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AUTHOR McCrae, Robert R.
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ABSTRACT

The domain and facet approach to personality assessment is discussed. The strategy used to identify and measure aspects of the five factors of personality structure is described. Evidence concerning the factorial invariance of the resulting set of 30 facet scales and some recent evidence concerning their discriminant validity are reviewed. Some theoretical and practical applications of analysis on the level of facet scales are considered. When P. T. Costa and R. R. McCrae began to develop a measure of personality, they adopted a top-down approach to hierarchical assessment, resulting eventually in five domains (multifaceted collections of specific cognitive, affective, and behavioral tendencies), with the lower-level traits corresponding to these groupings known as facets. The pragmatic value of a facet-level approach to personality assessment is apparent. Individual facets contain a specific variance not represented in the global factors. The explicit measurement of facets also has implications for an understanding of the origins and nature of personality traits themselves, such as why traits co-vary along five dimensions. Six tables present information from various studies, and seven figures illustrate the relationships among the facets. (Contains 27 references.) (SLD)

DOMAINS AND FACETS: A HIERARCHICAL APPROACH TO PERSONALITY ASSESSMENT

Robert R. McCrae
Gerontolgoy Research Center, National Institute on Aging, NIH

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Robert R. McCrae
Gerontology Research Center, National Institute on Aging, NIH

In a recent JPSP article on the cross-cultural invariance of personality structure, Paunonen, Jackson, Trzebinski, and Forsterling (1992) concluded that "If one desires a broad overview of personality dimensions, we regard the five-factor model as most promising, but if one's theoretical or pragmatic requirements are for a more differentiated, detailed perspective, perhaps other measurement models should be considered" (p. 455). Today I would like to discuss one of these alternative measurement models, the domain-and-facet approach of the Revised NEO Personality Inventory (Costa & McCrae, 1992a).

Each of the three preceeding papers has dealt with an extension of the five-factor model into new territory: the assessment of children of non-Indo-European language speakers, of the neuropsychiatrically impaired. My presentation is somewhat different; I am concerned with an elaboration of the five factors themselves, a specification of their component traits. First I will describe the strategy we have used to identify and measure aspects of the five factors; next I will review some evidence on the factorial invariance of the resulting set of 30 facet scales and some recent evidence on their discriminant validity; and finally I will suggest some theoretical and pragmatic applications of analysis on the level of facet scales.

The Logic of Domains and Facets

As a recent review by Goldberg (in press) noted, there is a long tradition of identifying different levels of specificity in personality trait assessment. Conceptually, this is usually illustrated by the combination of discrete behaviors to form specific traits, and the combination of groups of covarying traits to form broad dimensions of personality.

Factor analysts such as Guilford, Cattell, and Eysenck, all adopted such a model, although Guilford and Cattell emphasized the lower level traits and Eysenck the higher. In the usual factor analytic approach, test items were factored, usually using oblique rotations, and the obtained factor scores were then factored themselves to yield second order factors. Third order factors were occasionally reported.

In practice, this bottom-up scheme presented several difficulties. Most important was the specification of the initial pool of items. Were all important trait elements included? Even large item pools may omit important aspects of personality. For example, McCrae, Costa, and Piedmont (in press) reported that relatively few of the 480 items in the California Psychological Inventory measure Agreeableness, and Johnson, Butcher, Null, Johnson's (1984) item factor analysis of the 566-item Minnesota Multiphasic Personality Inventory (MMPI; Hathaway & McKinley, 1983) found no factors related to Conscientiousness.

The lexical approach, in which the body of trait names in the natural language has been adopted as an exhausitve enumeration of traits, has proven to be the most fruitful guide to a comprehensive model of personality; it was in analyses based on trait terms that the five-factor model was first discovered. But the lexical approach has distinct limitations as the basis of a hierarchical model of personality, first because some specific traits (such as openness to aesthetics) are not well represented in the natural language (McCrae, 1990), and second because trait terms are found at every level of breadth (John, Hampson, & Goldberg, 1991), from extremely narrow (e.g., "sanctimonious," "sedantary," "sirupy") to extremely

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broad (e.g., "kind," "weak," "emotional"). Broad terms naturally covary with many narrower terms, whereas narrower terms may not covary with each other. The result is that when representative lists of trait adjectives are factored, the broader terms account for the lion's share of the covariance, and only five broad factors typically emerge (Goldberg, 1990).

