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Psychometric and Geometric Characteristics of the Revised Interpersonal Adjective Scales (IAS-R)

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Previous research has suggested that the Interpersonal Adjective Scales (IAS) have properties that are compatible with the substantive, structural, and external characteristics required by the circumplex-based interpersonal theory which guided scale construction procedures. In the present study, we describe an item-analytic procedure that identifies and selects items in terms of their estimated geometric location within a circumplex model and we apply the procedure to the task of reducing the 128-item IAS to a 64-item short form version (IAS-R). Scales constructed to conform to a circumplex model are evaluated by somewhat different structural criteria than are those developed to conform to other multivariate models and these differences are illustrated. The resultant IAS-R was found to have improved substantive and structural characteristics and acceptable reliability. We discuss possible applications of this highly efficient measure of interpersonal behavior.

The construct-oriented approach to test construction emphasizes substantive, structural, and external considerations that follow from a theoretical framework which specifies the nature of and interrelations among the constructs under investigation (Cronbach & Meehl, 1955; Jackson, 1971; Loevinger, 1957). The Interpersonal Adjective Scales (IAS) (Wiggins, 1979a) were developed within the framework of a neo-Sullivanian theory of social cognition which emphasizes the exchange of love and status in interpersonal transactions (Carson, 1969; Foa & Foa, 1974; Leary, 1957; Sullivan, 1953). The universe of content was defined as a subset of Goldberg's (1977) 1710 trait-descriptive adjectives which had been derived from the earlier taxonomic work of Allport and Odbert (1936) and of Norman (1967). Approximately 800 terms were identified which had social (status) and emotional (love) consequences for both participants in dyadic interactions (Wiggins, 1979b).

The structural model which guided the construction of the IAS was a two-dimensional circumplex (Guttman, 1954) defined by the coordinates of love and status. This model seemed the most appropriate

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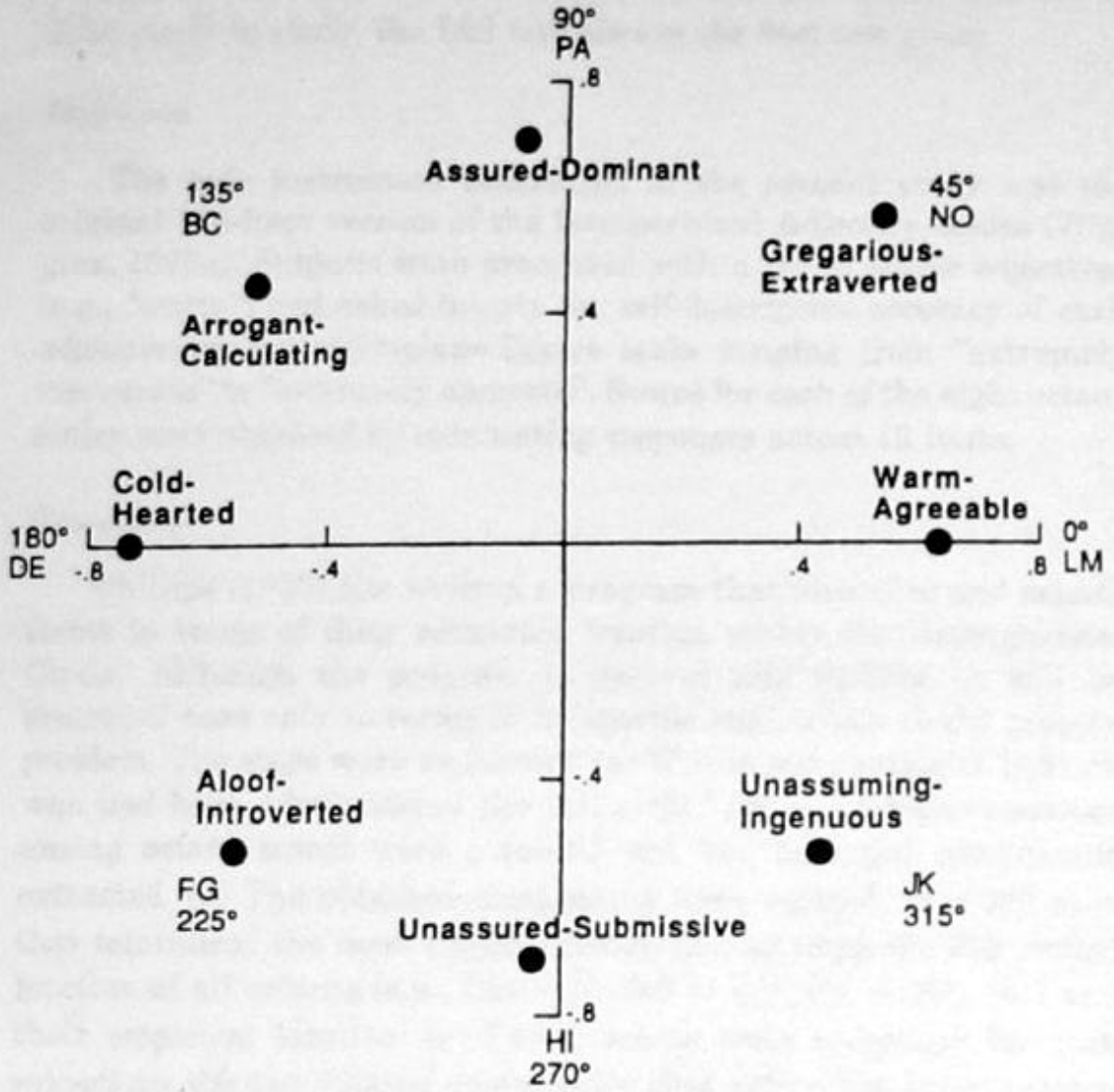

