Measuring Treatment

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These are working notes with updates since 1994

During the past 50 (now 70) years there has been a steady increase in the number of schools or styles of psychotherapy. In 1984 Karasu, T., et. al. reported 418 systems. At the same time there has been a moderate increase in the elements of psychotherapy. In recent years there has been a trend to merge these systems with common factors. It is the purpose of this section to show how research designs empirically support the process of sorting out the characteristics of this system. At the same time the designs should support the further elaboration and search for the elements of psychotherapy. Frank (1971) proposed that there were common factors in addition to specific factors in psychotherapy that might be related to outcome (see also Parloff, 1986).

In an attempt to determine whether the treatment has been implemented three approaches have been used: (1) developing therapy manuals, (2) labeling or coding psychotherapy as it unfolds, and (3) rating the process by the use of scales. In 1979 Russell and Stiles reviewed the coding systems and attempted to devise a taxonomy and resulting coding system that would include all elements of the existing coding systems. They generated a logical or rational taxonomy. Although their task was different they did attempt to develop taxonomy of the psychotherapeutic elements. Many of the taxonomies that have been developed have been developed for specific style of school of therapy. We are proposing methods to perform empirical taxonomies, or a combination of judgments and empirical

These methods can be used in two ways: (1) develop taxonomy of the styles of therapy, or (2) develop taxonomy of the elements of therapy. Probably both of these would be useful. If both were developed they would complement each other so that identifying a particular style or school of therapy would be a matter of selecting a set of elements of therapy. The techniques are similar for the two areas. Finally, modes other than psychotherapy are presented.

For example, of the 400 different schools what is the overlap and how would one determine the overlap between the schools? It would be useful to identify the overlap or common factors.

What are the interactions that would place a therapeutic interaction within a specific school and separate the interaction from other schools (unique factors)? What therapeutic interactions overlap with other schools (common factors). There are two major tasks to be accomplished if one is to make such discriminations. The first task is to be able to identify and measure (either by counting or by assessing some degree) of the client/therapist interactions. If that can be accomplished the second task is to indicate the taxonomy of performances that each of the styles need. That is, a profile of the style in terms of the performances is needed. The most fruitful method of identifying these performances has been to code the utterances of the psychotherapy process.

There are at least four or five statistical methods that might be used for this process: (1) cluster analysis, (2) discriminant function analysis, (3) multidimensional scaling, (4) factor analysis and structural equation modeling. Four basic change processes are discussed: (1) psychotherapy, (2) group therapy, (3) ancillary therapies, and (4) milieu therapy.

[Trochim](http://www.socialresearchmethods.net/kb/conmap.php) used a combination of cluster analysis and multidimensional scaling to develop maps of attitudes of toward organizations. It is proposed here that the same methods could be used to build taxonomy of the elements of psychotherapy.

In this example participants were asked to identify processes or characteristics of psychotherapy that they thought were curative. The following is that list (along with an abbreviated name):

Develop insight INSIGHT

desensitize DESENS

reflect REFLECT

introspection INTROSP

develop trust DEVTRUST

reframe REFRAME

acceptance ACCEPT

interpret INTERP

being consistent CONSIT

being nurturing BEINGNUR

address anxiety ADDRESA

correct faulty cognition CORRECT

try new behaviors TRYBEHAV

challenge CHALLENG

set limits SETLIMIT

help cope HLPCOPE

define expectations DEFEXP

demythetize DEMYTH

counter transference CONTRAN

be a good mom BGDMOM

identify conflicts IDCONFL

These statements were put on slips of paper and the participants were asked to place them into stacks. They were in structured that there must be fewer stacks than slips of paper and there must be more than one stack. Once these stacks were created the information was transferred to a coding sheet in the following manner (the coding sheet is on the following page). Assume that ACCEPT, DEVTRUST, BEINGNUR, and BGDMOM were placed in the same stack. Marks would be place on the coding sheet at the intersection of all of these pairs. Note that there is a mark where DEVTRUST intersects with DEVTRUST, ACCEPT, BEINGNUR, AND BGDMOM. Again there is a mark where ACCEPT intersects with DEVTRUST, ACCEPT, BEINGNUR, and BGDMOM. The same procedure is performed for BEINGNUR and BGDMOM. The coding sheet has the marks filled in for this one stack (DEVTRUST, ACCEPT, BEINGNUR and BGDMOM). The same sheet would be used to complete the remaining stacks.

Twenty-four participants completed the task of sorting the items and completing the tally sheets. The cells of a summary sheet were then completed by counting the number of participants who had a check (or one (1)) in each in the corresponding cell. That data is presented in Frame CURET.SAV the labels across the top are not part of the file. The tallies are the number students who raised their hand when the cells were identified. The tallies are actually an estimate of the number of hands raised when they were more than about 5. The cells now give an indication of the similarity of the items or labels for the cell. For example, the cell in Figure \_\_ identified by REFRAME and REFLECT is 12 indicating that 12 of the respondents put those two items in the same stack. That indicates a moderate to high similarity of the items. The cell labeled CHALLENG and DEVTRUST has a 0 indicating that none of the respondents put those two items in the same stack and therefore judge them to be dissimilar. Consequently, a high score indicates similarity and a low score indicates dissimilarity. The upper right triangle and lower left of the triangle are identical. The estimates were in fact not identical (because of errors in estimation) but the computer program requires and the lower left was used to duplicate the upper right.

 Figure 1. A coding sheet for recording.....

