Psychologica Belgica
1994, 34-4, 195-206.

THE HEURISTIC POTENTIAL OF THE ABRIDGED BIG-FIVE DIMENSIONAL CIRCUMPLEX (AB5C) MODEL: EXPLAINING THE CHIASMIC ILLUSION

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In two small-scale investigations, chiasmic configurations of personality traits (e.g., Thrifty/Generous/Stingy/Extravagant) derived from the Peabody and Goldberg (1989) Double-Cone model were compared with chiasms derived from the Abridged Big-Five dimensional Circumplex (AB5C) model. To this end, chiasms were decomposed into three kinds of contrasts between traits: content contrast, social desirability contrast, and oppositeness. Inventories of 24 and 90 items, respectively, comparing a Double-Cone contrast and an AB5C-contrast were administered to 12 and 35 subjects, respectively. In both studies, the AB5C chiasms prevailed. As the AB5C model does not generate true chiasms but illusions thereof, we argue that the perception of chiasmic structure is best understood as an illusory phenomenon.

The Abridged Big-Five Dimensional Circumplex (AB5C; see Hofstee, De Raad, & Goldberg, 1992) structure of personality traits integrates the Five-Factor Model (see, e.g., Goldberg, 1993) and lower-dimensional circumplex models (Wiggins, 1980). First, the AB5C model assigns each trait variable to the two-dimensional slice (circumplex) of the five-space on which it has its highest projection. Next, within a circumplex, a trait is assigned to the clock vector to which it is closest, the 12 vectors being located at the full-hour positions. For example, Reckless is assigned to the five-o'clock position in the I (Extraversion) x III (Orderliness) circumplex, in which Extraversion occupies the three-o'clock position and Disorderliness, the six-o'clock position. Thus, Recklessness is represented as a blend of Disorderliness and Extraversion (III-I+).

Equivalently, traits are assigned their position in the AB5C structure on the basis of their primary and secondary factor loadings. For another example, Nervous (IV-I-) has its primary loading on the negative pole of Factor IV (Emotional Stability) and a nonnegligible secondary loading on I-, and is thus represented by the seven-o'clock position in the I x IV circumplex, and interpreted as Emotional Instability tinged with Introversion. In total, the AB5C model contains 90 different positions (I+I+, I+II+, ..., V-IV-, V-V-), namely, all combinations of the 10 poles of the Big Five factors except the I+I- through V+V- combinations, which are void by definition. Without invoking additional dimensions – as in hierarchical

models – the AB5C model offers a refined taxonomy of traits.

Hofstee (1992, 1993, 1994) analysed the heuristic potential of the AB5C model. In particular, he argued that the AB5C model was capable of generating and explaining the kind of fourfold structures that have intrigued people from ancient times on. The following example of a set of four traits forming a foursome is taken from Peabody (1967):

Stingy - Thrifty - Generous - Extravagant

This foursome consists of two desirable but seemingly opposed traits (Thrifty and Generous) and their seeming exaggerations (Stingy and Extravagant), which are undesirable.

Three conceptualizations of these foursomes may be distinguished. The first and classical interpretation is to conceive of the vices, Stinginess and Extravagance, as too much of a good thing, namely, of the virtues of Thriftiness and Generousness, respectively. In this interpretation, the four traits are positioned on a linear scale, as follows:

Spending:

too little - little - much - too much

The classical interpretation is encountered in clinical thinking, most notably, in Kiesler's (1983) modelling thereof. Hofstee (1994) has argued that the classical conception is untenable. It implies that the greatest distance is between Stingy and Extravagant, whereas the proper opposite of Stingy (undesirable, little spending) is Generous (desirable, much spending) rather than Extravagant, which shares its undesirability with Stingy. Likewise, the opposite of Extravagant is Thrifty rather than Stingy. The linear representation fails to account for the fact that „les extrêmes se touchent".

The second interpretation has been put forward by Peabody (1967). In his conception, we have desirable and undesirable versions of two opposed traits, as follows:

	Spending	
	Little	Much
Desirable	Thrifty	Generous
Undesirable	Stingy	Extravagant

In this two-dimensional model, the distances are adequately represented: Opposites are placed along the diagonals. However, upon closer analysis this representation is less than completely satisfactory. Generous and Stingy have clear prosocial and asocial connotations, respectively, that are lacking in Thrifty and Extravagant. Stinginess is not simply an undesirable version of Thriftiness, but an asocial version of it; in other words, it is better conceived as a blend of Spending and Socialness. Similarly, Extravagance arises by suppressing the prosocial facet of Generousness. Peabody (1970) himself has noted that denotation and desirability cannot be varied independently.