Figure 1. Circumplex structure of IAS-R (n=1161).

for representing the *conceptual* properties of the Interpersonal Circle (Kiesler, 1983) and for representing the *empirical* interrelations among interpersonal variables that have been reported by others (Wiggins, 1982). From Figure 1 it may be seen that two bipolar coordinates (love and status) define the universe of content of interpersonal behavior within which any vector from the origin can be represented as a "blend" of nurturance and dominance. For example, gregarious-extraverted behavior is a blend of strong and warm components. The scales have been given alphabetic designations in a counter-clockwise direction around the circle (PA, BC, DE . . . NO). The hyphenated scale labels indicate that adjacent "sixteenths," e.g., (B) arrogant and (C) calculating, have been combined into more reliable "octants," e.g., (BC) arrogant-calculating. The empirical fit of the IAS to the circumplex model is excellent (Wiggins, Steiger, & Gaelick, 1981).

The IAS has been related to a variety of individual difference measures within the fields of personality and social psychology (Wiggins & Broughton, 1985), including the Big Five dimensions of personality research (Botwin & Buss, 1987). It has been shown to be related to preferences in mate selection (Buss & Barnes, 1986), the use of interpersonal manipulation tactics (Buss, Gomes, Higgins, & Lauterbach, 1987), and to ratings of nonverbal social behavior (Gifford & O'Connor, 1987). The IAS has also been studied in relation to psychopathology (Wiggins, Phillips, & Trapnell, in press), and to interpersonal problems (Alden, Wiggins, & Phillips, 1987).

In the present paper, we describe the procedures whereby the 128-item IAS was reduced to a 64-item short form version (IAS-R) and present an evaluation of the substantive, geometric, and psychometric properties of the revised version. Scales constructed to conform to a circumplex model are evaluated by somewhat different structural criteria than are those developed to conform to other multivariate models and we attempt to illustrate these differences.