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NAME | INSIGHT | DESENS | REFLECT | INTROSP | DEVTRUST | REFRAM | ACCEPT | INTERP | CONSIT | BEINGNUR | ADDRESA | CORRECT | TRYBEHAV | CHALLENG | SETLIMIT | HLPCOPE | DEFEXP | DEMYTH | CONTRAN | BGDMOM | IDCONFL |
| INSIGHT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| DESENS |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| REFLECT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| INTROSP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| DEVTRUST |  |  |  |  | 1 |  | 1 |  |  | 1 |  |  |  |  |  |  |  |  |  | 1 |  |
| REFRAM |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| ACCEPT |  |  |  |  | 1 |  | 1 |  |  | 1 |  |  |  |  |  |  |  |  |  | 1 |  |
| INTERP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CONSIT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BEINGNUR |  |  |  |  | 1 |  | 1 |  |  | 1 |  |  |  |  |  |  |  |  |  | 1 |  |
| ADDRESA |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CORRECT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| TRYBEHAV |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CHALLENG |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| SETLIMIT |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| HLPCOPE |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| DEFEXP |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| DEMYTH |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| CONTRAN |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| BGDMOM |  |  |  |  | 1 |  | 1 |  |  | 1 |  |  |  |  |  |  |  |  |  | 1 |  |
| IDCONFL |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |

Table 2. Representation of data base files CURET.Sav.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| NAME | INSIGHT | DESENS | REFLECT | INTROSP | DEVTRUST | REFRAM | ACCEPT | INTERP | CONSIT | BEINGNUR | ADDRESA | CORRECT | TRYBEHAV | CHALLENG | SETLIMIT | HLPCOPE | DEFEXP | DEMYTH | CONTRAN | BGDMOM | IDCONFL |
| INSIGHT | 24 | 6 | 6 | 10 | 2 | 6 | 1 | 8 | 0 | 1 | 5 | 1 | 4 | 2 | 3 | 7 | 2 | 6 | 5 | 1 | 7 |
| DESENS | 6 | 24 | 4 | 4 | 0 | 5 | 0 | 2 | 1 | 0 | 12 | 5 | 6 | 6 | 4 | 6 | 3 | 6 | 4 | 1 | 5 |
| REFLECT | 6 | 4 | 24 | 6 | 3 | 12 | 5 | 8 | 4 | 4 | 4 | 3 | 2 | 4 | 2 | 3 | 3 | 8 | 3 | 2 | 6 |
| INTROSP | 10 | 4 | 6 | 24 | 3 | 5 | 3 | 12 | 1 | 2 | 4 | 2 | 4 | 3 | 2 | 2 | 0 | 7 | 5 | 2 | 4 |
| DEVTRUST | 2 | 0 | 3 | 3 | 24 | 2 | 18 | 1 | 12 | 14 | 1 | 2 | 1 | 0 | 4 | 3 | 3 | 3 | 1 | 12 | 2 |
| REFRAM | 6 | 5 | 12 | 5 | 2 | 24 | 3 | 4 | 5 | 2 | 5 | 5 | 5 | 7 | 2 | 5 | 3 | 9 | 2 | 2 | 4 |
| ACCEPT | 1 | 0 | 5 | 3 | 18 | 3 | 24 | 1 | 12 | 15 | 0 | 3 | 1 | 1 | 4 | 1 | 3 | 1 | 0 | 13 | 0 |
| INTERP | 8 | 2 | 8 | 12 | 1 | 4 | 1 | 24 | 1 | 0 | 2 | 5 | 2 | 4 | 3 | 2 | 2 | 7 | 7 | 1 | 3 |
| CONSIT | 0 | 1 | 4 | 1 | 12 | 5 | 12 | 1 | 24 | 9 | 1 | 4 | 1 | 0 | 7 | 2 | 6 | 0 | 0 | 9 | 0 |
| BEINGNUR | 1 | 0 | 4 | 2 | 14 | 2 | 15 | 0 | 9 | 24 | 0 | 3 | 1 | 1 | 3 | 1 | 3 | 1 | 0 | 15 | 0 |
| ADDRESA | 5 | 12 | 4 | 4 | 1 | 5 | 0 | 2 | 1 | 0 | 24 | 6 | 7 | 5 | 5 | 5 | 3 | 6 | 5 | 0 | 7 |
| CORRECT | 1 | 5 | 3 | 2 | 2 | 5 | 3 | 5 | 4 | 3 | 6 | 24 | 4 | 6 | 4 | 7 | 4 | 6 | 6 | 4 | 2 |
| TRYBEHAV | 4 | 6 | 2 | 4 | 1 | 5 | 1 | 2 | 1 | 1 | 7 | 4 | 24 | 9 | 6 | 7 | 3 | 4 | 2 | 1 | 4 |
| CHALLENG | 2 | 6 | 4 | 3 | 0 | 7 | 1 | 4 | 0 | 1 | 5 | 6 | 9 | 24 | 3 | 8 | 4 | 8 | 7 | 0 | 4 |
| SETLIMIT | 3 | 4 | 2 | 2 | 4 | 2 | 4 | 3 | 7 | 3 | 5 | 4 | 6 | 3 | 24 | 2 | 8 | 5 | 1 | 3 | 4 |
| HLPCOPE | 7 | 6 | 3 | 2 | 3 | 5 | 1 | 2 | 2 | 1 | 5 | 7 | 7 | 8 | 2 | 24 | 3 | 4 | 2 | 2 | 7 |
| DEFEXP | 2 | 3 | 3 | 0 | 3 | 3 | 3 | 2 | 6 | 3 | 3 | 4 | 3 | 4 | 8 | 3 | 24 | 8 | 1 | 3 | 6 |
| DEMYTH | 6 | 6 | 8 | 7 | 3 | 9 | 1 | 7 | 0 | 1 | 6 | 6 | 4 | 8 | 5 | 4 | 8 | 24 | 4 | 1 | 9 |
| CONTRAN | 5 | 4 | 3 | 5 | 1 | 2 | 0 | 7 | 0 | 0 | 5 | 6 | 2 | 7 | 1 | 2 | 1 | 4 | 24 | 0 | 6 |
| BGDMOM | 1 | 1 | 2 | 2 | 12 | 2 | 13 | 1 | 9 | 15 | 0 | 4 | 1 | 0 | 3 | 2 | 3 | 1 | 0 | 24 | 1 |
| IDCONFL | 7 | 5 | 6 | 4 | 2 | 4 | 0 | 3 | 0 | 0 | 7 | 2 | 4 | 4 | 4 | 7 | 6 | 9 | 6 | 1 | 24 |