In response to these problems, when Paul Costa and I began to develop our measure of personality in the 1970s, we adopted a top-down approach to hierarchical assessment. We began by looking for the broadest and most pervasive themes that recurred in personality measures. Eysenck's E and N had already been identified as the Big Two by Wiggins (1968), and we proposed that Openness to Experience, O, also qualified as a major dimension of personality (Costa & McCrae, 1978). A few years later we embraced A and C as additional dimensions.

Rather than use the term "factors," which might apply to any level in the hierarchy, we chose to call N, E, O, A, and C "domains," a term defined as "a sphere of concern or function" (Morris, 1976, p. 389). Intellectual curiosity, need for variety, and aesthetic sensitivity all concerned some aspect of experiencing the world, and thus belonged in the *domain* of Openness. Although this terminology is somewhat unusual, it is not unparallelled: About the same time, and quite independently, Digman (1979) presented a paper entitled "The Five Major Domains of Personality Variables: Analyses of Personality Questionnaire Data in the Light of the Five Robust Factors Emerging from Studies of Rated Characteristics."

We regarded domains as multifaceted collections of specific cognitive, affective, and behavioral tendencies that might be grouped in many different ways, and we used the term "facet" to designate the lower level traits corresponding to these groupings.[1] Our working metaphor was the mathematical set, which could be divided into subsets by selecting different combinations of elements.

Consider the following set of attributes--chronic tendencies to feel tense, worried, irritable, and so on--that together define the domain of Neuroticism. There are many possible ways to group these attributes into what we might consider specific traits. We could treat them singly, emphasizing for example the difference between tension and apprehension, as Spielberger (1972) did (Figure 1), or we might combine these two with other traits like "shy" and "guilt-prone" to form a broader anxiety cluster that might be contrasted with depression and hostility clusters, as Zuckerman and Lubin (1965) suggested (Figure 2).

Again, we might group together those traits that share a secondary loading on another major factor, as Hofstee and Hendricks (1991) suggested. In this case we could conceptually identify facets on the basis of negative associations with the domain of Agreeableness or Conscientiousness (Figure 3). Each of these ways of identifying specific traits within the domain of Neuroticism is reasonable, but the differences among them explain why there is so little consensus on lower level traits (Briggs, 1989). In fact, with only twelve elements in a set, there are 4,094 different proper, non-null subsets. The ways in which a domain as broad as Neuroticism could be subdivided is virtually limitless.

This is not to say that the identification of specific facets is not useful. Even if there is an element of arbitrariness in the way in which a domain is cut up, there are still good reasons to make distinctions. Any meaningful specification of facets should provide more information than the undifferentiated global domain scale. And some specifications are more meaningful than others. First, and perhaps most obviously, facets should represent the more

[1]This usage should be distinguished from that of Guttman (1954), who used the term "facet" to refer to one of several conceptual factors which, when crossed, yielded a set of variables. A well-known example is Guilford's (1967) structure of intellect model, which uses Operation, Content, and Product as facets in Guttman's sense.

closely covarying elements within the domain, not arbitrary combinations of elements (Figure 4). Second, they should be mutually exclusive, with each element in the domain assigned to only a single facet (Figure 5). Both these goals are facilitated by factor analyses of items within the domain, because factor analysis identifies discrete clusters of covarying items. This kind of item factor analysis was one of the steps in the development of NEO-PI-R facets.

Third, at whatever level of specificity one chooses, all facets should be of comparable scope and breadth in content. It makes little sense to carve a domain into some very specific facets and some very global ones (Figure 6). Fourth, the facets selected should cover as much of the known domain as possible (Figure 7). Just as the five-factor model is intended to be a comprehensive taxonomy of all personality traits, so each set of facets should be a comprehensive specification of the contents of each domain. In one respect we have systematically violated this principle in creating NEO-PI-R facets. For example, we deliberately omitted somatic concerns from the Neuroticism domain, even though there is reason to consider somato-psychic distress as a facet of N, because we wanted to be able to predict health complaints from our measures of N, and thus needed to have content-uncontaminated scales. It is sometimes difficult to know the boundry between a domain of personality and its external correlates.

Finally, the facets of each domain should be as consistent as possible with existing psychological constructs. It is in combing the literature that we identify constructs relevant to each domain, and, where empirically supportable, it makes sense to retain the initial constructs. They are familiar to personality psychologists, and their previous use suggests that they will have some utility. The NEO-PI-R N facets of Anxiety, Angry Hostility, Depression, Self-Consciousness, Impulsiveness, and Vulnerability all have clear roots in the psychological literature.