There were two main reasons for revising the original IAS: (a) the availability of a shorter version would make it more convenient for investigators to include the IAS in test batteries and thus further extend our knowledge of IAS correlates; (b) software developed since the time the IAS was constructed held open the possibility of developing an instrument of improved structural properties. In principle, the optimal pool of adjectives for a short form IAS would be the approximately 800 interpersonal adjectives from which the original IAS was derived (Wiggins, 1979b). In practice, the pool was restricted to the 128 adjectives of the IAS that have been administered to various groups over the last six years. Given that the scales of the original IAS have exceptionally clear structural properties, in relation to other scales based on a circumplex model (Wiggins, Steiger, and Gaelick, 1981), the present item-analytic task presents a challenge to our newer procedures for selecting items.

Method

Subjects

The subjects were 1161 University of British Columbia students (476 men and 685 women) who had participated in one of nine separate studies of the IAS conducted over the last six years. Subjects were recruited from a variety of lower division psychology courses. Al-

though the instruments administered in addition to the IAS varied from study to study, the IAS was always the first test given.

Measures

The only instrument considered in the present study was the original 128-item version of the Interpersonal Adjective Scales (Wiggins, 1979a). Subjects were presented with a list of single adjectives (e.g., "warm") and asked to rate the self-descriptive accuracy of each adjective on an eight-place Likert scale ranging from "extremely inaccurate" to "extremely accurate". Scores for each of the eight octant scales were obtained by cumulating responses across 16 items.

Procedure

Phillips (1983) has written a program that identifies and selects items in terms of their estimated location within the Interpersonal Circle. Although the program is general and flexible, it will be described here only in terms of its specific application to the present problem. The steps were as follows: (a) Within our sample of 1161 *Ss* who had been administered the full scale IAS, the intercorrelations among octant scores were obtained and two principal components extracted. (b) The obtained components were rotated, to a criterion that minimized the least squares differences between the theoretical location of all octants (e.g., LM = 0°, NO = 45°, PA = 90°, etc.) and their empirical location. (c) Factor scores were computed for each subject on the two rotated components that define the Interpersonal Circle. (d) For each of the 128 items of the IAS, the correlation was obtained between the item and the subjects' factor scores on the first (Love) and second (Dominance) components. (e) The correlations of each item with the two components were interpreted as locations on the Love and Dominance coordinates. Thus, for example, correlations of .60 and .40 were interpreted as distances of .6 and .4 from the origin of the Love and Dominance coordinates. (f) The angle of the item vector was computed with reference to the coordinate values: θ = arctan (.4/.6) = 33.7°. (g) The length of the item vector, or "communality," was computed from the sum of the squares of correlations of each item with the two component scores: $h^2 = (.4)^2 + (.6)^2 = .52$.

The above computations resulted in an angular location (e.g., 33.7°) and an index of communality (e.g, .52) for each of 128 items. These two results enabled us to project each item onto the space spanned by the two principal components of the IAS octants. The

Table 1

Revised Set of Interpersonal Adjective Scales (IAS-R)