The objection against the second interpretation leads to the third, which is the facet interpretation. It amounts to reconstructing the foursome as follows:

	Spending	
	Little	Much
Prosocial		Generous
Neutral	Thrifty	Extravagant
Asocial	Stingy	

This kind of reconstruction fits in the framework of the AB5C model. One may envisage a circumplex with Spending as its horizontal dimension and Social orientation as its vertical dimension. In this circumplex, Generous occupies the two-o'clock position, Extravagant is at three o'clock, Stingy at eight, and Thrifty at nine. Opposites occupy opposite positions, as they should. However, in the AB5C model the chiasm results from pitting two substantive dimensions against each other, rather than content against social desirability. Consequently, no pure content contrast between Thrifty and Generous, or between Stingy and Extravagant, is implied in the model: In both pairs, the traits are 150 degrees apart, rather than 180. The model represents the perceived oppositeness of Thrifty and Generous as a semantic illusion: To the extent that such a contrast is perceived, that perception comes about by suppressing the prosocial connotation of Generousness or adding an asocial connotation to Thriftiness. This is easily done when trait

vectors are 150 degrees apart.

The facet interpretation of this example has not been verified empirically; Spending is not among the Big Five dimensions, and in Hofstee, De Raad, and Goldberg's (1992) AB5C study of American-English trait terms the four traits are assigned to different circumplexes. Setting the argument in reverse gear, however, the following empirical implication may be derived: If the facet interpretation in terms of the AB5C model is adequate, the model should be capable of generating more credible foursomes (according to criteria to be set out below) than other models do. In particular, it should outperform its closest competitor, which is Peabody's conception.

A fully developed procedure for generating Peabody-type chiasms is implied in Peabody and Goldberg's (1989) Double-Cone model for three-dimensional trait spaces. This model uses the trait sphere that is formed by the Big-Five dimensions I (Extraversion), II (Kindness), and III (Orderliness). First, the sphere is rotated in such a way that its vertical axis coincides with social desirability. Thus, all desirable traits are on the Northern hemisphere, and their undesirable opposites are on the Southern hemisphere in the antipode positions. Next, a circle (a kind of tropic) is drawn through the positive endpoints of the original axes I, II, and III on the globe, and another, parallel, circle is drawn through the negative poles. Connecting all antipodes on the two circles yields the double-cone structure. Finally, all traits are represented by the point on one of the two circles to which they are closest (see Hofstee, 1994, for a more detailed exposition).

A way to obtain a double cone is to rotate a Chi (or X) around its vertical axis, which in this case is the social desirability axis. Thus, the Double-Cone model is in fact a set of chiasmic configurations of traits, and chiasms may be taken directly from the structure.

AB5C-chiasms also result automatically. In each of the circumplexes that together form the AB5C structure, a diameter can be drawn that separates desirable from undesirable traits. Staying close to the diameter, traits may be taken on both sides of it, for example, Extraverted (I+I+, desirable) and Boastful (I+II-, undesirable). Together with their opposites Introverted (I-I-) and Modest (I-II+) they form a chiasmic structure.

Hofstee (1994) has argued on analytical grounds that AB5C chiasms are more credible than are chiasms derived from the Double-Cone model. In the latter model, the angular positions between the two bipolar trait axes are 90 degrees; it is therefore difficult to view the two desirable traits as semantic opposites, and to attribute a common meaning to a desirable and an undesirable trait. In the AB5C configuration, the angle between the two

bipolar axes is around 30 degrees; thus, for example, Extraverted and Modest are about 150 degrees apart and are easily viewed as semantic opposites, whereas Boastful is only about 30 degrees apart from Extraverted and is easily viewed as an undesirable version of it. Similarly, Introverted and Boastful are easily perceived as opposites, and Modest, as a desirable version of Introverted.

The present paper contains two empirical tests of the claim that AB5C chiasms are more credible than Double-Cone chiasms. The first criterion for credibility is the extent to which the pairs of desirable or of undesirable traits (e.g., Thrifty-Generous or Stingy-Extravagant) are perceived as pairs of semantic opposites. This criterion was employed in Study 1, in which the chiasms were taken directly from the materials published by Peabody and Goldberg (1989) and Hofstee, De Raad, and Goldberg (1992). The second criterion is the extent to which desirability contrasts (e.g., Thrifty-Stingy or Generous-Extravagant) are perceived as pairs of synonyms except for their social desirabilities. (The emphasis is thus on equal content, the term „desirability contrast" notwithstanding). This criterion was added in Study 2, in which the two models were applied to another data set.