**Cluster Analysis**

The first method used to develop taxonomy is cluster analysis. It should be remembered that this process is a descriptive process and not hypothesis testing. The purpose is to describe the relative position of one element to another. The result of cluster analysis is a distance indicator of one element to another. Frame CURCLS1.SPS is a job stream for SPSSPC+, Frame CURET.sav contains the data.

|  |
| --- |
| File Name = curcls1.sps |
| get file = '\proeval\curet.sav'/keep=NAME INSIGHT DESENS REFLECT INTROSP DEVTRUST REFRAM ACCEPT INTERP CONSIT BEINGNUR ADDRESA CORRECT TRYBEHAV CHALLENG SETLIMIT HLPCOPE DEFEXP DEMYTH CONTRAN BGDMOM IDCONFL .cluster insight to idconfl /id=name /print=distance /print=schedule cluster(9) /plot=dendrogram hicicle.  |

 CURCLS1.LIS

Dendrogram using Average Linkage (Between Groups)

 Rescaled Distance Cluster Combine

 C A S E 0 5 10 15 20 25

 Label Seq +‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+

 DEVTRUST 5 ‑+‑‑‑+

 ACCEPT 7 ‑+ +‑‑‑‑‑+

 BEINGNUR 10 ‑‑‑+‑+ +‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+

 BGDMOM 20 ‑‑‑+ | |

 CONSIT 9 ‑‑‑‑‑‑‑‑‑‑‑+ |

 SETLIMIT 15 ‑‑‑‑‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+ |

 DEFEXP 17 ‑‑‑‑‑‑‑‑‑‑‑‑‑+ | |

 DESENS 2 ‑‑‑‑‑+‑‑‑‑‑‑‑‑‑‑‑‑‑+ | |

 ADDRESA 11 ‑‑‑‑‑+ +‑+ | |

 TRYBEHAV 13 ‑‑‑‑‑‑‑‑‑‑‑‑‑+‑+ | | +‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+

 CHALLENG 14 ‑‑‑‑‑‑‑‑‑‑‑‑‑+ +‑‑‑+ +‑‑‑+ |

 HLPCOPE 16 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+ | | |

 CORRECT 12 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+ | |

 REFLECT 3 ‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑‑‑+ +‑‑‑+

 REFRAME 6 ‑‑‑‑‑‑‑+ +‑‑‑+ |

 DEMYTH 18 ‑‑‑‑‑‑‑‑‑‑‑‑‑+‑‑‑‑‑+ | |

 IDCONFL 21 ‑‑‑‑‑‑‑‑‑‑‑‑‑+ +‑+

 INTROSP 4 ‑‑‑‑‑‑‑+‑‑‑‑‑+ |

 INTERP 8 ‑‑‑‑‑‑‑+ +‑‑‑‑‑‑‑+ |

 INSIGHT 1 ‑‑‑‑‑‑‑‑‑‑‑‑‑+ +‑+

 CONTRAN 19 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+

Frame CURCLS1.LIS contains part of the output from the CURCLS1.SPS computer run. The horizontal axis of the dendrogram represents distance between the variables listed on the vertical axis. Moving to the right indicates greater distance. A plus (+) indicates that two variables have joined to form a cluster. In the diagram DEVTRUST and ACCEPT were the first to join (when moving from left to right) are the most similar. The next pair to join are BEINGNUR and BGDMOM indicating they are next pair in close proximity. The next pair to join are DEFEXP and DESENS. The next joining is not a pair of variables but the joining of two clusters; the cluster formed by DEVTRUST and ACCEPT is joined with BEINGNUR and BGDMOM. The final joining (the further to the right) represents the joining of two clusters that are the most distant. One of the clusters is made up of DEVTRUST, ACCEPT, BEINGUUR, and BGDMOM and the cluster to join it is made up of all of the other variables. The method proposed for determining the number of clusters is to find the greatest horizontal distance where no variables or clusters join and draw a vertical line. All clusters that have formed up to that line are considered to be clusters. In the Figure that would be line A. That is, there are no joinings between about 15 and 25; there is no other distance that great when no variables or clusters join. Using those criteria there are two clusters in this solution since there are two clusters to the left of line A. This solution is not very satisfying theoretically. Many of the elements in cluster two seem different it does not help our taxonomy to combine them all in a single cluster. Like factor analysis there is a second method for determining the number of clusters and that is interpretability. Further, we are not testing hypotheses but building taxonomy. The next greatest distance when no joinings occur is at line B. That vertical line intersects 9 horizontal lines indicating that 9 clusters have been formed up to that point. The 9 clusters are presented along with the cluster names.

1. Intrapshychic

INSIGHT

INTROSP

INTERP

2. Anxiety

DESENS

ADDRESA

3. Give Feedback

REFLECT

REFRAME

4. Warmth

DEVTRUST

ACCEPT

CONSIT

BEINGNUR

BGDMOM

5. Correct

CORRECT

6. Directive

TRYBEHAV

CHALLENG

HLPCOPE

7. Set Limits

SETLIMIT

DEFEXP

8. ??

DEMYTH

IDCONFL

9. Countertransference

CONTRAN

This solution appears to give a better taxonomy than does the first solution. Cluster 1 INSIGHT, INTROSP, and INTERP would appear to similar type of therapist interventions; REFLECT and REFRAME are similar and so forth. There are two clusters that contain single items and they do not seem to belong to any of the clusters that exist.

Although there is some indication in the dendrogram of the distance between clusters it does not give a graphic picture. For example, in the 9 cluster solution the distance between clusters REFLECTS and REFRAME and the cluster SETLIMIT and DEFEXP is not readily apparent. Is that distance about the same or much greater than the distance between DESENS and ADDRESA and the cluster SETLIMIT and DEFEXP?

**Multidimensional Scaling**

The method of multidimensional scaling offers a more graphic picture of the distance between variables. The following job stream uses the same set of data as that used in the cluster analysis. The task requests a three dimension solution.

|  |
| --- |
| File Name = curcls3.sps |
| get file = '\proeval\curet.sav'/keep=NAME INSIGHT DESENS REFLECT INTROSP DEVTRUST REFRAM ACCEPT INTERP CONSIT BEINGNUR ADDRESA CORRECT TRYBEHAV CHALLENG SETLIMIT HLPCOPE DEFEXP DEMYTH CONTRAN BGDMOM IDCONFL .als var = insight to idconfl /level=ordinal(similar) /criteria=dimensions(3) /plot=all.  |

The weights for each item on the three dimensions are presented in Frame CURALS3.LST.