Facet Scales in the NEO-PI-R

We measure each domain as the sum of six facet scales. Unlike five and seven, there is nothing magical about the number six. It was chosen because we saw the need to make at least that many distinctions within domains and because more than six would soon lead to intellectual overload (in fact, six may be too many facets for some users.) There is one other reason: In the late 1970s we spent a good deal of time reading about factor analysis, and Gorsuch (1974) warned that "it is generally difficult to replicate factors with fewer than five or six salient variables per factor" (p. 295). We naturally wanted a replicable structure, and by following Gorsuch's advice, it appears that we have obtained one.

We recently conducted a study in collaboration with David Dye that gathered NEO-PI-R data from over 1,500 employees of a large national organization (Costa, McCrae & Dye, 1991). Because of the size and diversity of this sample, it is ideal for demonstrating the robustness of the NEO-PI-R factor structure. Table 1 shows the factor structure in subsamples of younger adults (aged 21 to 29) and older adults (aged 30 to 64). Each of the 30 facets has a substantial loading on the intended factor in each sample--its highest loading in 57 of the 60 instances. There are a number of large secondary loadings (such as Angry Hostility on Agreeableness and Activity on Conscientiousness), which are themselves meaningful and to a considerable degree replicable.

Table 2 shows the same sample divided into white and non-white subjects; Table 3 shows the structure in men and women. Finally, a comparison of the full sample with spouse ratings on a small (and independent) sample (Table 4) shows that the observed structure is not limited to self-reports.

The facets within each domain cohere so well in factor analyses that one might wonder whether they are not simply interchangeable markers of the factor. This is the issue of discriminant validity: Do different facet scales in fact measure *different* aspects of the same domain? We have recently addressed that question in a series of analyses, examining questionnaire scale (Costa & McCrae, 1992b) and adjective (McCrae & Costa, 1992) correlates of individual facets. For example, three of the need scales of Jackson's (1984) Personality Research Form (PRF)--Change, Sentience, and Understanding--consistently load on a factor that has been interpreted as Openness (Paunonen et al., 1992) These three scales show a highly differentiated and appropriate pattern of correlations with NEO-PI O facet scales with Change most strongly related to Openness to Actions, Sentience most strongly related to Openness to Aesthetics, and Understanding most strongly related to Openness to Ideas (Costa & McCrae, 1988).

Adjective correlates also provide evidence of differential validity of facet scales. Consider the facets of Extraversion. Watson and Clark (in press), in their review of Extraversion, offered a division of the domain similar to ours, but they regarded warmth and gregariousness as parts of a single Affiliation facet. As Table 5 shows, both NEO-PI-R Warmth and Gregariousness--and only these two facets--have "sociable" among their highest ACL correlates, partially supporting Watson and Clark. But there is also evidence of differentiation: Individuals high in Warmth describe themselves on the ACL as "warm" and "friendly"; those who score high in Gregariousness describe themselves as "outgoing" and "pleasure-seeking". This appears to be a relatively subtle but reliable distinction.

I would next like to present some preliminary results from a study of California Q-Set correlates. The data are from 172 men and women in the Baltimore Longitudinal Study of Aging (Shock et al., 1984). They completed the CQS between 1981 and 1985, and the NEO-PI-R in 1990. It should be stressed that these are self-sorts, not the expert ratings that the CQS was originally designed for. However, they do provide a different way of examining the differential correlates of facets. Table 6 presents the five largest CQS correlates of each of the facets of Agreeableness; the correlations range from .25 to .44 in absolute magnitude and are all statistically significant, $p < .001$.

Individuals who scored high on the Trust facet had described themselves five to nine years earlier as being cheerful and expressive, lacking the guardedness of less trusting people. Those who scored low on Trust were distrustful, skeptical, and, understandably, kept their distance from others.

Straightforwardness has a very different set of correlates. High scorers are ethically consistent and do not vary roles: They treat everyone with the same honest candor. Low scorers are more devious: They stretch limits and describe themselves as guileful, deceitful, and manipulative.

The major correlates of Altruism involve compassion and sympathy; sympathy is also a correlate of Compliance, but compliant people are in addition submissive and do not openly express hostility.

