ACT RESEARCH REPORT

No. 40

40

January, 1971

AN ANALYSIS OF THE STRUCTURE OF VOCATIONAL INTERESTS

Nancy S. Cole
Gary R. Hanson

PUBLISHED BY THE RESEARCH AND DEVELOPMENT DIVISION

THE AMERICAN COLLEGE TESTING PROGRAM

P. O. BOX 168, IOWA CITY, IOWA 52240

ABSTRACT

The internal structural relationships of scales from the SVIB, the Kuder OIS, Holland's VPI, the MVII, and the new ACT Vocational Interest Profile were compared. The configurations of the scales for all the inventories were found to be similar and to conform to the circular configurations of interest proposed by Roe and Holland. The common configuration of vocational interests was used to reconcile previous contradictory research results about the comparability of interest scores from various instruments and as a basis for counselor interpretation.

AN ANALYSIS OF THE STRUCTURE OF VOCATIONAL INTERESTS

Nancy S. Cole
Gary R. Hanson [1]

Several inventories of vocational interest are used in this country. These inventories were constructed in different ways, are scored by different methods, and report scores on different numbers of scales with different names. However, the similarity of scale names across instruments raises the question of the degree to which the different inventories measure the same or similar interests.

The degree of correspondence between various inventories has been investigated by directly comparing an individual's interests as measured by various instruments. Several studies, in which this direct approach has been used, yielded apparently contradictory results. Triggs (1943), Triggs (1944), and Wittenborn, Triggs, & Feder (1943) reported definite similarities in the Strong Vocational Interest Blank (SVIB) and the Kuder Preference Record by considering overall profiles and correlational configurations. In more recent studies, King, Norrell, & Powers (1963), O'Shea & Harrington (in press), Wilson & Kaiser (1968), and Zytowski (1968) reported low correlations between corresponding scales of the SVIB and various Kuder forms, and Kuder (1969) pointed out methodological differences in construction of the instruments which would lead to low correlations. In still other comparisons, Rose & Elton (1970) and Wall, Osipow, & Ashby (1967) used intermediate variables (such as vocational choice or major field) to demonstrate the relationship between two inventories—this time the SVIB and Holland's Vocational Preference Inventory (VPI).

Although the direct approaches have produced different conclusions, many writers have proposed categories of vocational interest which, indirectly, suggest correspondence between inventories. Super & Crites (1962) compared the factors of interests reported in several factor analytic studies including those of Thurstone (1931), Strong (1943), and Guilford, Christensen, Bond, & Sutton (1954). Six factors were commonly found in analyses of data from various instruments: scientific, social, language-literary, mechanical, business, and artistic factors. Cottle (1950) and Harrington (1970) also reported correspondence of many factors of the SVIB and those obtained from different Kuder forms.

Many classifications of occupations have used categories which appear similar to the factors listed. Roe (1956) proposed eight groups (Technology, Outdoor, Science, General Cultural, Arts and Entertainment, Service, Business Contact, and Organization) in her two-way classification of occupations. Super (1957) named similar groups: Technical or Material, Scientific, Musical or Artistic, Lit-

[1]The authors acknowledge their indebtedness to John L. Holland and Douglas R. Whitney for the research and ideas which provided the stimulus for this study. Special appreciation is also due Leo A. Munday for his encouragement and support and Dale J. Prediger for his many helpful critical readings of the manuscript.

erary, Humanistic or Social Welfare, Business Contact, and Business Detail. Further similarities are found in the families of scales of the SVIB (Strong, 1943; Darley & Hagenah, 1955).

Holland (1966b) described six major occupational and personality types (Realistic, Intellectual, Artistic, Social, Enterprising, and Conventional) and used the types to classify occupations (Holland, 1966a). The Realistic category represents masculine, technical interests while Intellectual interests are primarily scientific and asocial. Artistic interests include music, writing, and art as well as other forms of individual expression. The Social category encompasses interests in working with people and serving people. The Enterprising type is ambitious, business-oriented, and social. Finally, Conventional interests are business-related, systematic, and structured. Holland's six types represent one of the simplest skeletal versions of the common aspects in the classifications of occupational interests.

The classes of occupations and occupational interests suggested by various writers have been used primarily as discrete and independent categories. However, recent considerations of the relationships among the categories suggest a basis for the comparison of interest inventories which may help to unify previous results. Roe (Roe, 1956; Roe & Klos, 1969) suggested that her interest categories were related to each other in a circular ordering in which classes adjacent in the circle were most closely related while those most widely separated were the least related. Several studies supported the proposed continuum of interests (Jones, 1965; Roe, Hubbard, Hutchinson, & Bateman, 1966). Holland examined the relationships of the six scales of the VPI and empirically demonstrated a circular arrangement of the VPI scales (Holland, Whitney, Cole, & Richards, 1969). Holland's circular configuration is presented schematically in Figure 1 and the arrangement suggested by Roe is related to it there. Cole, Whitney, and Holland (in press) used a statistical analysis of spatial configuration to relate occupational groups to the six VPI scales. The results also demonstrated that the VPI circle can be considered as a continuum of interests with each location in the circle representing a different mix of the six Holland interests.

The similarities of the many proposed categories of occupational interests and the recent

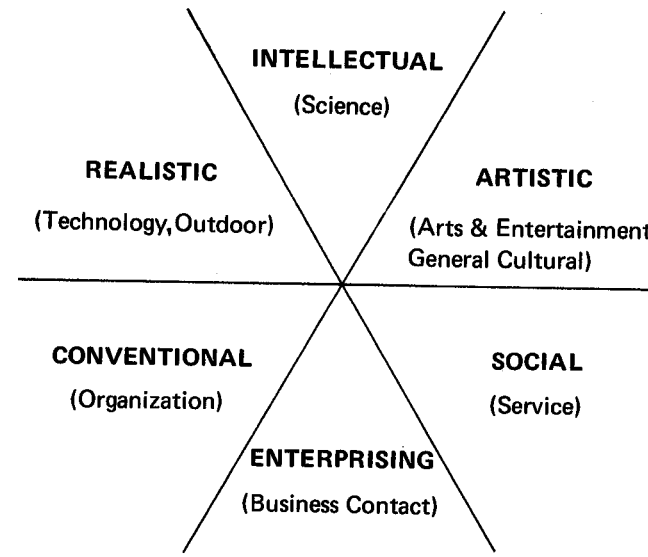


Figure 1. Circular ordering of Holland's categories (in capital letters) and the corresponding ordering of the categories of Roe (in parentheses).

demonstrations of relations among the categories suggest that a simple configuration or structure may underlie the vocational interests assessed by various inventories. If such a configuration does exist, the inventories may be sampling interests from a common underlying interest domain, thus providing a useful perspective for both research and the interpretation of the instruments.

The purpose of this paper is to determine whether the circular configuration of interests proposed and demonstrated by Roe and Holland is common to other interest inventories. The following inventories were studied: the SVIB, the Kuder Occupational Interest Survey (Kuder OIS), Holland's VPI, the Minnesota Vocational Interest Inventory (MVII), and a new instrument, The American College Testing Program's Vocational Interest Profile (ACT VIP). The method of analysis used in this study is indirect in the sense that the instruments are considered separately without any direct comparison of scores for the same people. However, if the circular arrangement is common to the internal structure of several instruments, the arrangement itself would provide a basis for direct comparisons of the instruments and may resolve the conflicting results of previous research as well as provide a useful basis for counselor interpretation.

Method

The Analysis of Spatial Configuration

For the analysis of spatial configuration, correlation coefficients were accepted as the measures of relationship among the scales of each interest inventory. Since the information about relationships contained in a correlation matrix is not easily interpreted in that form, a method of reducing the information was sought. Although factor analysis can be used to reduce the information in a correlation matrix, its purpose is to discover underlying dimensions, not to exhibit the relations among the variable, per se. However, factor analysis (or principal components analysis) does suggest a method which can be used in considering variable relationships. It has been common in factor analysis to use the factor loadings to plot variables on the factor axes. For example, Strong (1943) plotted several scales of the SVIB on pairs of factor axes. This procedure, while useful in the comparison of variables, omits an important step necessary for the analysis of spatial configuration (Cole & Cole, 1970).