For the purpose of a comparison with the three-dimensional Double-Cone model, the AB5C model was reduced to a three-dimensional subset of it, consisting of the I x II, I x III, and II x III circumplexes. The alternative would have been to generalize the Double-Cone model to five dimensions. This generalization may be carried out as follows: Take all ten three-dimensional slices of the five-space, that is, the I x II x III, I x II x IV, ... III x IV x V three-dimensional circumplexes or spheres. Rotate each of the ten spheres so that its vertical axis coincides with social desirability, and construct a double cone for that sphere in the manner described above. The result is a bundle of ten double cones in the five-dimensional space, sharing their vertical axes. (The reader who finds it difficult to imagine how spheres sharing their vertical axes can differ, should realize that one can have different orthogonal planes sharing their vertical axis in a three-dimensional space). Applying the model would amount to dividing the variables into ten sets on the basis of their three highest loadings, thus assigning each variable to the spherical slice on which it has its highest projection, and applying the three-dimensional Double-Cone model to each slice in the manner described above. However, this generalization would have been somewhat questionable as Peabody and Goldberg (1989) emphasize the difference in size between the first three and the last two Factors.

STUDY 1

From the data presented by Peabody and Goldberg (1989, Table 2) six Double-Cone (DC) chiasms were taken. Six AB5C-chiasms were taken from Figure 1 of Hofstee, De Raad, and Goldberg (1992). The 12 chiasms are presented in Table 1.

Table 1. *Chiasms Derived from the Double-Cone (DC) and Abridged Big Five-Dimensional Circumplex (AB5C) Models*

	DC-Chiasms		AB5C-Chiasms	
1.	Persistent	Cooperative	Outspoken	Quiet
	Uncooperative	Nonpersistent	Unrestrained	Bashful
2.	Forceful	Peaceful	Extraverted	Modest
	Quarrelsome	Submissive	Boastful	Introverted
3.	Sociable	Thrifty	Talkative	Reserved
	Extravagant	Unsociable	Boisterous	Silent
4.	Cheerful	Serious	Assertive	Lenient
	Frivolous	Gloomy	Combative	Shy
5.	Lighthearted	Orderly	Daring	Cautious
	Disorderly	Grim	Reckless	Timid
6.	Friendly	Hard-working	Quiet	Verbal
	Lazy	Unfriendly	Untalkative	Unrestrained

A questionnaire was constructed to compare DC-pairs supposed to contain a content contrast (e.g., Persistent-Cooperative) with AB5C-pairs (e.g., Outspoken-Quiet). Socially desirable pairs taken from the DC-chiasms were randomly combined with socially desirable pairs taken from the AB5C-chiasms, to form six comparison items; another six were formed by their socially undesirable counterparts. Instructions were to indicate which of the two pairs formed the better contrast.

An ad hoc sample of 12 judges, consisting of staff members and senior students of the Personality Group of the University of Groningen and the wife of the senior author, compared the contrasts. None of the judges were familiar with the relevant details of the materials. Two terms (Lenient and

Boisterous) were translated upon the request of one of these non-native English speakers.

Thus 144 votes were cast, of which 115 appeared to be in favor of pairs from AB5C-chiasms, and 29 in favor of DC-pairs. All judges appeared to favor the AB5C pairs by a margin of at least 8 to 4. All but two DC-pairs, namely, Quarrelsome-Submissive and Forceful-Peaceful, received fewer votes than their randomly selected AB5C competitors; under the null hypothesis of equal credibility, the probability of this result is less than .05 by the Sign Test. In view of the low power of the design and the imperfect mastery of the language by the judges, the outcome is a clear demonstration of the superiority of the AB5C chiasms.

AB5C chiasms are scarce, as they are composed of relatively neutral traits (see also Hofstee, 1994). For example, no chiasms could be taken from the II x III circumplex in Hofstee, De Raad, and Goldberg (1992). Most terms in the AB5C chiasms have their primary loading on Factor I, which is least correlated with social desirability. In the DC chiasms, which capitalize on traits that are outright desirable or undesirable, Factors II and especially III are better represented. The difference in content between chiasms derived from the two models is thus not accidental. In Study 2, however, we aimed for a more even spread in order to control for such differences.