(PA) ASSURED-DOMINANT		**(MI) UNASSURED-SUBMISSIVE**	
80.5°	Self-assured (.391)	255.3°	Timid (.330)
83.9°	Self-confident (.398)	256.4°	Bashful (.305)
86.5°	Assertive (.443)	258.1°	Shy (.373)
89.2°	Persistent (.171)	260.4°	Meek (.306)
94.7	Firm (.269)	271.6°	Forceless (.314)
107.1°	Dominant (.423)	275.9°	Unauthoritative (.321)
107.7°	Forceful (.377)	279.3°	Unbold (.314)
113.8°	Domineering (.342)	283.0°	Unaggressive (.399)
(BC) ARROGANT-CALCULATING		**(JK) UNASSUMING-INGENUOUS**	
130.2°	Cocky (.254)	294.4°	Unargumentative (.198)
136.1°	Crafty (.393)	295.0°	Undemanding (.200)
137.4°	Cunning (.456)	305.2°	Uncalculating (.213)
140.1°	Boastful (.200)	311.0°	Uncrafty (.306)
141.7°	Wily (.385)	313.4°	Boastless (.171)
142.5°	Calculating (.205)	316.2°	Unwily (.279)
144.2°	Tricky (.427)	317.9°	Uncunning (.348)
146.2°	Sly (.452)	321.3°	Unsly (.319)
(DE) COLD-HEARTED		**(LM) WARM-AGREEABLE**	
159.3°	Ruthless (.291)	348.6°	Softhearted (.337)
175.3°	Ironhearted (.327)	356.0°	Accommodating (.182)
178.5°	Hardhearted (.364)	359.7°	Gentlehearted (.390)
179.2°	Uncharitable (.286)	360.0°	Tenderhearted (.376)
186.0°	Coldhearted (.358)	4.1°	Charitable (.290)
179.8°	Cruel (.292)	5.6°	Tender (.368)
187.2°	Unsympathetic (.369)	6.2°	Sympathetic (.310)
195.5°	Warmthless (.373)	8.6°	Kind (.229)
(FG) ALOOF-INTROVERTED		**(NO) GREGARIOUS-EXTRAVERTED**	
214.9°	Uncheery (.358)	29.8°	Cheerful (.414)
215.3°	Unneighbourly (.336)	32.7°	Friendly (.471)
217.3°	Distant (.337)	34.3°	Neighbourly (.308)
218.3°	Dissocial (.429)	39.7°	Jovial (.303)
220.9°	Unsociable (.452)	45.1°	Perky (.328)
222.0°	Antisocial (.389)	50.0°	Enthusiastic (.357)
228.9°	Unsparkling (.352)	57.1°	Outgoing (.570)
242.4°	Introverted (.406)	66.2°	Extraverted (.460)

Note. Each adjective is preceded by its angular location (e.g., 80.5°) and followed by its communality value (e.g., h^2 = .391).

communality score was also interpreted as an index of how well an item's covariance was captured by the two-dimensional circumplex space and, hence, the higher the communality, the more "interpersonal" was an item. For that reason, the program was next instructed to select eight items from each of eight sectors of 45° in such a way as to maximize the communality of the items selected. The new 64-item IAS thus generated (IAS-R) was scored on the same population of subjects. Angular locations and communality values for each of the 64 items in IAS-R are provided in Table 1. From the intercorrelations

among the eight short-form octants, two principal components were extracted and rotated to a theoretically optimal position. Next, the original pool of 128 IAS items was projected onto the improved circumplex structure of IAS-R. The resultant solution was then evaluated in terms of geometric, substantive, and psychometric considerations.

The locations of octants within a two-dimensional circumplex space are highly interdependent. Changes in the item composition of a given octant scale will frequently result in changes in the location of other scales within the total set. Since improvements within a given scale may be offset by undesirable changes in the location of other scales, there are definite limitations on the amount of "fine tuning" that can follow analytic procedures for item selection, such as those we employed. There is also the problem of overfitting solutions to a given sample, even with samples as large as the present one. As a consequence, we made relatively few changes in the item composition of the analytically derived scales and instead turned our attention to the evaluation of what we considered the "final" 64-item short form of the IAS.

Results

Substantive Considerations

On several occasions in the past it had been suggested to us that the behaviors indexed by our contrasting sixteenths of ambitious (P) *versus* lazy (H) are not strictly interpersonal in nature. More recently, Kiesler (1983) has classified these contrasting sixteenths as assured (P) *versus* unassured (H) and the present data tend to substantiate his argument. Of the eight items in the original ambitious category, only one survived item selection ("persistent") and that item had the lowest communality of items selected for the PA category. Only one other item from the original ambitious category ("deliberative") fell in the PA sector of the IAS-R and its communality was quite low (.025). The remaining six items from the original ambitious category fell in the NO sector of IAS-R, with communalities ranging from .063 to .138. The items "self-confident" and "self-assured," which were originally classified in the dominant (A) category, easily survived item selection and were located in the *P* sector of IAS-R. On the basis of this evidence and Kiesler's (1983) arguments, the PA scale of IAS-R has been renamed "assured-dominant".

None of the items from the original lazy category were selected for inclusion in the short form, again calling into question the appropriateness of this category. Four of the lazy items fell within the HI sector of IAS-R, but their communalities were uniformly low. The remaining four lazy items fell in the FG sector with similarly low communalities. The revised HI scale of IAS-R consists of six items originally classified as submissive plus two items originally classified as introverted ("shy," "bashful").