Suppose the scales of an interest inventory are represented by vectors of unit length whose values are the loadings on the factor (or component) axes. Then the vectors representing interest scales fall at the surface of a unit hypersphere. Such a vector representation contains all the information about variable relationships contained in a correlation matrix, but in addition provides a geometric interpretation of those relationships. Visualizing or understanding relationships of interest scale vectors in a many-dimensioned space is, of course, impossible. Suppose, however, that the locations on the hypersphere representing the interest scales were contained in a smaller-dimensioned subspace of the larger space. Then the locations of the interest scales in the smaller subspace would provide a simplified representation of the relationships among the variables.

The possibility of fitting a smaller space to the vectors representing scales can be examined by performing a principal components analysis on those vectors. This second stage principal components analysis can be interpreted as a fitting procedure in which the first component gives the line which best fits the interest scale locations, the first two give the best-fitting plane, etc. Thus, if the vector representations of interest scales lie predominately in a plane, for example, the first two components will account for a large proportion of the trace (or variance).

The operation can be visually described by consideration of Figure 2. In the figure, four hypothetical interest scales (A, B, C, and D) are plotted on the three axes of the box which represent the factors or components of the first stage of the analysis. (For four scales there would be four such axes and each scale vector would have the same length, but only three can be pictured.) Projection of the four variables onto any of the walls of the box yields the type of plot commonly made by factor analysts. However, in the example the four points lie in a plane which cuts the box diagonally from the lower left front corner (X) to the upper right rear corner (Z), and the second stage principal components analysis yields the configuration of the four points as they lie in the diagonal plane. The resulting planar configuration is also presented in Figure 2.

The relationships among the scales of an interest inventory as measured by a correlation matrix and reduced, where possible, by an analysis of spatial configuration is referred to in this paper as the internal structure or configuration of the inventory. It is this internal structure which for Holland's VPI was shown to be circular with the ordering discussed earlier (Holland et al., 1969; Cole et al., in press). Thus, two parts of the configural analysis are of special relevance to the questions under examination in this study. The first is the degree to which a plane fits the points on a hypersphere representing the interest scales, and the second is the particular arrangement of scales in that plane. The percentage of the trace for the first two components of the second stage analysis can be interpreted as indicating the percentage of the variance of the scale points accounted for by the plane. If the percentage of the trace is large, the two dimensions are a dominant part of the structure of interests. If small, the planar config-

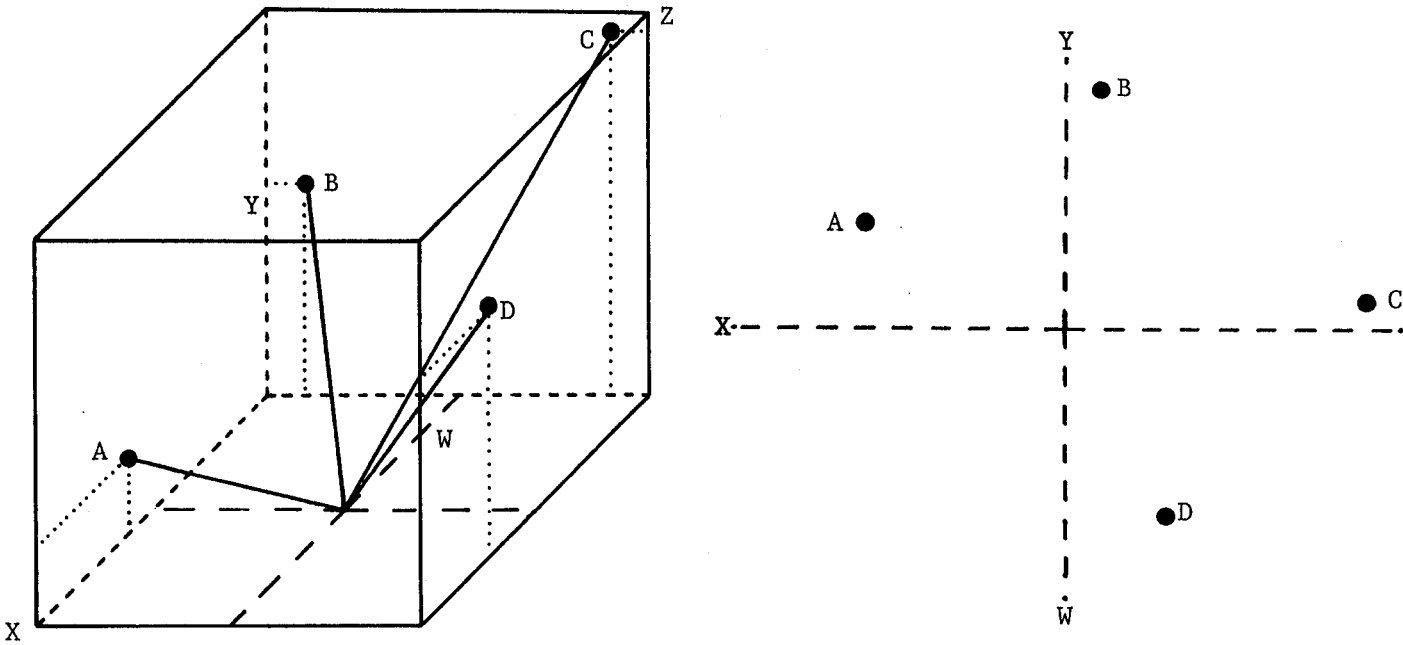


Figure 2. Location of four points in a three-space and on the best-fitting plane.

uration does not dominate and is, therefore, less important alone in describing that structure. The resulting configuration of the interest scales in the plane provides the basis for comparison of the internal structure of the various interest inventories.

Comparison of Configurations

In order to compare the planar configuration of one instrument with that of another, differences in types and numbers of scales used in the instruments must be accommodated. Since Holland's system represents one of the simplest versions of the various categorizations of interests, is similar in many ways to other categorizations, and has the circular configuration under consideration, it is used as the basis of comparison. Scales of the SVIB and Kuder OIS were classified into Holland's system on the basis of a classification of 400 occupations reported in Holland, Viernstein, Kuo, Karweit, & Blum (1970). (Scales without a corresponding classification in that report were left unclassified.) Then the positions in the configural analysis for all the scales in each Holland class were averaged, resulting in mean planar locations representing each of the six Holland categories. These mean planar points could then be examined for indication of the circular configuration in the Holland ordering.

It should be noted that this procedure makes it difficult to find conformance with Holland's circle when the number of scales classified into one of Holland's categories is small and not representative of the occupations most typical of the category. However, though conservative in this way, the method should offer some assistance in comparing the internal structure of the interest inventories.

Data

Separate correlation matrices of the scales in each of the interest inventories were submitted to the analysis described. The intercorrelations of 50 SVIB Occupational Scales for 301 men were reported in Campbell (1966, pp. 37-39); those for the 22 SVIB Basic Scales for 647 men were found in Campbell et al. (1967, p. 49). The Kuder Occupational Interest Survey Manual (Kuder, 1966, pp. 58-59) gave the intercorrelations of the 23 core scales for 276 men. Intercorrelations of the nine homogeneous keys of the MVII for 400 men were

obtained from Clark (1961, p. 65). The 12 scales of the ACT VIP were intercorrelated for 6,969 male students in diverse curricula at 57 two-year colleges and the resulting correlation matrix is given in Table 1. The analysis of a correlation matrix for men on Holland's VPI is adapted from Cole et al. (in press) in order to facilitate comparisons with the other inventories.