STUDY 2

The AB5C and DC models were applied to Brokken's (1978) data set consisting of 200 self-ratings and 200 peer ratings on 1203 Dutch trait-descriptive adjectives. The matrix of loadings on the first three principal components of these ratings was used.

Construction of DC-Chiasms

Social desirability indices of the trait terms were available from Brokken (1978). These indices were regressed upon the loadings of the traits on each of the three Factors, to determine the first column of the 3 x 3 rotation matrix that rolls the sphere into the intended position. The remaining two columns of the rotation matrix were determined through the Gram-Schmidt orthogonalisation process (Apostol, 1967), resulting in an orthonormal rotation matrix.

Traits with a loading of less than .20 on the first (Social Desirability) rotated Factor were discarded because of insufficient fit to the DC-model, as were traits with a sum of squared loadings below .20 on the other two Factors, leaving 839 of the 1203 traits. Of these, the traits with positive loadings on the first and second Factor were selected to serve as points of departure for the construction of chiasms. There were 101 such traits.

Traits from the 101 subset were selected at random in turn. First, their opposite on the same (Northern) tropic was searched for within a margin of three degrees; next, the antipodes of these two traits were searched for, again applying a margin of three degrees. In total, 28 starter traits had to be selected to arrive at the preset number of 15 complete chiasms. In seven cases it appeared impossible to find traits to complete the chiasm; in six cases, traits occurred that were already used up (in these cases, the chiasm that best met the specifications was retained). The chiasms are presented in the Appendix.

Construction of AB5C-chiasms

To reduce the number of traits comparable to the above reduction, traits with a sum of squared loadings on the first three factors of less than .25 were discarded, leaving 837 traits. On the basis of their primary and secondary loadings, these traits were distributed among the I x II, I x III, and II x III circumplexes forming the three-dimensional version of the AB5C model. Within each circumplex, the traits were distributed among the 12 clock positions.

To determine the diameter in each circumplex that best separates the socially desirable and undesirable traits, the average social desirabilities of the traits at each of the clock positions were calculated. On that basis, the diameter was chosen that gave the best separation. Due to error in the determination of the clock positions of the traits, perfect separation could not be attained (for further details, see Arends, 1994). Traits whose social desirability did not correspond with their location vis-a-vis the diameter were discarded.

The traits closest to the diameter were used to find AB5C-chiasms. For example, if the diameter ran from the 4.30 o'clock to the 10.30 o'clock position, traits were taken from the 4, 5, 10, and 11 o'clock positions to form a chiasm. To arrive at the number of 15, five chiasms were taken from each of the three circumplexes. Further specifications were that adjacent traits (e.g., traits at the 4 and 5 o'clock positions) should be close to 30 degrees

apart, and that opposites should be close to 180 degrees apart. The resulting chiasms are presented in the Appendix.

Empirical Comparison of DC and AB5C-chiasms

Each chiasm was decomposed into six contrasts, to wit, two social-desirability contrasts (e.g., Thrifty-Stingy and Generous-Extravagant), two content contrasts (e.g., Thrifty-Generous and Stingy-Extravagant), and two pairs of opposites (e.g., Thrifty-Extravagant and Generous-Stingy). For each kind of contrast, a questionnaire was constructed of 30 items. In each item, one of the contrasts taken from a DC-chiasm had to be compared with a contrast taken from an AB5C- chiasm. A translated example of a content-contrast item is:

Unpleasant - Sly

Inaccurate - Overzealous

In this item, the first contrast is taken from a DC-chiasm, the second, from an AB5C-chiasm. The assignment of contrasts to items was random without replacement. In the content-contrast items, contrasts were either both socially desirable or both undesirable. In all three questionnaires, we avoided using the same pair of chiasms twice in forming items.

Subjects were instructed to select the best content contrast, the best social-desirability contrast (in terms of or the best pair of equal traits except for social desirability, see above), and the best pair of opposites (in terms of both substance and social desirability), respectively. Complete instructions are documented in Arend (1994). We hypothesized that content and social-desirability contrasts derived from AB5C chiasms would be judged relatively superior, but that no effect would be found for the opposites, which in both models are 180 degrees apart. The opposites served as a baseline for the comparison between the models. Thirty-five respondents aged between 19 and 30 years of higher-education level completed the 90-item questionnaire individually. Several respondents commented that many contrasts were not at all obvious, so that their answers had to be intuitive or even arbitrary. This difficulty arises from the fact that only part of the variance of the traits is covered by the three-dimensional space. We do not pretend that the AB5C-chiasms constructed in this study were superior in an absolute sense.