 CURALS3.LST

 Dimension 1 Dimension 2 Dimension 3

BEINGNUR ‑2.2475 INTROSP ‑1.5347 CORRECT ‑1.2737

ACCEPT ‑2.1976 INTERP ‑1.4272 CONTRAN ‑1.1266

BGDMOM ‑2.1645 REFLECT ‑1.1540 CHALLENG ‑0.9879

CONSIT ‑2.1478 CONTRAN ‑1.0630 REFRAME ‑0.8759

DEVTRUST ‑1.8399 INSIGHT ‑0.9176 HLPCOPE ‑0.6125

DEFEXP ‑0.4503 ACCEPT ‑0.4117 TRYBEHAV ‑0.4709

SETLIMIT ‑0.4328 DEVTRUST ‑0.3511 BGDMOM ‑0.2777

CORRECT ‑0.1885 BEINGNUR ‑0.3222 INTROSP ‑0.2690

REFLECT ‑0.0692 DEMYTH ‑0.2027 DESENS ‑0.1460

REFRAME 0.0569 REFRAME ‑0.1758 BEINGNUR ‑0.0709

INTROSP 0.3780 BGDMOM ‑0.0736 ADDRESA ‑0.0234

HLPCOPE 0.5617 IDCONFL 0.0142 INTERP ‑0.0207

TRYBEHAV 1.0587 CONSIT 0.4554 ACCEPT 0.0023

DEMYTH 1.0670 CORRECT 0.5163 CONSIT 0.0217

INTERP 1.0758 CHALLENG 0.6593 REFLECT 0.3745

IDCONFL 1.1449 ADDRESA 0.7462 DEVTRUST 0.6676

INSIGHT 1.1548 DESENS 0.8300 DEMYTH 0.7658

CHALLENG 1.1846 SETLIMIT 0.9680 INSIGHT 0.8362

CONTRAN 1.2479 DEFEXP 1.0765 SETLIMIT 1.1014

ADDRESA 1.3813 HLPCOPE 1.1151 IDCONFL 1.1337

DESENS 1.4265 TRYBEHAV 1.252? DEFEXP 1.2520

It should be noted that this is not direct output from the SPSSPC+ run CURALS3.SPW, each dimension has been arranged from the most negative weight to the most positive weight. Dimension 1 has at one pole BEINGNUR, ACCEPT, BGDMOM, CONSIT, and DEVTRUST while the other pole is DESENS, ADDRESA, CONTRAN, CHALLENG, and INSIGHT. This dimension seems to be warmth (possibly emotional) to relearning (possibly cognitive). Dimension 2 has at one pole INTROSP, INTERP, REFLECT, CONTRAN, and INSIGHT; at the other pole are TRYBEHAV, HLPCOPE, DEFEXP, and SETLIMIT. The continuum seems to go from intrapsychic understanding to a directive or dydactive approach. The third dimension has CORRECT, CONTRAN, CHALLENG, and REFRAME at one pole and DEFEXP, IDCONFL, and SETLIMIT at the other pole. Dimensions 1 and 2 have been plotted in Figure \_\_ while dimensions 1 and 3 have been plotted in Figure \_\_

The following clicks will produce a similar run:











Figure \_\_ gives a graphic picture of the distance between cluster 1 (from the previous calculation; DEVTRUST, ACCEPT, BEINGNUR, and BGDMOM) and cluster 2 (SETLIMIT and DEFEXP). It also shows the distance between cluster 1 and cluster 3 (DESENS and ADDRESA; the variable CHALLENG is added to this cluster). Further, the distance between cluster 2 and cluster 3 is presented in this graphic. It is important to remember that the task as presented here is not to test theory but develop taxonomies (in a sense to develop theory). The task is to help the researcher visualize (understand) the complexities of the relationships among the variables.



Multidimensional scaling provides information beyond cluster analysis as presented here. The two dimensions represented in the circumplex provides to additional bits of information: (1) distance between the clusters (and individual variables) and (2) where along each of dimensions each variable and cluster lies. Although the dendrogram in cluster analysis does provide information of the distance between cluster 1 (INSIGHT, INTROSP, and INTERP) and cluster 3 (REFLECT and REFRAME) it is a much clearer in the circumplex model of multidimensional scaling. Further, one can readily note the relation to other clusters.

Multidimensional scaling is not limited to two dimensions, like factor analysis there can be as many factors as there are variables and there can be as many dimensions as there are variables. Unlike factor analysis the methods of determining the number of dimensions is not as advanced as is the method for determining the number of factors. As multidimensional scaling is presented here that is not a problem

One could think of these 21 elements being used to describe a school or style of psychotherapy. In a simplified form psychoanalysis might be thought of as made up of interpretation, transference and countertransference, and working through.

This set of statistics can be used on a range of taxonomic or descriptive problems. The creation of the input matrix determines the issue studied. The method presented here combined the data from a panel as described by Trochim (19\_\_) and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ (19\_\_). This process assists the clinician in sorting out their judgments. However, a single clinician could fill in the chart in Figure \_\_ by making judgments of the similarity of the pairs (zero might represent similar--or no difference while 8 might represent a great difference). In the cell identified by ACCEPT (acceptance) and BEINGNUR (being nurturing) the judgment might be 1 (quite similar). The cell identified by DEVTRUST and CHALLENG might be judged 6 (quite dissimilar). The same set of statistics could then be computed on the matrix of this single clinician. This would result in a map of the clinician. Such maps could be used be used in comparing theories. Students could be compared to a panel of experts.

These methods could be used to empirically support the judgements of clinicians. The following are examples of these methods might be used. [Trot out a few methods.]

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The purpose of this next section is twofold: (1) to demonstrate another method of the use of the statistics and (2) compare the various statistics methodologically.