The positive correlates of Modesty are somewhat puzzling; modest individuals describe themselves as self-defeating and conventional. On the other hand, it is easy to understand why an individual low in modesty would describe him- or herself as verbally fluent, intelligent, and "an interesting, arresting person". Immodest people certainly find themselves interesting.

Finally, the correlates of Tender-mindedness show its distinctiveness from altruism. Altruism is kindness in action; Tender-mindedness is kindness in attitude. Note that low scorers--tough-minded individuals--are unemotional, conservative, and aloof, suggesting a rather cold-blooded rationality.

Benefits of a Differentiated Approach

The pragmatic value of a facet-level approach to personality assessment is clear. Individual facets contain valid specific variance, not represented in the global factors. If the object of research is to find predictors of, say, ease in public speaking, then measures of self-consciousness and assertiveness will probably work better than global measures of neuroticism and extraversion. In dealing with individual cases, the specific pattern of scores within each domain may be crucial. A client in psychotherapy who is high in anxiety and low in anger is likely to have very different needs from one who is high in anger and low in anxiety.

But the explicit measurement of facets also has theoretical implications for an understanding of the origins and nature of personality traits themselves. For example, one of the most fundamental questions in trait psychology is *why* traits covary along five dimensions. Do they share some underlying neurochemical basis? Are they learned behaviors that are mutually reinforcing? Does their covariation reflect the internalization of a socially shared and lexically encoded stereotype, specific to a particular culture? Since we cannot easily manipulate personality traits, we need to find natural experiments that may help us tease these possibilities apart.

If the covariation is due to cultural influences, we should find cultures in which the usual grouping of facets is altered. Knowledge and art are universal human concerns, and every culture is likely to show a range of individual differences in intellectual curiosity and in aesthetic sensitivity. But will these two traits always covary to form an Openness factor? In Chinese as in Western cultures, both are viewed as necessary parts of a complete education, but in other cultures they might be seen as competing interests, perhaps even negatively related. If so, it would suggest that the patterning of facets into domains is culturally dictated.

The covariation of traits might be learned. For example, people with a high need for affiliation may find that they are rewarded with social attention when they are smiling and cheerful, not dour and serious. Developmental psychology at the facet level could support this hypothesis by showing that there is no association between gregariousness and positive emotions in young children, but that gregarious children become more and more cheeful as they accumulate social experience.

Alternatively, the covariation might be due to the structure of the brain itself, and if so, changes in the brain due to accident or to progressive neuropsychiatric impairments might affect all facets of a domain equally. Selective effects on isolated facets might suggest that individual facets have their own localization in the brain.

These three approaches certainly do not exhaust the possibilities. They merely illustrate the idea that we can understand the five broad factors by analyzing the conditions under which their components covary. And for that, we must have valid and reliable measures of the component traits. The hierarchical measurement of personality promises real advances in personality theory as well as personality assessment.

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Table 1
Factor Analysis of NEO-PI-R Scales in Younger and Older Adults

NEO-PI-R Facet	Varimax Rotated Principal Component									
	N		E		O		A		C	
	Younger	Older	Younger	Older	Younger	Older	Younger	Older	Younger	Older
N1: Anxiety	83	81								
N2: Angry Hostility	70	66					−44	−45		
N3: Depression	80	80								
N4: Self-Consciousness	72	71								
N5. Impulsiveness	55	56								
N6: Vulnerability	72	68								−42
E1: Warmth			77	74						
E2: Gregariousness			77	62						
E3: Assertiveness			52	40						43
E4: Activity			53	46					47	51
E5: Excitement Seeking			62	50				−41		
E6: Positive Emotions			71	76						
O1: Fantasy					60	61				
O2: Aesthetics					77	76				
O3: Feelings	43			45	58	44				
O4: Actions					59	61				
O5: Ideas					77	74				
O6: Values					56	51				
A1: Trust			40	43			48	45		
A2: Straightforwardness							73	67		
A3: Altruism			46	54			62	52		
A4: Compliance							75	73		
A5: Modesty							62	59		
A6: Tender-Mindedness							65	54		
C1: Competence	−43								63	61
C2: Order									67	71
C3: Dutifulness									70	67
C4: Achievement Striving									77	76
C5: Self-Discipline									75	73
C6: Deliberation									57	58

Note. N = 708 younger (21-29), 823 older (30-64) adults. Adapted in part from Costa, McCrae, & Dye, 1991. All loadings over .40 in absolute magnitude are shown. Decimal points are omitted.