In view of the modest over-all quality of the chiasms, the outcome of the comparisons is all the more convincing. In the content-contrast items, the AB5C-contrast was preferred in 24 of the 30 comparisons ($p < .01$); among the social-desirability contrasts, the AB5C-contrast was preferred in 23

cases ($p < .01$). Among the opposites, which served as a baseline, the split was about even: AB5C opposites were preferred in 13 cases, and there was one tie.

General Discussion

The two low-power studies provide an unequivocal demonstration of the superior heuristic potential of the AB5C structure. The model appears to beat the Double-Cone model on its own territory: As the Double-Cone structure arises by revolving a chi configuration around its vertical axis, it is very much a „dedicated" model, specifically designed to generate chiasmic structures. However, the present empirical results are no more than a demonstration of an argument that is primarily analytical (Hofstee, 1993). In the Double-Cone model, the angles between the trait vectors in a chiasm are all 90 degrees. In the AB5C reconstruction, the angle between traits forming a content contrast is 150 degrees, making it easier to perceive the contrast; the angle between traits forming a social desirability contrast is 30 degrees, facilitating their interpretation as desirable and undesirable variants of the same trait.

All this is not to say that the AB5C model yields real chiasms. The purpose of the empirical demonstration is to explain away the chiasmic illusion, which has influenced our psychological thinking from ancient times on. The generating of credible AB5C-based chiasms should be considered as a conjuring trick creating the illusion. The procedure for generating AB5C-chiasms set out above has the merit of clarifying how the illusion comes about. In view of the ubiquitousness of the chiasmic illusion, let us document its unmasking as carefully as possible.

First, we have shown that the classical interpretation of vices as exaggerations of virtues is incoherent, as it wrongly predicts the distances between the traits. Between the models that take chiasmic configurations seriously, the Peabody (1967) reconstruction is to be preferred in this respect. In the Double-Cone model, traits occupying the same degree of latitude have the same content; only their social desirabilities can differ. If this model had prevailed in the empirical comparison, we would have found support for the interpretation of chiasms as fourfold tables pitting a content contrast against a social desirability contrast. However, it so appears that the AB5C-chiasms do better. These chiasms are based on a different principle, namely, mixture of content. Stinginess, for example, is interpreted

not as a socially undesirable version of Thriftiness, but as a somewhat Asocial variant of it. In this interpretation, a so-called social desirability contrast is by definition contaminated with content. The impression of synonymity (apart from social desirability) can arise because the two traits are only 30 degrees apart, but again by definition that impression is illusory. Conversely, the illusion of a content contrast can arise because the two traits are 150 degrees apart.

The structure of our argument is thus that the AB5C model, which generates pseudo-chiasms, does a better job than the Double-Cone model, which should provide true chiasms. The approach therefore effectively explains away chiasmic configurations as being mere illusions. The only escape from this reasoning would consist of designing still another interpretation of chiasmic perceptions, deriving a corresponding model, and provide an empirical test of its superiority over the AB5C-approach. To those who believe in the existence of true chiasms, that is the challenge to be met.

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APPENDIX[1]

The 15 Double-Cone Chiasms and the 15 AB5C Chiasms Used in Study 2
A. Chiasms derived by the Double-Cone Model:

1.	gemakkelijk	efficient	2.	behoedzaam	blijgeestig
	bitsig	onverstandig		moeilijk	losbandig
3.	braaf	positief	4.	goedgehumeurd	ijverig
	nors	immoreel		wanordelijk	intolerant
5.	fijnbesnaard	energiek	6.	makkelijk	nijver
	afwezig	zelfgenoegzaam		ordeloos	snauwerig
7.	conscientieus	grappig	8.	loyaal	leerzuchtig
	wrevelig	onvoorzichtig		luidruchtig	ontoerekeningsvatbaar
9.	discreet	blij	10.	bescheiden	ondernemend
	onplezierig	slinks		onpersoonlijk	opsnijderig
11.	trouwhartig	wilskrachtig	12.	fijnbesnaard	voortvarend
	wankelmoedig	heerszuchtig		sloom	zelfgenoegzaam
13.	voorzichtig	collegiaal	14.	beheerst	beweeglijk
	sceptisch	opportunistisch		eenkennig	brutaal
15.	correct	tolerant			
	bokkig	bandeloos			

AUTHOR NOTE

The authors wish to thank Ivan Mervielde for his thoughtful commentary on the draft version of this paper.

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[1]English translations are not provided because the English equivalents may have a different AB5C classification and pattern of loadings.