Peabody and Goldberg (1987) have called attention to the fact that many of the items in the original ambitious (P) category of IAS (e.g., industrious, organized, self-disciplined) are more appropriately classified as falling within the domain of the presumably orthogonal factor of Conscientiousness that has been repeatedly identified as one of the Big Five factors of personality research (Norman, 1963). R. R. McCrae (personal communication, September 4, 1986) and P. T. Costa, Jr. have jointly factored their NEO Personality Inventory (Costa & McCrae, 1985) with the original IAS and found the ambitious-dominant (PA) and lazy-submissive (HI) octants to be most highly related to their Conscientiousness factor. A subsequent reanalysis with the assured-dominant (PA) and unassured-submissive (HI) octants of IAS-R revealed that this relationship was substantially reduced (McCrae & Costa, in press). Thus, rescoring PA as "assured-dominant" and HI as "unassured-submissive" both clarifies the content of these scales and brings them into closer alignment with the Big Five factors of personality research.

The cold-quarrelsome (DE) category of the IAS has proven somewhat problematic in its interpretation (Wiggins & Broughton, 1985), although its status as a category of interpersonal behavior has not been questioned. In the present analysis, the quarrelsome component was found to be less robust than the cold component, although not dramatically so. All of the items from the original cold-quarrelsome category fell within the DE sector of IAS-R. However, none of the items in the original quarrelsome category survived item selection. Thus, although quarrelsome items were located appropriately on the IAS-R circle, their communalities were consistently lower than those of the cold items. Strictly speaking, then, the DE scale of IAS-R is more a measure of "cold-hearted" behavior than of "cold-quarrelsome" behavior. The conceptual significance of this change of emphasis is discussed in depth by Costa, McCrae and Dembroski (in press). The item imbalance in DE is also reflected in the opposite octant of LM in which six items were selected from the original warm category and only two from the original agreeable category.

Psychometric Characteristics of Interpersonal Adjective Scales

Scale label	IAS-R Means and Standard Deviations[a]						IAS Full Scale Coefficient Alpha		IAS-R Short Form Coefficient Alpha	
	Men (n=473)		Women (n=688)		Total (n=1161)		Total Sample (n=1161)	Range of values from the 9 subsamples	Total Sample (n=1161)	Range of values from the 9 subsamples
	M	SD	M	SD	M	SD				
PA	5.08	.90	4.91	1.01	4.98	.97	.860	.794-.880	.842	.793-.876
BC	4.22	1.01	3.46	1.08	3.77	1.12	.880	.860-.886	.849	.735-.884
DE	2.82	.87	2.34	.78	2.54	.85	.872	.848-.882	.802	.781-.862
FG	3.51	.96	3.25	1.04	3.35	1.01	.885	.825-.894	.847	.756-.867
HI	3.92	1.00	4.05	1.10	4.00	1.06	.816	.800-.840	.829	.776-.853
JK	4.13	.89	4.68	.92	4.46	.95	.813	.773-.850	.749	.648-.783
LM	5.74	.83	6.08	.76	5.94	.81	.900	.823-.900	.857	.785-.873
NO	5.45	.86	5.69	.90	5.59	.89	.906	.834-.910	.853	.719-.874

Note. Scale labels stand for assured-dominant (PA); arrogant-calculating (BC); cold-hearted (DE); aloof-introverted (FG); unassured-submissive (HI); unassuming-ingenuous (JK); warm-agreeable (LM); gregarious-extraverted (NO).

[a]Scale values range from 1 (extremely inaccurate) to 8 (extremely accurate).