Table 2
Factor Analysis of NEO-PI-R Scales in White and Nonwhite Adults

NEO-PI-R Facet	Varimax Rotated Principal Component									
	N		E		O		A		C	
	White	Nonwhite	White	Nonwhite	White	Nonwhite	White	Nonwhite	White	Nonwhite
N1: Anxiety	84	75								
N2: Angry Hostility	68	66					−47	−43		
N3: Depression	82	72								
N4: Self-Consciousness	74	66								
N5: Impulsiveness	52	63								
N6: Vulnerability	73	63								−44
E1: Warmth			78	59				49		
E2: Gregariousness			73	71						
E3: Assertiveness			46	51			−42			44
E4: Activity			49	49					49	47
E5: Excitement Seeking			53	68						
E6: Positive Emotions			74	63						
O1: Fantasy					62	54				
O2: Aesthetics					79	68				
O3: Feelings		45			55	45				
O4: Actions					61	57				
O5: Ideas					77	68				
O6: Values					55	53				
A1: Trust			40				49	55		
A2: Straightforwardness							70	66		
A3: Altruism			55				54	72		
A4: Compliance							76	70		
A5: Modesty							62	46		
A6: Tender-Mindedness							61	67		
C1: Competence	−43								63	60
C2: Order									70	68
C3: Dutifulness									70	67
C4: Achievement Striving									77	75
C5: Self-Discipline									73	76
C6: Deliberation		−42							58	57

Note. N = 1,042 for whites, 442 for nonwhites. Adapted in part from Costa, McCrae, & Dye, 1991. All loadings over .40 in absolute magnitude are shown. Decimal points are omitted.

Table 3
Factor Analysis of NEO-PI-R Scales in Men and Women

NEO-PI-R Facet	Varimax Rotated Principal Component									
	N		E		O		A		C	
	Men	Women	Men	Women	Men	Women	Men	Women	Men	Women
N1: Anxiety	82	81								
N2: Angry Hostility	66	66					−48	−48		
N3: Depression	78	81								
N4: Self-Consciousness	69	72								
N5: Impulsiveness	48	54							−45	
N6: Vulnerability	67	69							−47	
E1: Warmth			73	75						
E2: Gregariousness			66	73						
E3: Assertiveness			41	50					55	
E4: Activity			49	52					45	47
E5: Excitement Seeking			65	57						
E6: Positive Emotions			75	71						
O1: Fantasy					61	59				
O2: Aesthetics					77	77				
O3: Feelings	45				52	52				
O4: Actions					62	58				
O5: Ideas					79	76				
O6: Values					52	55				
A1: Trust							54	46		
A2: Straightforwardness							70	65		
A3: Altruism			50	47			62	55		
A4: Compliance							75	74		
A5: Modesty							60	57		
A6: Tender-Mindedness							08	55		
C1: Competence									66	61
C2: Order									69	69
C3: Dutifulness									72	68
C4: Achievement Striving									73	77
C5: Self-Discipline									72	75
C6: Deliberation									68	55

Note. N = 543 men, 996 women. Adapted in part from Costa, McCrae, & Dye, 1991. All loadings over .40 in absolute magnitude are shown. Decimal points are omitted.

Table 4
Factor Analysis of NEO-PI-R Scales in Self-Reports and Spouse Ratings

NEO-PI-R Facet	Varimax Rotated Principal Component									
	N		E		O		A		C	
	Self	Spouse	Self	Spouse	Self	Spouse	Self	Spouse	Self	Spouse
N1: Anxiety	82	85								
N2: Angry Hostility	68	61					−46	−60		
N3: Depression	80	81								
N4: Self-Consciousness	72	70								
N5: Impulsiveness	55	51								
N6: Vulnerability	70	70							−40	−46
E1: Warmth			74	69				44		
E2: Gregariousness			72	81						
E3: Assertiveness			48	42					40	
E4: Activity			51	45					48	46
E5: Excitement Seeking			57	47						
E6: Positive Emotions			73	69						
O1: Fantasy				45	60	53				
O2: Aesthetics					76	67				
O3: Feelings	41	40		57	52					
O4: Actions					60	51				
O5: Ideas					76	80				
O6: Values					54	66				
A1: Trust							49	73		
A2: Straightforwardness							70	79		
A3: Altruism			48	42			59	64		
A4: Compliance							74	77		
A5: Modesty							59	72		
A6: Tender-Mindedness							61	68		
C1: Competence									62	72
C2: Order									69	68
C3: Dutifulness									69	77
C4: Achievement Striving									76	78
C5: Self-Discipline									74	75
C6: Deliberation									58	56

Note. N = 1,539 for self-reports, 91 for spouse ratings. Adapted in part from Costa, McCrae, & Dye, 1991. All loadings over .40 in absolute magnitude are shown. Decimal points are omitted.