The purpose of this section is to show the relationships between correlation (and factor analysis), and cluster analysis. In this example 4 people have taken 4 tests (tests are like variables). The data are as follows:

 CLSDAT1.TXT

 "PER1",2,3,5,2

 "PER2",3,2,6,3

 "PER3",2,3,5,3

 "PER4",3,2,6,2

Correlation of variables (and consequently factor analysis) will indicate the similarity of tests in terms of their relative position of each individual on the test, while cluster analysis will indicate the similarity of tests using the absolute position difference of each individual on the test. The correlation is presented:

|  |
| --- |
| File Name = crscor16.sps |
| get file = '\proeval\CLSDAT1.sav' /keep= PERs TEST1 TEST2 TEST3 TEST4.COR TEST1 TO TEST4 /STATISTICS=all. |

 CRSCOR16.LIS

Variable Cases Mean Std Dev

TEST1 4 2.5000 .5774

TEST2 4 2.5000 .5774

TEST3 4 5.5000 .5774

TEST4 4 2.5000 .5774

Correlations: TEST1 TEST2 TEST3 TEST4

 TEST1 1.0000 ‑1.0000\*\* 1.0000\*\* .0000

 TEST2 ‑1.0000\*\* 1.0000 ‑1.0000\*\* .0000

 TEST3 1.0000\*\* ‑1.0000\*\* 1.0000 .0000

 TEST4 .0000 .0000 .0000 1.0000

N of cases: 4 1‑tailed Signif: \* ‑ .01 \*\* ‑ .001

In Frame CRSCOR16.LIS TEST1, TEST2, and TEST3 all correlate perfectly with each other, even though test 2 is negatively correlated with the other two. Test4 correlates zero with all three tests. It can be seen in the graphic that the profiles of TEST1 and TEST3 are identical even though are separated in terms of distance. TEST2 is the mirror image of the other two. TEST4 although close in proximal distance to TEST1 and TEST2 is quite dissimilar in terms of the relative shape or profile.

Factor analysis shows how this small set of variables can be summarized. It should be noted that there are not nearly enough variables in this set for what would be considered appropriate; there should be at a minimum 40 subjects to compute this analysis. The purpose of this example is to show the differential effects of factor analysis and cluster analysis. As indicated the two analyses are similar in that they both summarize the possible underlying characteristics of a set of variables thus simplifying and consequently obtaining more parsimony. However, the summarization process is somewhat different for the two processes and this demonstration is designed to show.

|  |
| --- |
| File Name = crsfac8.sps |
| get file = '\proeval\CLSDAT1.sav' /keep= PERs TEST1 TEST2 TEST3 TEST4.fac var= test1 to test4  / rotation.  |

 CRSFAC8.SPS

Final Statistics:

Variable Communality \* Factor Eigenvalue Pct of Var Cum Pct

 \*

TEST1 1.00000 \* 1 3.00000 75.0 75.0

TEST2 1.00000 \* 2 1.00000 25.0 100.0

TEST3 1.00000 \*

TEST4 1.00000 \*

Varimax Rotation 1, Extraction 1, Analysis 1 ‑ Kaiser Normalization.

 Varimax converged in 2 iterations.

Rotated Factor Matrix:

 FACTOR 1 FACTOR 2

TEST1 1.00000 .00000

TEST2 ‑1.00000 .00000

TEST3 1.00000 .00000

TEST4 .00000 1.00000

TEST1, TEST2, and TEST3 form the first factor and TEST4 forms a factor of its own. Further, the first three variables are perfectly correlated with the first factor. However, TEST2 is negatively correlated with the factor. The relative weights are perfectly related.

The cluster analysis is presented. It is necessary to invert the data in order for the analyses to be comparable as shown in Frame CLSDAT2.TXT. Frame CRSCLS7.SPS contains the jobstream and Frame CRSCLS7.LIS contains the output.

 CLSDAT2.sav

 "TEST1",2,3,2,3

 "TEST2",3,2,3,2

 "TEST3",5,6,5,6

 "TEST4",2,3,3,2

|  |
| --- |
| File Name = crscls7.sps |
| get file = '\proeval\CLSDAT2.sav' /keep= ID PER1 PER2 PER3 PER4.cluster PER1 TO PER4 /id=ID /print=distance /print=schedule cluster(2) /plot=dendrogram hicicle. |

 CRSCLS7.LIS

 Squared Euclidean measure used.

 1 Agglomeration method specified.

 Squared Euclidean Dissimilarity Coefficient Matrix

 Case 1 2 3

 2 4.0000

 3 36.0000 40.0000

 4 2.0000 2.0000 38.0000

 Number of Clusters

 Label Case 2

 TEST1 1 1

 TEST2 2 1

 TEST3 3 2

 TEST4 4 1

 Dendrogram using Average Linkage (Between Groups)

 Rescaled Distance Cluster Combine

 C A S E 0 5 10 15 20 25

 Label Seq +‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+

 TEST2 2 ‑+

 TEST4 4 ‑+‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+

 TEST1 1 ‑+ |

 TEST3 3 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+

Note in the cluster analysis that there are also two clusters representing the four variables but they are constructed of different variables or tests than the factor analysis. TEST1, TEST2, and TEST4 make up cluster1 and TEST3 is in a cluster alone. The calculations below show that in the correlation (factor analysis) a relative relationship among variables and cluster analysis assesses an absolute relationship.