TABLE 1

Correlations of the ACT VIP Scales

	1	2	3	4	5	6	7	8	9	10	11	12
1. Scientific	1.00											
2. Health	.58	1.00										
3. Artistic	.43	.53	1.00									
4. Social Service	.35	.62	.63	1.00								
5. Business Contact	.26	.49	.47	.68	1.00							
6. Business Management	.31	.37	.39	.56	.72	1.00						
7. Business Detail	.33	.43	.36	.50	.63	.59	1.00					
8. Household	.27	.32	.39	.38	.31	.29	.42	1.00				
9. Carpentry	.26	.16	.23	.15	.11	.22	.19	.58	1.00			
10. Mechanical	.21	.05	.01	-.04	.01	.15	.05	.37	.65	1.00		
11. Electrical	.61	.32	.23	.16	.20	.27	.26	.27	.39	.44	1.00	
12. Agriculture	.17	.25	.21	.22	.12	.17	.16	.41	.51	.45	.16	1.00

Results

Goodness of Fit of the Planes

The goodness of fit of a planar surface to the points representing the scales of an inventory was measured by the percentage of the trace given by the first two dimensions. Table 2 gives the results for the fit of the plane for each of the inventories considered. The percentage of the trace may be interpreted as the proportion of variance of the scale points accounted for by the two dimensions.

The planar configuration accounted for over half (between 56% and 64%) of the variance in the scale points for four of the inventories while the SVIB Basic Scales gave the poorest fit. Since the Basic Scales were constructed to be as nearly independent as possible, this poorer planar fit is not surprising. Two dimensions do not offer a complete representation of the internal structure of any of the inventories. However, the percentages near 50% and higher are substantial for instruments having many factors and, supposedly, great complexity.

TABLE 2

Goodness of Fit of the Planes

No. of scales	*Instrument*	*Percentage trace accounted for by the plane*
6	Holland's VPI Scales	63.7%
50	SVIB Occupational Scales	56.4%
22	SVIB Basic Scales	37.8%
23	Kuder OIS Core Scales	60.7%
9	MVII Homogeneous Keys	58.2%
12	ACT VIP Scales	46.9%

The Planar Configurations

The scale points were projected onto the best-fitting planar surface for each of the inventories. Since the location of the principal component axes is of no special interest in this configural analysis, the planar configurations have been oriented in the same general way for each inventory to simplify visual comparisons.

Holland's VPI. Figure 3 gives the configuration of Holland's six VPI scales as reported in Cole, et al. (in press). The circular configuration is apparent as is the conformance to the schematic description in Figure 1.

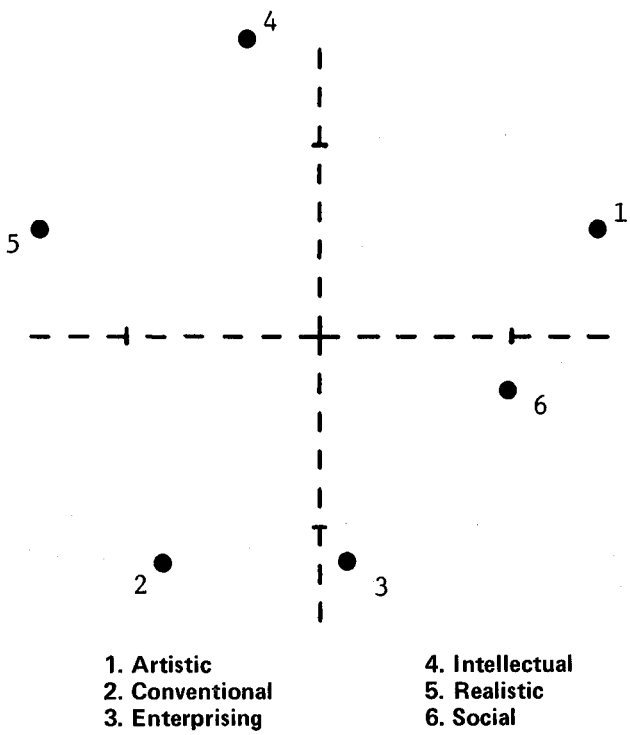
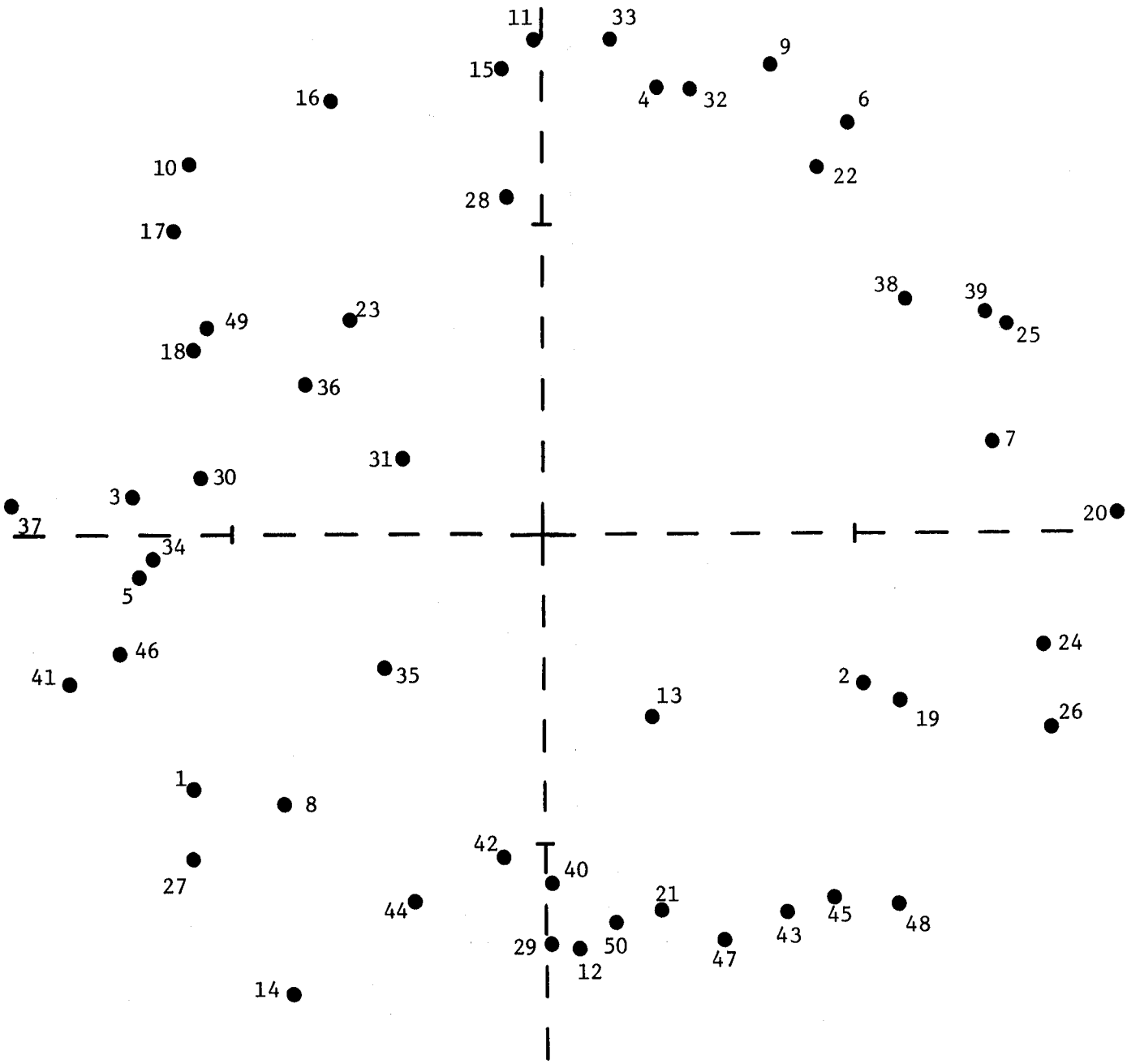


Figure 3. Spatial configuration of the six VPI scales.