Table 5

ACL Correlates of NEO-PI-R Extraversion Facets

Extraversion Facet	Adjective Check List Items
E1: Warmth	*friendly, warm, sociable*
E2: Gregariousness	*sociable, outgoing, pleasure-seeking*
E3: Assertiveness	*aggressive, not shy, assertive*
E4: Activity	*energetic, hurried, quick*
E5: Excitement Seeking	*pleasure-seeking, daring, adventurous*
E6: Positive Emotions	*enthusiastic, humorous, praising*

Note: N = 305, all $p < .001$. Adapted from McCrae & Costa, 1992.

Table 6

CQS Correlates of NEO-PI-R Agreeableness Facets:

A1: Trust

Is cheerful
Facially/gesturally expressive
vs.
Basically distrustful of people
Critical, skeptical
Aloof, keeps people at a distance

A2: Straightforwardness

Behaves in ethically consistent manner
Does not vary roles
vs.
Is power-oriented
Tries to stretch limits
Guileful, deceitful, manipulative

A3: Altruism

Has warmth, is compassionate
Behaves in sympathetic manner
Is cheerful
vs.
Critical, skeptical
Aloof, keeps people at a distance

A4: Compliance

Behaves in sympathetic manner
Basically submissive
vs.
Behaves in assertive fashion
Is verbally fluent
Expresses hostile feelings directly

A5: Modesty

Is self-defeating
Judges in conventional terms
vs.
Is verbally fluent
Appears to have high intellectual capacity
Is interesting, arresting person

A6: Tender-mindedness

Has warmth, is compassionate
Behaves in sympathetic manner
vs.
Emotionally bland
Favors conservative values
Aloof, keeps people at a distance

Figure 1.

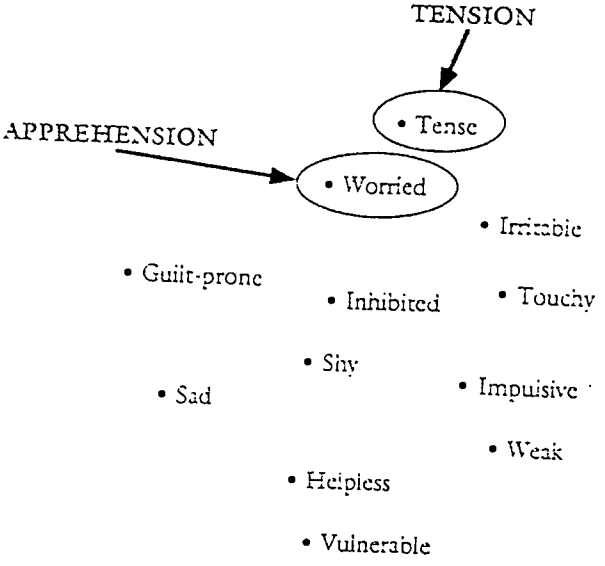

Figure 2.

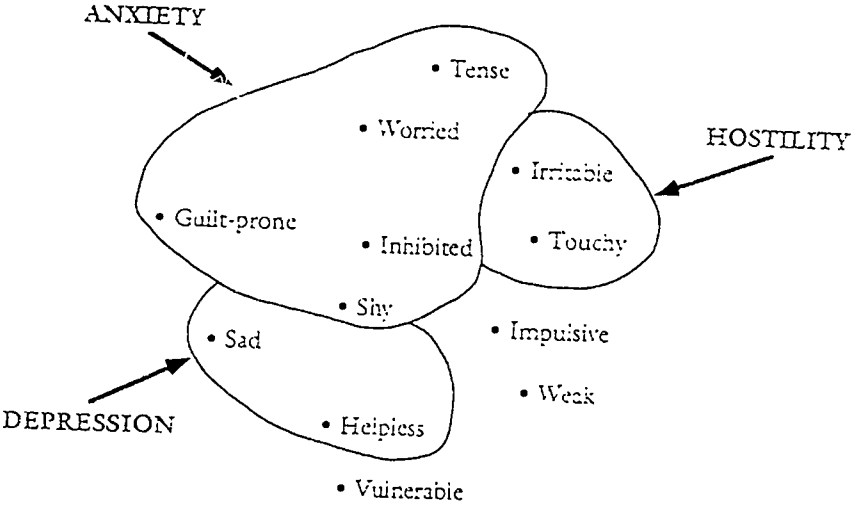

Figure 3.