A more detailed inspection of the analysis will demonstrate the differences. The following jobstream and output shows how the correlation and factor analysis operate in relative terms.

|  |
| --- |
| File Name = crslis1.sps |
| get file = '\proeval\CLSDAT1.sav' /keep= PERs TEST1 TEST2 TEST3 TEST4.COMPUTE T1LX = TEST1 ‑ 2.5.COMPUTE T2LX = TEST2 ‑ 2.5.COMPUTE T3LX = TEST3 ‑ 5.5.COMPUTE T4LX = TEST4 ‑ 2.5.COMPUTE T1LX2=T1LX\*T1LX.COMPUTE T2LX2=T2LX\*T2LX.COMPUTE T3LX2=T3LX\*T3LX.COMPUTE T4LX2=T4LX\*T3LX.COMPUTE T1LXT2LY=T1LX\*T2LX.COMPUTE T1LXT3LY=T1LX\*T3LX.COMPUTE T1LXT4LY=T1LX\*T4LX.LIST T1LX T2LX T3LX T4LX .LIST T1LX2 T2LX2 T3LX2 T4LX2 T1LXT2LY T1LXT3LY T1LXT4LY. |

 CRSLIS1.LIS

 T1LX T2LX T3LX T4LX

 ‑.50 .50 ‑.50 ‑.50

 .50 ‑.50 .50 .50

 ‑.50 .50 ‑.50 .50

 .50 ‑.50 .50 ‑.50

 T1LX2 T2LX2 T3LX2 T4LX2 T1LXT2LY T1LXT3LY T1LXT4LY

 .25 .25 .25 .25 ‑.25 .25 .25

 .25 .25 .25 .25 ‑.25 .25 .25

 .25 .25 .25 ‑.25 ‑.25 .25 ‑.25

 .25 .25 .25 ‑.25 ‑.25 .25 ‑.25

Recall that the formula for the correlation is:

Note that all the little x scores are either -.5 or +.5 indicating that the differences from the means are the same for all cases. That is true for the scores on TEST3 on the plot is considerably distant from the other tests. The scores are the difference from their own mean so that the distance between tests will be lost. Each score represents a difference from the mean for that variable (in this example a test), however, the relative distribution of the cases for that test will remain. Consequently, the correlation for TEST1 and TEST2 is:

While the correlation between TEST1 and TEST3 is:

And one more example of the relationship between TEST1 and TEST4.

In this instance TEST1, TEST2, and TEST3 are similar while TEST4 is different.

A look at cluster analysis tells a different story.

|  |
| --- |
| File Name = crslis2.sps |
| get file = '\proeval\CLSDAT1.sav' /keep= PERs TEST1 TEST2 TEST3 TEST4.COMPUTE dif12 = TEST1 ‑ TEST2.COMPUTE dif13 = TEST1 ‑ TEST3.COMPUTE dif14 = TEST1 ‑ TEST4.compute dif12s=dif12\*dif12.compute dif13s=dif13\*dif13.compute dif14s=dif14\*dif14.LIST dif12 dif13 dif14 dif12s dif13s dif14s. |

 CRSLIS2.SPS

 DIF12 DIF13 DIF14 DIF12S DIF13S DIF14S

 ‑1.00 ‑3.00 .00 1.00 9.00 .00

 1.00 ‑3.00 .00 1.00 9.00 .00

 ‑1.00 ‑3.00 ‑1.00 1.00 9.00 1.00

 1.00 ‑3.00 1.00 1.00 9.00 1.00

First note that in the absolute differences between TEST1 and TEST2 (TEST1 minus TEST2) are all 1. However, half of them are in one direction and the other half are in the opposite direction (note the minus signs). The differences square and summed equal 4. The differences between TEST1 and TEST3 are all -3; the values squared and summed equal 36 indicating the most dissimilarity. In the correlation analysis these latter two variables had a perfect correlation. On the other hand tests 1 and 4 show the most similarity where their squared differences cumulate to only 2. In the correlation analysis these two variables had a correlation of zero indicating the relative positions to be the most dissimilar. [The point of this is for the investigator to decide what question is being asked.]

\*\*\*

There is a difference in profile but also a difference in that profiles can be opposite and still be a part of the same factor (negatively related to the factor).

\*\*\*

It might be useful at this point to compare and contrast the various statistical procedures used in this set. From a practical point of view different techniques were selected and it might be useful to note why they were selected for the various questions.

This chapter is provided to show similarities and differences between the various statistical procedures.

This data set to be used is made up of ratings of personality theories by 12 to 16 raters. The questionnaire used for these rating follows:

 Personality Theory Rating Scale

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Use the scale below to rate the personality theory of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

 None A Little Somewhat Quite a Bit A Lot

 0 1 2 3 4 5 6 7 8

 LEAVE THE QUESTION

 BLANK IF YOU DON'T

 KNOW OR IF IT DOESN'T

 APPLY.

ACCORDING TO THIS THEORY:

 \_\_\_\_\_ ...motivation is based on drive reduction.

 \_\_\_\_\_ ...the person is an intentional (goal-oriented) being.

 \_\_\_\_\_ ...people are hedonistic.

 \_\_\_\_\_ ...cognition accounts for the actions of people.

 \_\_\_\_\_ ...values account for the actions of people.

 \_\_\_\_\_ ...people are actively involved in the development of their personality.

 \_\_\_\_\_ ...people's early experiences influence their personality.

 \_\_\_\_\_ ...the person imposes perception on the world.

 \_\_\_\_\_ ...the environment or learning accounts for the person's actions.

 \_\_\_\_\_ ...people are basically good.

 \_\_\_\_\_ ...heredity effects the person's actions.

 \_\_\_\_\_ This theory stresses the individual's conscious view of the world.

 \_\_\_\_\_ This theory stresses the individual's unconscious view of the world.

 \_\_\_\_\_ This theory stresses the individual's social consciousness.

 \_\_\_\_\_ This theory accounts for the individual's perception of reality.

 \_\_\_\_\_ This theory has influenced psychology (clinical, research, literature).

 \_\_\_\_\_ This theory focus on "the here and now", the past, or the future.

 (0 = past, 4 = here and now, 8 = future)

 \_\_\_\_\_ This theory is empirically based.

 \_\_\_\_\_ This theory is parsimonious.

 \_\_\_\_\_ This theory assumes that the individual has free choice.

 \_\_\_\_\_ This theory employs a method of therapeutic intervention.

 \_\_\_\_\_ This theory emphasizes psychopathology.

 \_\_\_\_\_ I agree with this theory.