SVIB Occupational Scales. The SVIB Occupational Scale configuration is given in Figure 4. This configuration invites comparison not only with Holland's categories but also with the spatial configuration of occupations derived on the basis of VPI means for occupational groups and reported in Cole et al. (in press). The locations of corresponding occupational scales (of the SVIB) and occupational groups (based on the VPI) are in general comparable. For example, the Farmer (17), Forest Service Man (18), and Engineer (16) scales on the SVIB are located close to each other in Figure 3 as are the corresponding groups Farming, Forestry, and Engineering (Civil, Chemical, and Electrical) in the Cole configuration. Other similar groupings are Biologist (9), Chemist (11), and Physicist (33); Musician (25), Artist (6), Author-Journalist (7); and Accountant (1) and various business occupations. In addition to the similar clusters of occupations, the configural relationship of the clusters to other clusters generally corresponds for the SVIB configuration, the Cole configuration, and the Holland system.

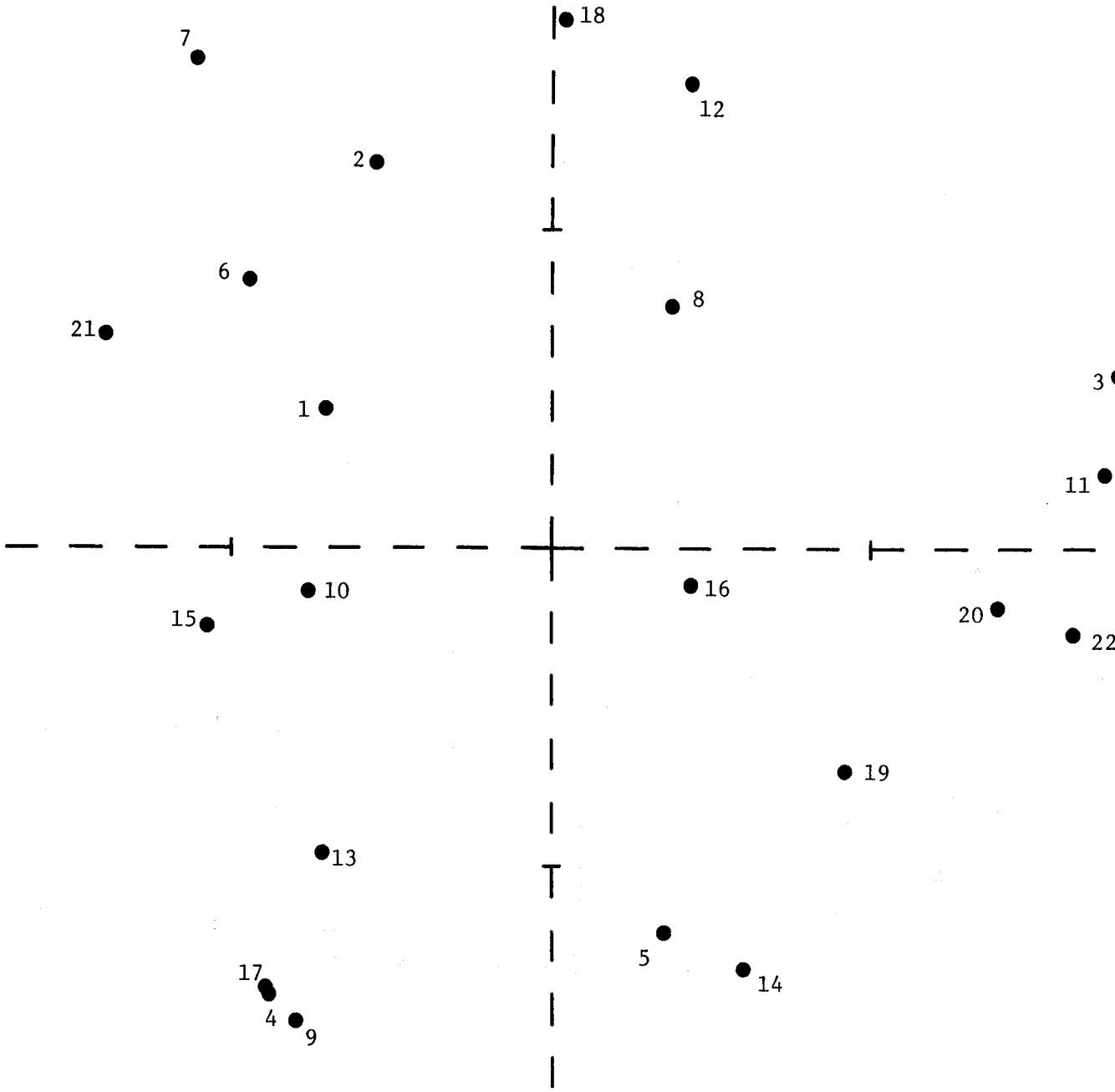
The SVIB Basic Scales. The configuration of the SVIB Basic Scales is given in Figure 5. As noted, the planar structure is less dominant in the Basic Scales. Even so, the planar configuration corresponded in a general way to other configurations discussed. Agriculture (2), Mechanical (7), and Technical Supervision (21) were closely related as expected, as were Science (18), Nature (12), Medical Service (8); Art (3), Music (11), Writing (22); and Religion (16) and Social Service (19). These groups were also related to each other in the Holland circular ordering.

The Kuder OIS. Figure 6 gives the planar configuration of the Kuder OIS scales. Again, in a general way, the scale locations gave a similar circular configuration from Electrical Engineer (9), Chemist (7), Clinical Psychologist (8), Lawyer (13), to Banker (3). However, several scales fell near the center of the configuration. Cole et al. (in press) interpreted locations near the center of their configuration as representing a mix of divergent interests or lack of interests. In that study Physician and Architect both represented such a mix. Physician was primarily a combination of Intellectual and Social interests and Architect combined Artistic and Realistic interests. Thus the location of these two scales in Figure 5 (scales 18 and 2) near the center of the configuration may represent the same type of phenomena. Accountant (1) and Business and Marketing majors (5), also located near the center, were both distinctly different in location from other similar-named groups. The reasons for these differences are not clear.