Internal Consistency

The item selection procedures employed in the derivation of IAS-R were meant to increase the structural fidelity of the instrument while, at the same time, reducing the number of items in each scale to a more economical length. The practical advantages of a 64-item instrument are obvious, but the possibly offsetting disadvantages of decreased scale reliabilities are equally evident, especially when scales are reduced by half and selection takes place on a very small pool of items. The last two columns of Table 2 present coefficient alpha values (Cronbach, 1951) for the total sample and the ranges of coefficient alphas in the nine separate samples. The preceding two columns present comparable statistics for the original full scale IAS. As can be seen from Table 2, the overall loss in reliability associated with the reduction of 16-item scales to eight-item scales was not great. The reliability of the unassured-submissive scale (HI) increased slightly

from .816 to .829 and the average decrease in reliability for the remaining seven scales was .045.

Circumplex Structure of IAS-R

Principal components analysis of the intercorrelation matrix of IAS-R scales revealed a clear two-factor solution in which the eigenvalues corresponding to the first three components were 2.90, 2.79, and .78, and the proportions of total variance accounted for were 36.29, 34.82, and 9.69 percent respectively. Figure 1 presents a plot of the IAS-R scales on the first two principal components. As can be seen from that figure, the IAS-R scales conform well to the expected circumplex structure.

The relative stability of the IAS-R circumplex structure was examined in each of nine samples ranging in size from 97 to 168. In these samples the proportion of variance accounted for by the first principal component ranged from 33.15 to 40.75 percent, with a mean of 38.92 and a standard deviation of 3.42 percent. The second principal component ranged from 28.53 to 35.93 percent in variance accounted for, with a mean of 32.86 and a standard deviation of 2.16 percent. The difference in proportion of variance accounted for between the two components ranged from .94 to 12.22, with a mean of 6.06 and a standard deviation of 3.52 percent. The total amount of variance accounted for by the two components ranged from 65.36 to 74.31, with a mean of 71.78 and a standard deviation of 2.94 percent. Clearly, there is not a great deal of variability in the magnitude of latent roots across different, relatively small, samples.

Inspection of the factor plots of IAS-R variables in the different samples suggested that, although there was some variability from sample to sample, a satisfactory circumplex structure was obtained in all groups, which was in most cases somewhat better than that obtained with the original IAS scales. Thus, the IAS-R scales have highly satisfactory circumplex properties, even in relatively small samples of subjects. This is not to encourage the use of small samples, however, and our intuition is that sample sizes of 175 or greater are necessary for near-perfect circumplexity to obtain.

Relation to Long Form (IAS)

An overall index of the similarity of a short form to the long form, from which it was derived, is provided by the zero-order correlations between comparable scales from the two forms. In our sample of 1161

Ss, these correlations were: PA (.886), BC (.927), DE (.903), FG (.927), HI (.742), JK (.913), LM (.918), and NO (.946). The correlations between original and short form versions of BC, FG, JK, LM, and NO are substantial and do not suggest changes in the content of these scales in their reduced form. The correlation between different versions of the DE scale is slightly lower and may reflect the change of emphasis from cold-quarrelsome to the more narrow band of cold-*hearted* behavior. The reduced correlation between PA scales likely reflects the change from ambitious-dominant to *assured*-dominant behavior. The relatively low correlation between versions of the HI scale reflects not only a change of emphasis from lazy-submissive to *unassured*-submissive, but the reclassification of "bashful" and "shy" as falling within this octant.

Although zero-order correlations between original and short form scales provide an index of scale similarities, they do not provide definitive evidence of the *structural similarity* of the two sets of circumplex scales. This kind of evidence may be found in Figure 2 which displays the projections of the revised scales (IAS-R) on the plane formed by the two principal components of the intercorrelations among original scales (IAS). Here, it is of interest to note that the three revised scales found to be most different in the zero-order correlational analysis reported above (PA-R, HI-R, and DE-R), have slightly better angular locations than do their original counterparts (PA, HI, and DE). Note that the revised scales were projected on to the space of the *original* scales without in any way perturbing that space. Hence, the three revised scales in question are slightly closer to the theoretical location in the space defined by the original IAS scales than are the comparable original scales themselves. The zero-order correlations suggested that the three scales were "different" from their original counterparts, but the differences appear to be structural improvements.