The names for the respective items are as follows:

TDATE

THER

THID

CLUS

DRIVE

GOAL

HEDON

COG

VALUE

ACTIVE

EARLY

IMPOSE

LEARN

GOOD

HERED

CONSCI

UNCONS

SOCIAL

PERCEP

INFLU

TIME

DATA

PARSI

FREE

THERA

PATH

AGREE

The theorists rated were:

Freud Sigmund Freud

ADLER Alfred Adler

JUNG Carl Jung

ROGERS Carl Rogers

KELLY George Kelly

HORNEY Karen Horney

SULLIVI Harry Stack Sullivan

BANDURA Albert Bandura

CATTELL Raymond B. Cattell

MASLOW Abraham Maslow

BINSWAN Ludwig Binswanger

ERIKSON Erik Erikson

This data was part of a graduate student class assignment for students taking a theories of personality class. Each week the students read the assignments and completed the questionnaire the day before the class meeting. There were 17 students enrolled in the class, however, not all students complete the forms each week and consequently there is some missing data. There were \_\_\_ completed forms.

In this first example the items of the questionnaire are grouped using factor analysis. Recall that in this condition the items with similar profiles will be grouped together (into factors); not necessarily the items that are closest in distance (refer to the above discussion). The data is in a dBase IV file with 9 indicating that data was omitted. As can be seen mostly defaults were used in the computer run (see Frame PERFAC5.SPS) and a principle components extraction method was used and the rotation was orthogonal. Using the eigenvalue of 1.00 is usually not considered the best method of deciding upon the number of factors; however, both interpretation and the scree method seemed also to indicate 5 factors.

|  |
| --- |
| File Name = perfac5.sps |
| get file= '\proeval\perall4.sav'/keep=tDATE THER THID CLUS DRIVE GOAL HEDON COG VALUE ACTIVE EARLY IMPOSE LEARN GOOD HERED CONSCI UNCONS SOCIAL PERCEP INFLU TIME DATA PARSI FREE THERA PATH AGREE .missing values drive to agree (9).fac var= drive to agree /missing=pairwise /plot=eigen /criteria=factors(5) /rotate. |

 PERFAC5.LIS

Final Statistics:

Variable Communality \* Factor Eigenvalue Pct of Var Cum Pct

 \*

DRIVE .54238 \* 1 6.98937 30.4 30.4

GOAL .50485 \* 2 2.15730 9.4 39.8

HEDON .54444 \* 3 1.72904 7.5 47.3

COG .56063 \* 4 1.47348 6.4 53.7

VALUE .66169 \* 5 1.32890 5.8 59.5

ACTIVE .70979 \*

EARLY .58670 \*

IMPOSE .64661 \*

LEARN .58716 \*

GOOD .51995 \*

HERED .58137 \*

CONSCI .64024 \*

UNCONS .68112 \*

SOCIAL .61566 \*

PERCEP .61891 \*

INFLU .59501 \*

TIME .58200 \*

DATA .56921 \*

PARSI .60125 \*

FREE .61128 \*

THERA .64608 \*

PATH .52881 \*

AGREE .54294 \*

Rotated Factor Matrix:

 FACTOR 1 FACTOR 2 FACTOR 3 FACTOR 4 FACTOR 5

DRIVE ‑.67035\*\* ‑.10424 ‑.12588 ‑.21679 .13893

GOAL .44300 .44580\* .16215 .17344 .23128

HEDON ‑.72226\*\* ‑.01600 .14498 .01324 .03653

COG .50422\* .28914 .40228 .23887 ‑.06251

VALUE .15529 .79294\*\* ‑.08091 ‑.04701 .00768

ACTIVE .58000\*\* .41073 .21364 .39876 ‑.00630

EARLY ‑.69231\*\* .27344 ‑.13863 .07009 .09220

IMPOSE .22239 .23344 ‑.10607 .72878\*\* .01706

LEARN .02767 .45879 .49137\* .21355 ‑.29809

GOOD .57563\*\* .41920 .00750 ‑.00350 .11316

HERED .10169 .28821 ‑.34325 ‑.60077\*\* ‑.09606

CONSCI .55734\*\* .40202 .29750 .26467 ‑.09712

UNCONS ‑.48833\* ‑.19803 ‑.48205 ‑.38498 .15119

SOCIAL ‑.05895 .71266\*\* .26140 .18852 .02080

PERCEP .29944 .16227 ‑.10921 .69839\*\* .05684

INFLU ‑.10405 .01029 .21463 ‑.17453 .71242\*\*

TIME .72841\*\* .04942 .11085 .18045 ‑.06419

DATA .29151 .04499 .63344\*\* ‑.20723 .19498

PARSI .05321 .06473 .76207\*\* .00803 .11581

FREE .51295\* .32588 .28510 .39853 .04315

THERA ‑.13541 ‑.11914 ‑.26013 .24730 .69622\*\*

PATH ‑.51195\* ‑.08011 ‑.40072 ‑.11859 .29269

AGREE ‑.01068 .34696 .25436 .21198 .55930\*\*

We were somewhat arbitrary in selecting 5 factors in this solution so that it would match with the five cluster solution in the cluster analysis solution that follows. It should be noted that one should not be so casual in determining the number of factors in a solution; the reader is referred to chapter \_\_ when testing for the number of factors. In developing theory the researcher may do that in an armchair fashion, reviewing the literature or with exploratory factor analysis. The major purpose here to compare factor analysis with cluster analysis so that the number of factors is done with that purpose in mind.

The factors in Figure \_\_ are presented in two ways: (1) the criterion of .60 is used to determine whether a variable loads on a factor, (2) if a variable does not load on any factor then it is placed on the factor with the highest loading.