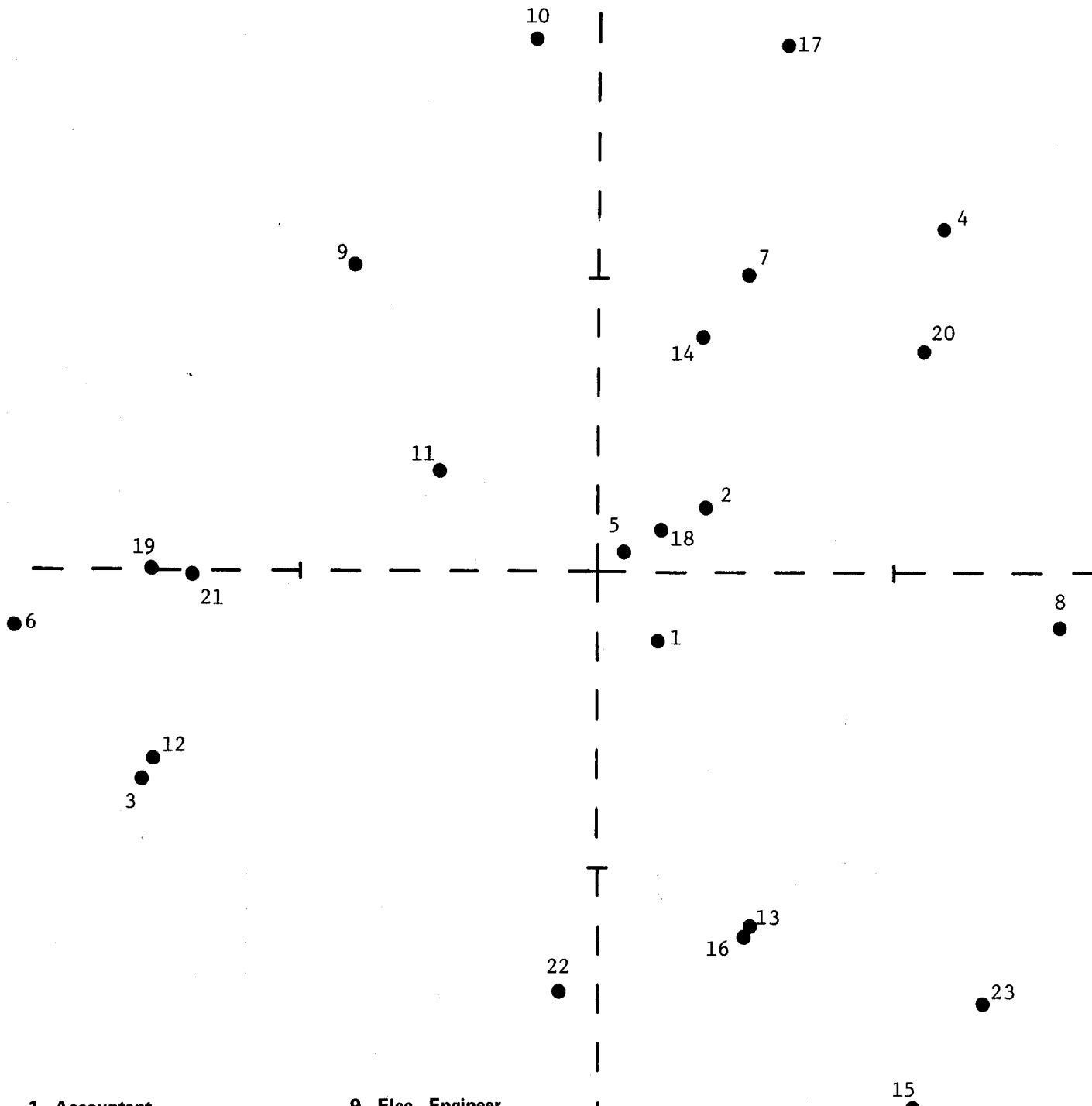
1. Accountant
2. Advertising
3. Air Force Off.
4. Architect
5. Army Officer
6. Artist
7. Author-Journ.
8. Banker
9. Biologist
10. Carpenter
11. Chemist
12. Com. Rec. Adm.
13. CPA Owner
14. Credit Mgr.
15. Dentist
16. Engineer
17. Farmer
18. Forest Service
19. Lawyer
20. Librarian
21. Life Ins. Sales
22. Mathematician
23. Math-Sci. Teach.
24. Minister
25. Musician
26. Music Teacher
27. Office Worker
28. Osteopath
29. Personnel Dir.
30. Pharmacist
31. Phys. Therapist
32. Physician
33. Physicist
34. Policeman
35. Pres. Mfg. Co.
36. Printer
37. Production Mgr.
38. Psychiatrist
39. Psychologist
40. Public Adm.
41. Purchasing Agt.
42. Real Estate
43. Rehab. Counselor
44. Sales Mgr.
45. School Supt.
46. Senior CPA
47. Soc. Sci. Teacher
48. Social Worker
49. Veterinarian
50. YMCA Sec.

Figure 4. Spatial configuration of 50 SVIB Occupational Scales.



1. Adventure
2. Agriculture
3. Art
4. Bus. Mgmt.
5. Law/Politics
6. Mathematics
7. Mechanical
8. Medical Serv.
9. Merchandising
10. Military
11. Music
12. Nature
13. Office
14. Public Spk.
15. Rec. Leader
16. Religion
17. Sales
18. Science
19. Soc. Serv.
20. Teaching
21. Tech. Super.
22. Writing

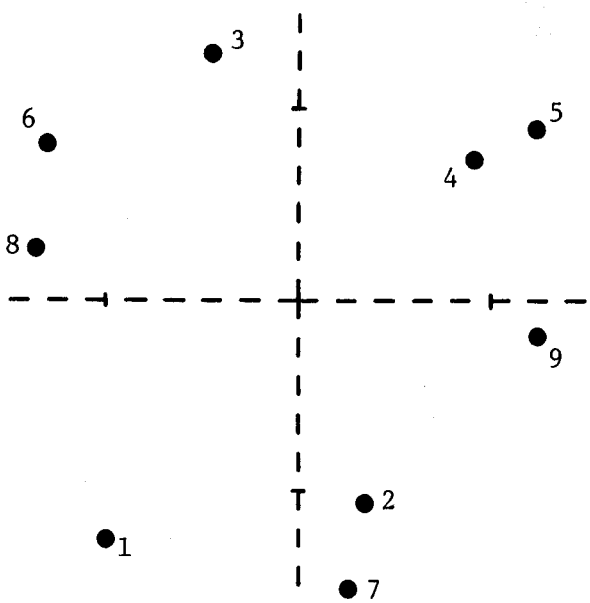
Figure 5. Spatial configuration of the SVIB Basic Scales.



1. Accountant
2. Architect
3. Banker
4. Bio. Sci. Maj.
5. Bus. & Mkt. Maj.
6. Carpenter
7. Chemist
8. Clin. Psychol.
9. Elec. Engineer
10. Elec. Eng. Maj.
11. Eng., Heat/Air
12. Farmer
13. Lawyer
14. Mathematician
15. Minister
16. Personnel Mgr.
17. Phys. Sci. Maj.
18. Physician
19. Policeman
20. Medical Maj.
21. Printer
22. School Supt.
23. Soc. Caseworker

Figure 6. Spatial configuration of the Kuder OIS Core Scales.

The MVII. The planar configuration of the MVII, given in Figure 7, again shows a familiar relationship among the scales. In the MVII, which is oriented to technical occupations, some parts of the circle are expanded and others are left out entirely. Although the Carpentry (1), Outdoor Service (8), Mechanical (6), and Electronics (3) scales all can be categorized as Realistic, they spread over almost half the circle due to their relative emphasis in the instrument. Even so, three of those scales maintain the same relations to each other as reported by Cole et al. (in press) for Construction, Mechanical Engineering, and Electrical Engineering. (There was no corresponding occupational group for the Outdoor Service scale.) Similarly, Sales-Office (9), "Clean Hands" (2), and Office Work (7) define the Enterprising-Conventional side of the circle. Health Service (5) and Food Service (4) fall on the Intellectual-Artistic-Social side of the circle where expected according to the configuration of Cole et al. and the classification of Holland et al.

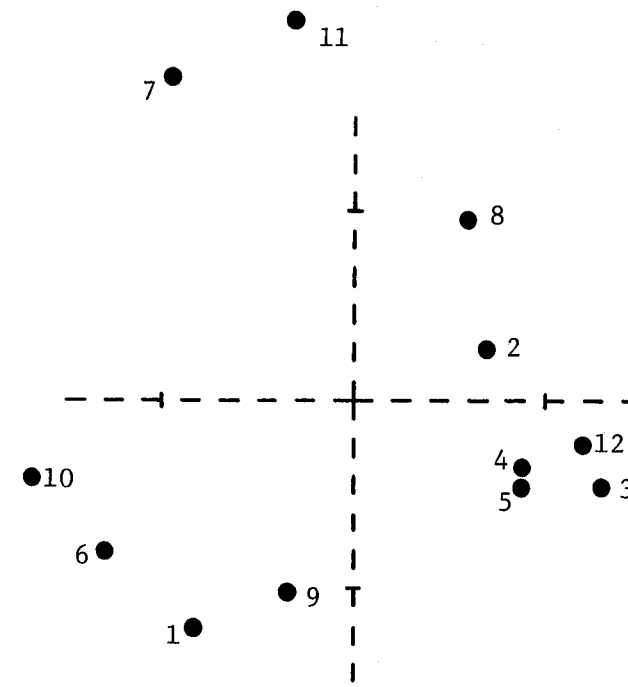


1. Carpentry
2. "Clean Hands"
3. Electronics
4. Food Service
5. Health Service
6. Mechanical
7. Office Work
8. Outdoor Service
9. Sales-Office

Figure 7. Spatial configuration of the nine MVII homogeneous keys.

