneity index of .79; for a label, terms like *careful, cautious, punctual,* or *formal* are therefore more appropriate than *conventional,* which is III+V–. Of the Realistic type, only 6 adjectives were included here; also in view of their homogeneity index of .65, we refrain from locating this type. Of the Investigative type, all but 2 adjectives were included, and the homogeneity index is .72. Its profile is V+III+ (cf. *analytical* and *perceptive; investigative* itself is not in our set), with a tertiary loading on I– lending an introverted touch to this type. Of the Artistic type, 11 adjectives were included here, and their homogeneity is .87; its profile is mainly V+III–, with touches of I+, II+, and IV–. The AB5C position of *artistic* itself is purely V+; we cannot offer any terms for the disorderly variant that is apparently implied. Holland's Social type is II+II+ with a perfect homogeneity index over 13 adjectives, so labels like *sympathetic, kind, warm,* and *understanding* would be more appropriate than the I+II+ label *Social.* Finally, the Enterprising (I+IV+) type is I+I+, with a homogeneity of .78 over 14 adjectives; it is better labeled as *Extraverted.*

The analysis shows that all trait dimensions except IV are clearly represented in this typology, which therefore cannot be meaningfully represented in a plane. It also shows that the correspondence between the adjectival descriptions and the type labels can be improved. We do not wish to imply that types should fit into one of the boxes of the AB5C taxonomy. On the contrary, types such as Analytical (V+III+) and Introspective (V+I–), characterized by a blend of three or more factors, may be found to be interesting and useful. Moreover, our intention is not to criticize a particular typology, but to demonstrate an analytic procedure that could be applied constructively to a variety of models.

Discussion

We developed the AB5C representation in response to Goldberg's (1981) quest for a periodic table of traits. The model is not strictly a periodic one; it is more like a tournament schedule that pits the five factors against each other, for both a home game and an away game. We do not presume that the AB5C model is definitive or comprehensive. Rather, it is demonstrably procrustean in that it discards any variance that is not covered by the first five principal components, and it does not deal adequately with those few variables that load highly on more than two of these factors. However, it is less restrictive than simple-structure and two-dimensional circumplex models, both of which constitute a special case. Also, the liberalization is not reached at the cost of a great loss of parsimony. On the contrary, by depicting facets of the Big Five as blends of two factors, the model achieves a much tighter conceptual structure than the hierarchical models that have been proposed by Goldberg (1990), Costa and McCrae (1985), and many other investigators. The empirical results and the comparisons with other solutions strongly suggest that the conception works in practice.

A comment is in order concerning the lexical approach to personality that characterizes the present study and others that were discussed here. The approach results in what is sometimes called *soft theory:* The researcher refrains from a priori theoriz-

ing and functions as a faithful bookkeeper. The manner in which traits are assigned to facets in the models is based entirely on the common denominator of laypersons' cognitive maps of personality. However, these results are not therefore trivial.

The overwhelming impression that arises from processing empirical data in this domain is that substantive results are fuzzy. Hardly any two persons using the same trait adjective seem to mean precisely the same thing; that uncertainty probably holds even when one rater applies an adjective to both another person and himself or herself, as in the present data. In all structural analyses of single traits, the larger part of the variance goes unaccounted for. The reason is not primarily error in the sense of sloppiness, but contradiction among idiosyncratic and target-specific points of view. Any correlation between two trait terms is the net result of verbal behaviors of subsets of subjects who conceive of the traits as related, inversely related, or unrelated. Not even the Big Five are in everyone's mind (cf. Peabody and Goldberg, 1989); that structure is the common multiple of many implicit theories of personality, most of which cover only a subset. It is thus not true that factors are based on the total sample; a more realistic representation is that the Big Five satisfy the condition that they attract enough votes to emerge above the threshold. (If samples of many thousands of subjects were customary, additional replicable dimensions might be uncovered.) However, all this is not to say that scientific theories of personality are superior to the sediment of lay perceptions.

Scientific researchers are no less idiosyncratic than laypersons. If 600 distinguished personologists would have served as subjects in the present research, the result would in all likelihood have been indistinguishable from our actual outcome. It is hard to think of a proper reason why it would have differed. Each single subject would have had more explicit and articulate ideas about personality than the laypersons in the present sample, but the theories would have conflicted no less. Each favorite scientific personality dimension, in this context, has the effect of making the personal space collapse. Even though we consider ourselves to be eclectics, we can testify to the difficulty experienced in simply looking up an adjective in the complete version of Table 1. This salutary exercise is wholeheartedly recommended as a confrontation with the white areas of one's cognitive map.

Another way to submerge oneself into the vagaries of language is to take a thesaurus such as the *Synonym Finder* (Rodale, 1961) and look up the meanings of trait terms. *Synonymity* means that in certain contexts a word can be substituted for another without changing the message. Starting with *aggressive* in the I+I+ cell, we find as a synonym *active* (I+III+), which leads to *restless* (IV–II–), which leads to *nervous* (IV–I–), which leads to *timid* (I–II+), which leads to *bashful* in the I–I– cell opposite the starting term. To pin down the meaning of a trait term for personological purposes, there is no other way than extracting the common denominator from many hundreds of uses of the term; all other definitions would be arbitrary and idiosyncratic and therefore less suitable for communication.

There is a familiar argument that personality researchers should step out of the area of common language and into objective measurement. There is nothing against this advice, as long as the pertinent outcomes do not have to be communicated in words. The strategy, however, is not to be viewed as a competitor to the unearthing of the thin layer of communality in everyday person talk, aimed at clarifying scientific and everyday discourse. The antagonistic position might be defensible if the lexical approach would do no more than map the language—that is, if trait names would not touch base with behavior. However, genetic–behavioral studies (e.g., Pedersen, Plomin, McClearn, & Friberg, 1988; Tellegen et al., 1988) have unequivocally shown that verbal measures of personality have a genetic base and therefore cannot be merely in the eye of the beholder.

The final truth about the structure of personality is at best an asymptotic concept: For example, the genetic base is likely to be so complex that all of humankind does not provide sufficient degrees of freedom to determine its behavioral effects. For the foreseeable future, an important task of personality theory is to capture as much interindividual variance as is possible as efficiently as is possible. Our model is presented as a step in that direction.

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