Many types of analyses involving IAS variables require that stable estimates of the two principal components of the system be obtained. Thus, although slight differences in angular location of individual scales might be found between original and revised sets (Figure 2), the more general issue is whether the scales employed *as sets* provide estimates of a common circumplex space. To address this issue, we computed two factor scores for each of 1161 subjects using both the original (IAS) and revised (IAS-R) sets of scales. The correlation between estimates of the first factor from the IAS and IAS-R scales was .958. The comparable correlation for the second factor was .954.

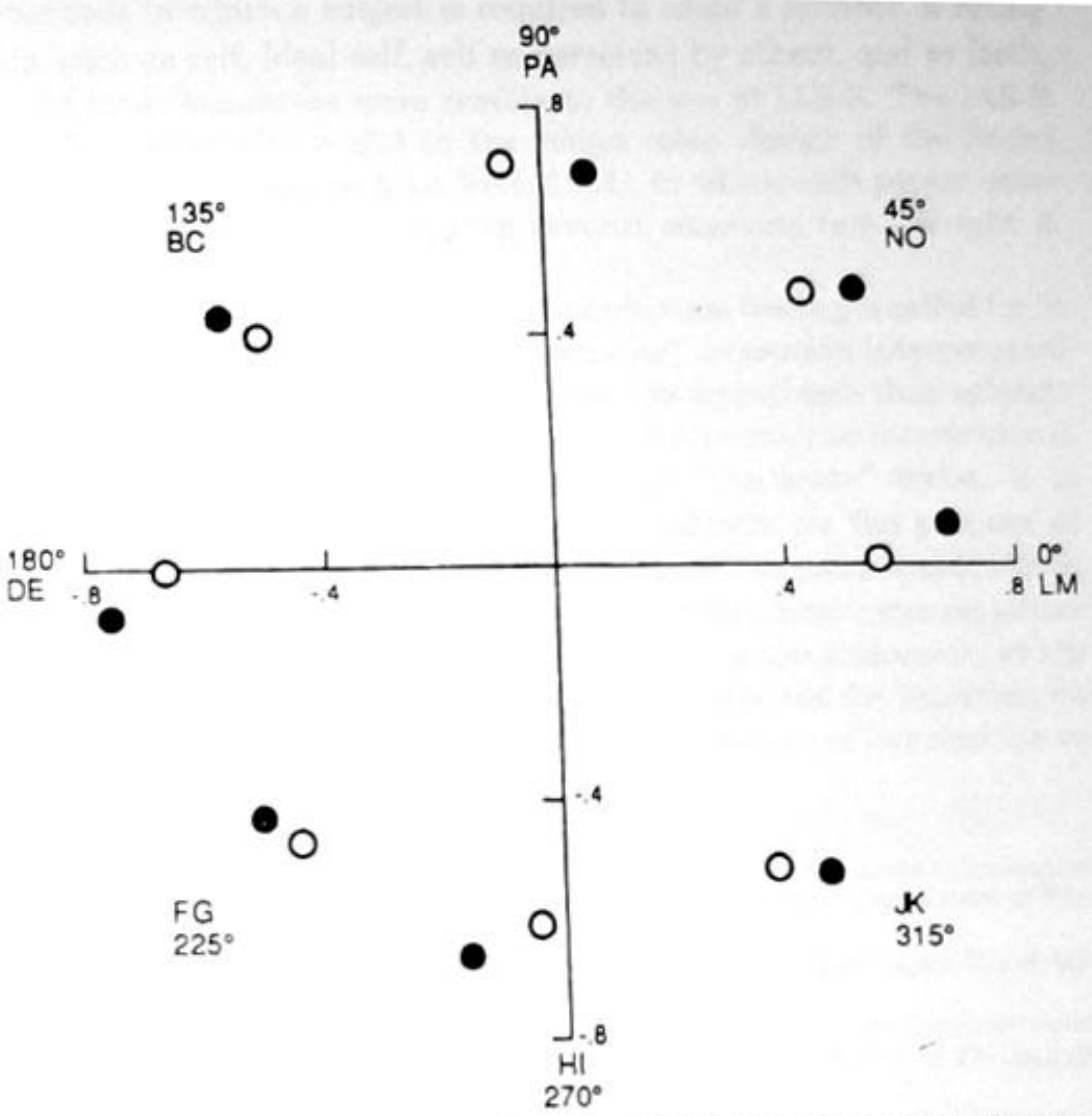

Figure 2. Projection of IAS-R scales onto IAS space (n=1161). (Black circles are original IAS scales; white circles are revised IAS-R scales).