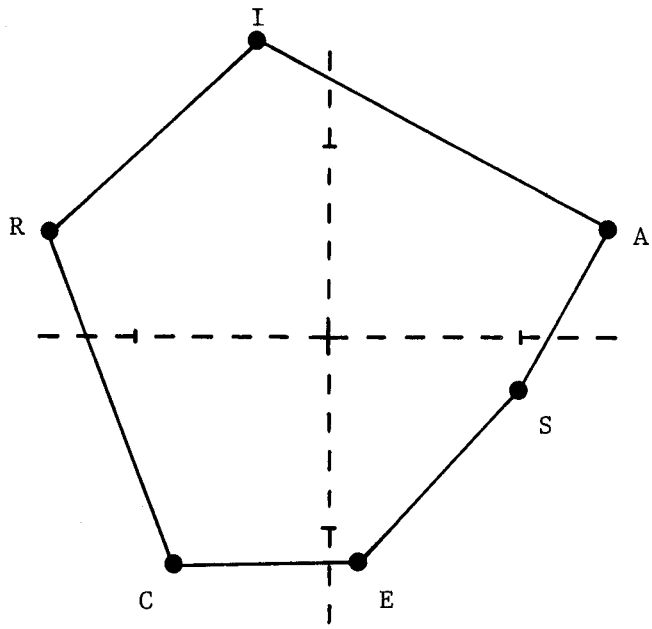
The VIP. The Vocational Interest Profile is a new instrument which offers a unique element in the consideration of the configuration of vocational interests. While the other instruments were constructed with no apparent use of the configuration discussed here, the construction of the VIP was an attempt to duplicate the Holland circular configuration with scales aimed at a different population and using different types of items (The American College Testing Program, 1970). In this respect, the existence of the circular configuration of VIP scales would provide evidence of its construct validity.

The ACT VIP was directed primarily toward students entering vocational-technical programs at 2-year colleges and technical institutes. Preference ratings for job-related activities were used on the VIP instead of occupational titles used on Holland's VPI. In addition, the six category system

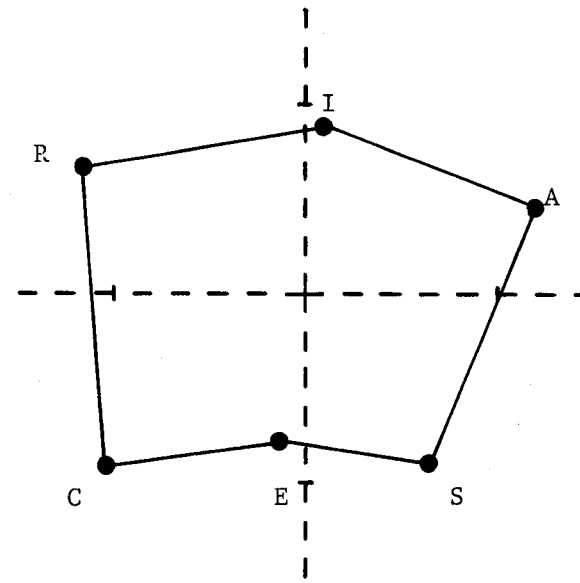


1. Agriculture
2. Artistic
3. Bus. Contact
4. Bus. Detail
5. Bus. Mgmt.
6. Carpentry
7. Electrical
8. Health
9. Household
10. Mechanical
11. Scientific
12. Social Serv.

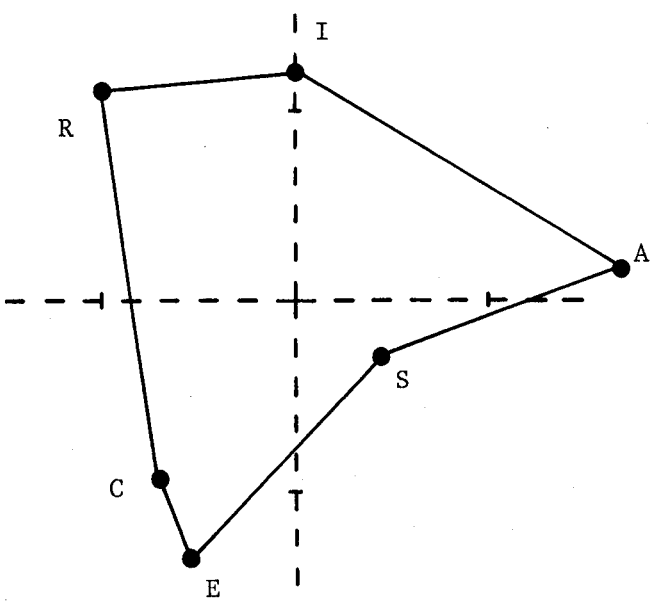
Figure 8. Spatial configuration of the 12 ACT VIP scales.



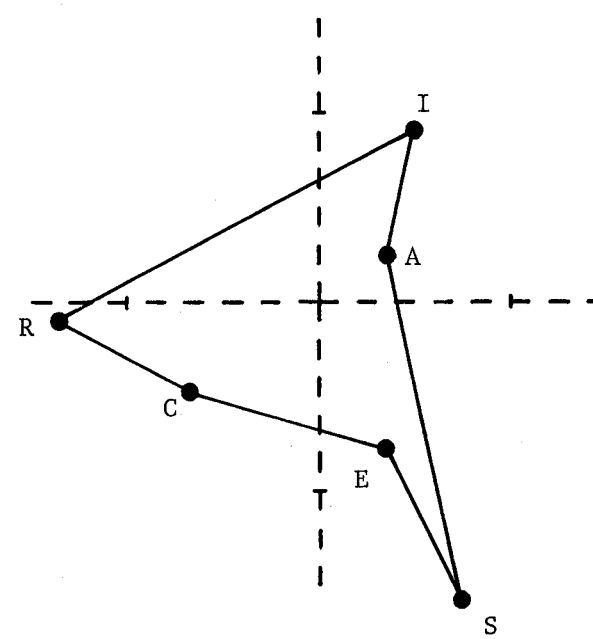
Holland's VPI



SVIB Occupational Scales



SVIB Basic Scales



Kuder OIS

Figure 9. Comparison of the spatial configuration of the SVIB and the Kuder OIS with Holland's VPI using scales categorized by Holland's classification as follows:

SVIB Occupational Scales: R-(10, 17, 18, 34); I-(9, 11, 15, 16, 22, 23, 28, 30, 32, 33, 38, 39, 49; A-(2, 4, 6, 7, 25); S-(12, 20, 24, 29, 31, 43, 45, 47, 48, 50); E-(19, 21, 37, 42, 44); C-(1, 8, 14, 27, 46)
SVIB Basic Scales: R-(2, 7, 21); I-(6, 8, 12, 18); A-(3, 11, 22); S-(15, 16, 19, 20); E-(4, 5, 9, 17); C-(13)
Kuder OIS Scales: R-(6, 11, 12, 19); I-(4, 7, 8, 9, 10, 14, 17, 18, 20); S-(15, 22, 23); A-(2); E-(5, 13, 16); C-(1, 3)

was expanded to twelve scales in an attempt to give broader coverage of the areas of special interest to vocational-technical students. The Realistic area was expanded to include four scales: Mechanical, Electrical, Carpentry, and Agriculture. The Conventional-Enterprising area was covered by three scales: Business Detail, Business Management, and Business Contact. Health and Household scales were also added.