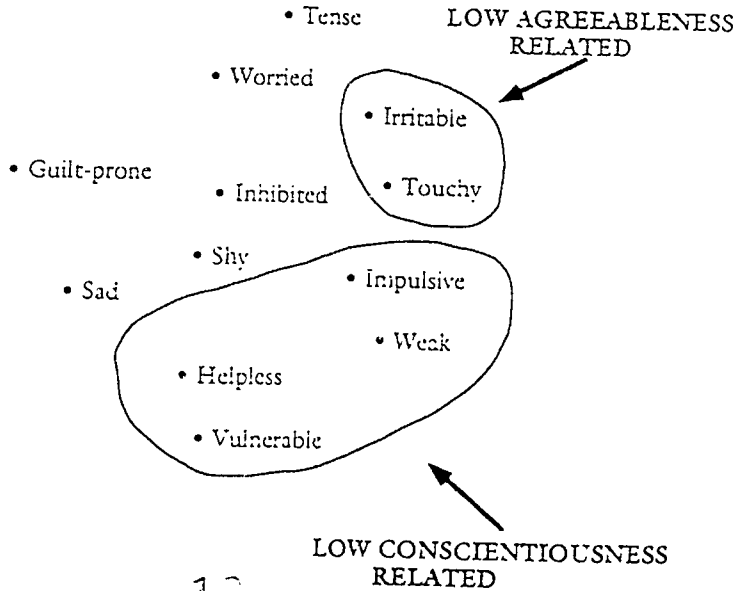

Figure 4.

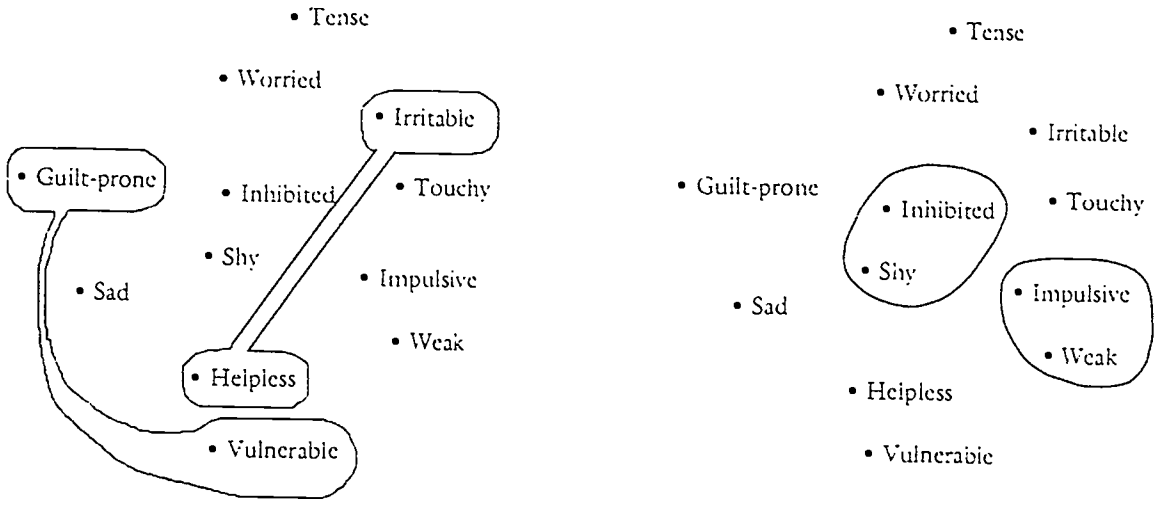

Figure 5.