The correlation between the IAS first factor and the IAS-R second factor was −.010; that between the IAS second factor and the IAS-R first factor was .001. Thus, the two scale sets appear to provide estimates of a common circumplex space.

Discussion

Previous research has suggested that the Interpersonal Adjective Scales (IAS) have properties that are compatible with the substantive, structural, and external characteristics required by the interpersonal theory which guided scale construction procedures. In the present study, an improved item-analytic procedure enabled us to reduce the original 128-item IAS to a 64-item short form version (IAS-R) that

appears to retain most of the desirable characteristics of the original instrument. Although IAS-R scale lengths were reduced by half, the overall loss in internal consistency was not great. One of the IAS-R scales had a slightly improved reliability and the average loss of reliability in the remaining seven scales was .045.

The circumplex structure of the IAS-R was as good or better than that of IAS in all samples studied. Moreover, the changes in substantive emphasis that occurred in three of the IAS-R scales brought the scales into closer alignment with the Big Five factors of personality research. The zero-order correlations between original and revised scales were moderate for the three scales which had a changed substantive emphasis and substantial for the other five scales. The two sets of scales showed substantial structural convergences both in terms of circumplex structure and in terms of providing factorial estimates of a common circumplex space.

The availability of a survey of the principal dimensions of interpersonal behavior, which can be administered in approximately ten minutes and which has the properties described in this paper, is likely to be of interest to those investigators who have previously employed the longer form and to some who have not previously considered using such a measure. Despite the obviously greater efficiency of IAS-R, there are reasons why one might prefer to use the original full scale version. Some investigators may not be willing to tolerate even the slight reduction in reliability of IAS-R scales. Others may prefer the substantive emphasis on ambitious and quarrelsome behaviors in the original IAS scales. Those who are interested in the more fine-grained substantive distinctions made by the IAS "sixteenths" or who require sixteen scales for the calculation of such indices as profile variance would have to administer IAS because IAS-R does not contain octants with equal numbers of sixteenth items. And finally, those who are undecided should be reminded that the full scale IAS can be scored for *both* sets of items.

Despite the foregoing, IAS-R is likely to be the instrument of choice for many assessment situations in which testing time is a major consideration. This is especially true of situations which call for repetitive or multiple ratings. For example, changes in the perceived interpersonal behavior of couples in psychotherapy might be measured by administering IAS-R in "self" and "other" format periodically over the course of treatment. Multiple ratings would be required in a situation in which a staff counselor in a residential center for delinquent boys is required to rate all boys in his cottage. Similarly,

situations in which a subject is required to adopt a number of rating sets, such as self, ideal-self, self as perceived by others, and so forth, would lend themselves more readily to the use of IAS-R. The IAS-R would be especially useful in the round robin design of the Social Relations Model (Kenny & La Voie, 1984), in which each person rates each other person in a group on several occasions (e.g., Wright & Ingraham, 1986).

There are also may situations in which mass testing is called for in order to identify subjects who are "extreme" on certain interpersonal variables. For example, in order to test the hypothesis that subjects with "extreme" interpersonal styles on IAS misconstrue interpersonal stimuli, in comparison with subjects with "moderate" styles, it is necessary to test very large numbers of subjects for the purpose of preselection (Valone, 1982). Such designs would be more feasible with a shortened version of IAS. Finally, perhaps the most common situation in which the benefits of IAS-R are evident is the *exploratory* study of interpersonal behavior in which tests are selected for inclusion on the basis of their expected yield of the most amount of information in the least amount of testing time.

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