The configuration of the VIP scales is presented in Figure 8. As with the MVII, the VIP emphasizes technical interests and the Electrical (7), Mechanical (10), Carpentry (6) ordering is found on the Realistic half of the VIP circle. The Health scale (8), falling between Scientific (11) and Artistic (2), and the Social Service (12) and Business scales (3, 4, 5) complete the familiar circular arrangement. However, the Social Service and Business scales fall very close to each other perhaps because of a lack of diversity of business programs pursued by vocational-technical students in the sample. In general, the ACT VIP corresponded to the configurations found in other inventories as well as to Holland's circular structure.

Comparison of Configurations

Only the SVIB and Kuder OIS have enough scales corresponding to occupations classified by Holland et al. (1970) to group the scales into the six Holland categories. Figure 9 gives the mean planar location for each category: R-Realistic, I-Intellectual, A-Artistic, S-Social, E-Enterprising, and C-Conventional. The mean locations are connected by lines in the order under investigation. If lines were drawn from the center of the configuration to each mean location, in each case the ordering of these lines would duplicate the -R-I-A-S-E-C- ordering. Thus the results in Figure 9 confirm the presence of the circular ordering already reported in connection with the individual scales.

Discussion

The primary purpose of this study was to examine the degree to which Holland's circular configuration of interests is common to various inventories. The results of the analysis of spatial configuration provide answers to two basic questions. The first question is: To what extent can the relationships among the scales be described in a plane (in two dimensions)? The answer, provided by the goodness of fit of the planes, is that the interrelations among the scales can be described to a large and important degree by two dimensions. The second question is: To what extent are the particular planar configurations of scales common from one instrument to another? Investigation of the configurations demonstrates that Holland's (and Roe's) configuration is, to a large degree, common to all the instruments investigated. This second result would have been an important finding even if present only on less dominant dimensions. That the circular configuration always appeared on the first two dimensions of variation among the scale points and that these two dimensions accounted for a large part of variation provide even stronger evidence for the practical importance of the circular ordering of interests.

Relation of Previous Research

A related purpose of the study was to use the results about the configuration of the scales to help reconcile the conflicting results of previous research. The demonstration of a common, underlying, circular ordering of vocational interest scales for several instruments provides a new basis for comparison of different inventories which may make the results of previous studies more understandable.

The previous studies may be divided into two groups: those in which pairs of similar scales from two or more inventories were correlated and those in which the entire pattern of scores for an individual was considered. Each group of studies reported opposite conclusions. In the first group of studies low correlations on same-named or similar-named scales were reported and it was concluded that the

inventories measured very different things. A general correspondence between patterns of scores of different inventories was reported in the second group of studies indicating that the inventories were very similar in many ways.

A new look at the results of the first group of studies on the basis of the common configuration of interests provides considerable reconciliation of the conflicting conclusions. Two of those studies (King et al., 1963; O'Shea & Harrington, in press) gave information useful to such a reconsideration. Table 3 of King et al. (pp. 398-399) presented a list of SVIB scales with which a particular Kuder, Form D, scale correlated more highly than it did with a similarly-named SVIB scale (and vice versa). For example, the Kuder-D Physician scale correlated more highly with the SVIB Psychologist scale than it did with the SVIB Physician. The SVIB Physician scale correlated more highly with the Kuder-D Meteorologist, Pediatrician, High School Science Teacher, and Chemist scales than with the Kuder-D Physician scale. If each scale in Table 3 of King et al. is categorized into one of the Holland et al. (1970) categories, then in almost every case the listed scales conform to the same Holland category or an adjacent one. Similar results are found in the few examples given by O'Shea and Harrington (in press). Thus, by reinterpreting results on the basis of the circular configuration, the overall correspondence of the SVIB and Kuder scales is clear even though the correspondence of particular individual scales may be small.

In the second group of studies (Triggs, 1943; Triggs, 1944; and Wittenborn et al., 1943), the use of patterns of profiles or patterns of correlations as the bases for comparison meant that many aspects of the circular configuration were being implicitly used. Thus the results provided evidence for similarities between the inventories. Similarly the factor analytic studies, using correlational configurations, usually demonstrated similarities.

Although the comparisons of the present study were indirect in the sense that correlation matrices for different groups were used, reconsideration of the results of studies making direct comparisons provides confirmation of the direct relation of one instrument's circular configuration to that of another. That is, those scales of interest inventory A that fall into one of Holland's categories, as a whole, tend to correlate most highly with the scales of inventory B that fall into the same category. Furthermore, the scales in an adjacent category (in the circular ordering) tend to provide the next highest correlations.

Implications for Counseling

Since much research on comparing interest inventories has been motivated by counselors who were frustrated and confused by contradictory results, it is appropriate to consider the relevance of these findings to counseling practice. The results of this study have implications for the interpretation of scores from a single inventory as well as for comparison of scores from more than one inventory. By using the circular structure, a counselor may determine patterns of interest by observing scores on groups of scales rather than considering scales individually. For example, a person's high scores on scales such as Farmer, Carpenter, Forester, and Engineer together indicate Realistic interests which may be applicable to many other occupations. Also the relationships of groups of scales to other groups is made more meaningful by the circular configuration. When an individual demonstrates Intellectual interests secondary to Realistic ones, the counseling implications are different from the case where the secondary interests are Conventional. When divergent interests, such as Realistic and Artistic, are mixed yet another type of interpretation is indicated.

The results of this study suggest that correspondence of the scores on two or more interest inventories can best be determined by considering patterns of scales rather than individual scales. If a person scores high on several Intellectual scales on one instrument, he will likely score high on Intellectual scales on another. However, he may be highest on Chemist on one instrument and on Physicist on the other.

The discrepancies that occur in the comparison of scores on similarly-named scales of different instruments deserve further consideration. This study suggests some reasons for the discrepancies which may be helpful to counselors. Most occupational titles, such as engineer, physician, lawyer, and salesman, do not represent narrowly-defined occupations. Instead many different types of activity

occur under the same occupational title. The activities of an engineer may range from building bridges to teaching electrical engineering. While the activities have common aspects and reflect many common interests, in the Holland scheme the bridge-builder represents almost typical Realistic interests while the electrical engineering professor combines Intellectual interests with the Realistic ones. Similarly, the physician may be a pediatrician or a surgeon. Both share the Intellectual interests common to all physicians but as well the pediatrician likely reflects strong Social interests as well as Intellectual interests and the surgeon Realistic interests. If we consider the circular structure of interests we can better understand why a scale based on one physician group (composed of pediatricians) would correlate more highly with a teacher scale, say, than with another physician scale (based on surgeons). Thus, the circular configuration of interests provides a possible explanation for differences in performance on scales having the same name but possibly based on groups reflecting somewhat different vocational interests.

Summary

This study examined the structure of vocational interests as measured by the SVIB, the Kuder OIS, Holland's VPI, the MVII, and the ACT VIP. The results of an analysis of the internal configural structure of the scales in each instrument suggested that a planar circular configuration of interests, as proposed by Roe, and found by Holland on the VPI, dominates the structure of interests. This common interest structure provides a basis for comparison of results from the different inventories, makes more understandable earlier research on such comparisons, and provides a valuable framework for counselor interpretation.

References

The American College Testing Program, *Handbook for the ACT Career Planning Profile.* Iowa City, Ia.: Author, 1970.

Campbell, D. P. *Manual for the Strong Vocational Interest Blank for men and women.* Stanford, Conn.: Stanford University Press, 1966.

Campbell, D. P., Borgen, F. H., Eastes, S. H., Johansson, C. B., & Peterson, R. A. *A set of basic interest scales for the Strong Vocational Interest Blank for men.* Minneapolis: University of Minnesota, 1967.

Clark, K. E. *The vocational interests of nonprofessional men.* Minneapolis: University of Minnesota Press, 1961.

Cole, N. S., & Cole, J. W. L. An analysis of spatial configuration and its application to research in higher education. *ACT Research Report No. 35.* Iowa City, Ia.: The American College Testing Program, 1970.