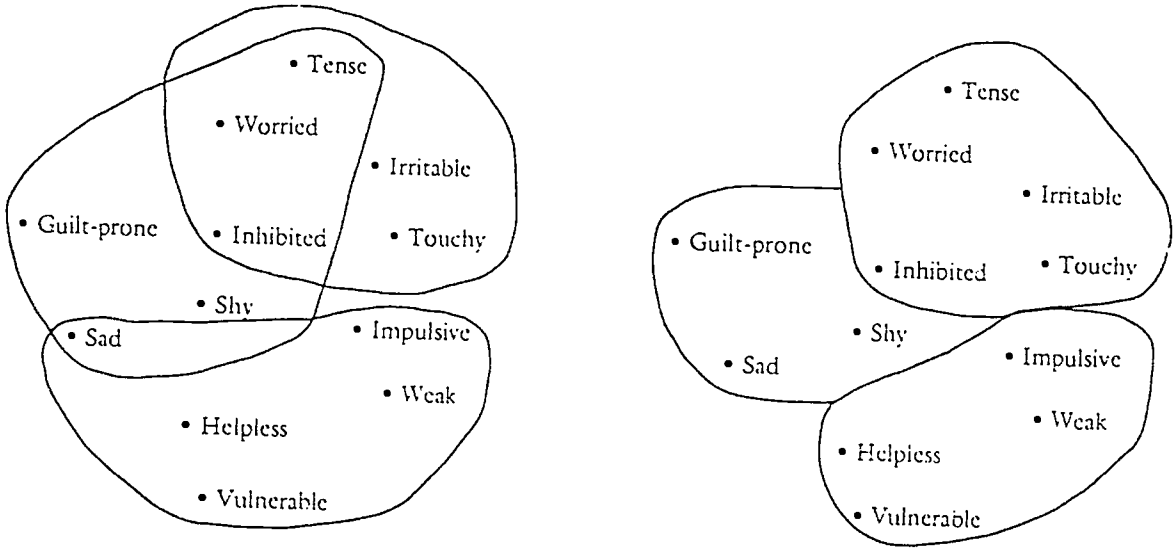

Figure 6.

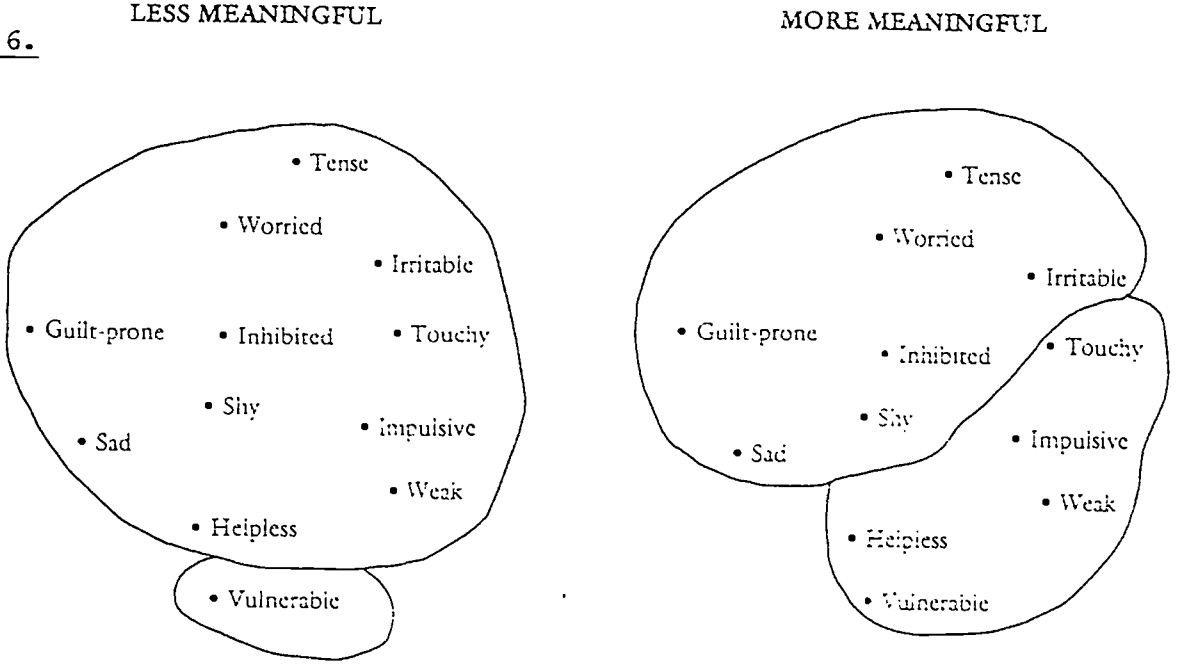

Figure 7.