Cole, N. S., Whitney, D. R., & Holland, J. L. A spatial configuration of occupations. *Journal of Vocational Behavior,* in press.

Cottle, W. E. A factorial study of the Multiphasic, Strong, Kuder, and Bell inventories using a population of adult males. *Psychometrika,* 1950, **15**, 25-47.

Darley, J. G., & Hagenah, T. *Vocational interest measurement.* Minneapolis: University of Minnesota Press, 1955.

Guilford, J. P., Christensen, P. R., Bond, N. A., & Sutton, M. A. A factor analysis study of human interests. *Psychological Monographs,* 1954, **68**, 4, No. 375.

Harrington, T. F. A factor analysis of 27 similar named scales of the SVIB and the Kuder OIS, form DD. Paper read at the American Psychological Association Annual Convention, Miami Beach, 1970.

Holland, J. L. A psychological classification scheme for vocations and major fields. *Journal of Counseling Psychology,* 1966, **13**, 278-288. (a)

Holland, J. L. *The psychology of vocational choice.* Waltham, Mass.: Blaisdell, 1966. (b)

Holland, J. L., Viernstein, M. C., Kuo, H., Karweit, N. L., & Blum, Z. D. A psychological classification of occupations. *Research Report No. 90.* Center for Social Organization of Schools, Johns Hopkins University, 1970.

Holland, J. L., Whitney, D. R., Cole, N. S., & Richards, J. M., Jr. An empirical occupational classification derived from a theory of personality and intended for practice and research. *ACT Research Report No. 29.* Iowa City, Ia.: The American College Testing Program, 1969.

Jones, K. J. Occupational preference and social orientation. *Personnel and Guidance Journal,* 1965, **43**, 574-579.

King, P., Norrell, G., & Powers, G. P. Relationships between twin scales on the SVIB and the Kuder. *Journal of Counseling Psychology,* 1963, **10**, 4, 395-401.

Kuder, F. G. *Kuder Occupational Interest Survey general manual.* Chicago: Science Research Associates, 1966.

Kuder, F. G. A note on the comparability of occupational scores from different interest inventories. *Measurement and Evaluation in Guidance,* 1969, **2**, 94-100.

O'Shea, A. J., & Harrington, T. F. Using the SVIB and Kuder, form DD, with the same clients. *Journal of Counseling Psychology,* in press.

Roe, A. *The psychology of occupations.* New York: John Wiley, 1956.

Roe, A., Hubbard, W. D., Hutchinson, T., & Bateman, T. Studies of occupational history. Part 1: Job changes and the classification of occupations. *Journal of Counseling Psychology,* 1966, **13**, 387-393.

Roe, A., & Klos, D. Occupational classification. *The Counseling Psychologist,* 1969, **1**, 84-89.

Rose, H. A., & Elton, C. F. Ask him or test him? *Vocational Guidance Quarterly,* 1970, **19**, 28-32.

Strong, E. K., Jr. *Vocational interests of men and women.* Stanford, Conn.: Stanford University Press, 1943.

Super, D. E. *The psychology of careers.* New York: Harper & Row, 1957.

Super, D. E., & Crites, J. O. *Appraising vocational fitness.* New York: Harper & Row, 1962.

Thurstone, L. L. A multiple factor study of vocational interests. *Personnel Journal,* 1931, **10**,198-205.

Triggs, F. O. A study of the relation of Kuder Preference Record scores to various other measures. *Educational and Pyschological Measurement,* 1943, **3**, 341-354.

Triggs, F. O. A further comparison of interest measurement by the Kuder Preference Record and the Strong Vocational Interest Blank for men. *Journal of Educational Research,* 1944, **37**, 538-544.

Wall, H. W., Osipow, S. H., & Ashby, J. D. SVIB scores, occupational choices, and Holland's personality types. *Vocational Guidance Quarterly,* 1967, **15**, 201-205.

Wilson, R. N., & Kaiser, H. E. A comparison of similar scales on the SVIB and Kuder, form DD. *Journal of Counseling Psychology,* 1968, **15**, 468-470.

Wittenborn, J. R., Triggs, F. O., & Feder, D. D. A comparison of interest measurement by the Kuder Preference Record and the Strong Vocational Interest Blanks for men and women. *Educational and Psychological Measurement,* 1943, **3**, 239-257.

Zytowski, D. G. Relationships of equivalent scales on three interest inventories. *Personnel and Guidance Journal,* 1968, **47**, 44-49.

ACT Research Reports

This report is the fortieth in a series published by the Research and Development Division of The American College Testing Program. The first 26 research reports have been deposited with the American Documentation Institute, ADI Auxiliary Publications Project, Photoduplication Service, Library of Congress, Washington, D. C. 20540. Photocopies and 35 mm. microfilms are available at cost from ADI; order by ADI Document number. Advance payment is required. Make checks or money orders payable to: Chief, Photoduplication Service, Library of Congress. Beginning with Research Report No. 27, the reports have been deposited with the National Auxiliary Publications Service of the American Society for Information Science (NAPS), c/o CCM Information Sciences, Inc., 22 West 34th Street, New York, New York 10001. Photocopies and 35 mm. microfilms are available at cost from NAPS. Order by NAPS Document number. Advance payment is required. Printed copies may be obtained, if available, from the Research and Development Division, The American College Testing Program. The reports are indexed by the *Current Contents, Education* Institute for Scientific Information, 325 Chestnut Street, Philadelphia, Pennsylvania 19106.

The reports since January 1969 in this series are listed below. A listing of previous reports is included in each of several items published by The American College Testing Program: *Your College Freshmen* (pp. 158-160), *Your College-Bound Students* (pp. 107-109). A complete list of the reports can be obtained by writing to the Research and Development Division, The American College Testing Program, P. O. Box 168, Iowa City, Iowa 52240.

No. 28 *A Description of Graduates of Two-Year Colleges,* by L. L. Baird, J. M. Richards, Jr., & L. R. Shevel (NAPS No. 11306; photo, $3.00; microfilm, $1.00)

No. 29 *An Empirical Occupational Classification Derived from a Theory of Personality and Intended for Practice and Research,* by J. L. Holland, D. R. Whitney, N. S. Cole, & J. M. Richards, Jr. (NAPS No. 00505; photo, $3.00; microfilm, $1.00)

No. 30 *Differential Validity in the ACT Tests,* by N. S. Cole (NAPS No. 00722; photo, $3.00; microfilm, $1.00)

No. 31 *Who Is Talented? An Analysis of Achievement,* by C. F. Elton, & L. R. Shevel (NAPS No. 00723; photo, $3.00; microfilm, $1.00)

No. 32 *Patterns of Educational Aspiration,* by L. L. Baird (NAPS No. 00920; photo, $3.00; microfilm, $1.00)

No. 33 *Can Financial Need Analysis Be Simplified?* by M. D. Orwig, & P. K. Jones (NAPS No. 01210; photo, $5.00; microfilm, $3.00)

No. 34 *Research Strategies in Studying College Impact,* by K. A. Feldman (NAPS No. 01211; photo, $5.00; microfilm, $2.00)

No. 35 *An Analysis of Spatial Configuration and Its Application to Research in Higher Education,* by N. S. Cole, & J. W. L. Cole (NAPS No. 01212; photo, $5.00; microfilm, $2.00)

No. 36 *Influence of Financial Need on the Vocational Development of College Students,* by A. R. Vander Well (NAPS No. not available at this time.)

No. 37 *Practices and Outcomes of Vocational-Technical Education in Technical and Community Colleges,* by T. G. Gartland, & J. F. Carmody (NAPS No. not available at this time.)

No. 38 *Bayesian Considerations in Educational Information Systems,* by M. R. Novick (NAPS No. not available at this time.)

No. 39 *Interactive Effects of Achievement Orientation and Teaching Style on Academic Achievement,* by G. Domino (NAPS No. not available at this time.)