Factor I

DRIVE -.67

HEDON -.72

EARLY -.69

TIME .73

---------

GOAL .44

COG .50

ACTIVE .58

GOOD .58

CONSCI .56

UNCONS -.49

FREE .51

PATH -.51

Factor II

VALUE .79

SOCIAL .71

-----------

GOAL .45

Factor III

DATA .63

PARSI .76

----------

LEARN .49

Factor IV

IMPOSE .73

HERED -.60

PERCEP .70

Factor V

INFLU .71

THERA .70

AGREE .56

The next example shows how cluster analysis can be used to group the same set of data. The data needs to be conditioned before the cluster analysis can be run. The means are computed within each theorist for each item. For example, the first item DRIVE for all respondents to Freud were summed and divided by the number of respondents (the number was also rounded to the nearest integer to keep it on the same scale). The matrix was then transposed because the computer program requires that format for this problem. This data is presented in here and is a file labeled THER11.sav.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ITEM | FREUD | ADLER | JUNG | ROGERS | KELLY | HORNEY | SULLIVA | BANDURA | CATTELL | MASLOW | BINSWAN | ERIKSON |
| DRIVE | 8 | 2 | 3 | 2 | 2 | 3 | 4 | 1 | 3 | 4 | 2 | 4 |
| GOAL | 4 | 7 | 5 | 7 | 7 | 5 | 5 | 6 | 5 | 7 | 5 | 6 |
| HEDON | 7 | 3 | 2 | 2 | 2 | 4 | 4 | 2 | 3 | 4 | 3 | 3 |
| COG | 3 | 6 | 4 | 6 | 7 | 4 | 5 | 7 | 5 | 6 | 6 | 6 |
| VALUE | 4 | 6 | 5 | 6 | 4 | 4 | 5 | 5 | 4 | 6 | 6 | 6 |
| ACTIVE | 2 | 7 | 5 | 7 | 7 | 5 | 5 | 6 | 5 | 6 | 7 | 6 |
| EARLY | 8 | 7 | 4 | 5 | 4 | 6 | 6 | 5 | 4 | 5 | 4 | 7 |
| IMPOSE | 4 | 6 | 4 | 7 | 7 | 5 | 6 | 5 | 5 | 6 | 7 | 6 |
| LEARN | 3 | 6 | 3 | 5 | 5 | 6 | 6 | 7 | 6 | 5 | 5 | 6 |
| GOOD | 2 | 5 | 5 | 8 | 5 | 4 | 4 | 5 | 4 | 6 | 4 | 6 |
| HERED | 3 | 4 | 5 | 4 | 2 | 3 | 3 | 2 | 5 | 4 | 3 | 4 |
| CONSCI | 2 | 6 | 5 | 6 | 6 | 4 | 5 | 6 | 5 | 6 | 6 | 6 |
| UNCONS | 8 | 2 | 7 | 3 | 2 | 6 | 4 | 2 | 4 | 3 | 2 | 5 |
| SOCIAL | 4 | 7 | 3 | 6 | 5 | 5 | 6 | 6 | 5 | 5 | 5 | 6 |
| PERCEP | 5 | 6 | 5 | 7 | 7 | 5 | 6 | 6 | 5 | 6 | 7 | 5 |
| INFLU | 8 | 5 | 5 | 7 | 4 | 3 | 5 | 6 | 5 | 6 | 4 | 5 |
| TIME | 0 | 5 | 5 | 4 | 5 | 3 | 4 | 4 | 5 | 5 | 5 | 3 |
| DATA | 3 | 3 | 2 | 4 | 4 | 2 | 4 | 6 | 6 | 3 | 2 | 4 |
| PARSI | 4 | 5 | 3 | 5 | 6 | 4 | 4 | 5 | 5 | 5 | 3 | 5 |
| FREE | 2 | 5 | 3 | 7 | 7 | 5 | 4 | 6 | 4 | 6 | 7 | 5 |
| THERA | 7 | 5 | 6 | 7 | 6 | 5 | 6 | 5 | 3 | 3 | 5 | 5 |
| PATH | 7 | 3 | 5 | 3 | 3 | 6 | 5 | 3 | 4 | 3 | 4 | 4 |
| AGREE | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 5 |

This is an older syntax file and will run but the clicks are beow.

|  |
| --- |
| File Name = percls3.sps |
| get file = '\proeval\ther11.sav'/keep=ITEM FREUD ADLER JUNG ROGERS KELLY HORNEY SULLIVA BANDURA CATTELL MASLOW BINSWAN ERIKSON.cluster freud to erikson /id=item /print=distance /print=schedule cluster(5) /plot=dendrogram hicicle.  |

 







If five factors are chosen (to be comparable to the 5 factor solution above) there are as follows:

Cluster 1

IMPOSE

PERCEP

GOAL

COG

CONSCI

ACTIVE

FREE

VALUE

GOOD

LEARN

SOCIAL

PARSI

AGREE

Cluster 2

INFLU

THERA

EARLY

Cluster 3

HERED

TIME

DATA

Cluster 4

DATA

Cluster 5

DRIVE

HEDON

UNCONS

PATH

The first question is whether there is a difference between the factor analysis solution and the cluster analysis solution? There is not a test of significance that can be run [or would Chi Square be appropriate? there is the problem of what is a match is it two or more variables in the same group; cluseter or factor or must all overlap] so it mostly a matter determining whether appears that the solution are the same or different. If one chooses to the criteria of two or more variables in the same group then it does not look too bad. Four variables from cluster 1 can be found in factor 1; 3 variables from cluster 1 can be found in factor 2 (all of factor 2); 2 variables in cluster 2 can be found in factor 5; and 4 variables in cluster 5 can be found in factor 1. That is 16 variables that overlap and 8 variables that do not [something wrong with this count]. That does give some indication that there is some fit of the two methods. However, cluster 3 does not have any variables that are shared in any of the factors and factor 4 does not have any variables that are shared in any of the clusters. Further, cluster 1 and factor 1 are fragmented across the two methods. Finally, if one tries to develop taxonomy from the two methods it would seem to be different for the two methods.

|  |
| --- |
| File Name = perals4.sps |
| get file = '\proeval\therdtt.sav'/keep=item DRIVE GOAL HEDON COG VALUE ACTIVE EARLY IMPOSE LEARN GOOD HERED CONSCI UNCONS SOCIAL PERCEP INFLU TIME DATA PARSI FREE THERA PATH AGREE.ALS VAR=drive to agree /LEVEL=interval(disSIMILAR) /PLOT=ALL. |

 PERALS4.LST

 Configuration derived in 2 dimensions

 Stimulus Coordinates

 Dimension

Stimulus Stimulus 1 2

 Number Name

 1 DRIVE 2.7576 ‑.0457

 2 GOAL ‑1.2316 .3747

 3 HEDON 2.2009 ‑.2654

 4 COG ‑1.2308 ‑.1352

 5 VALUE ‑.2718 .1322

 6 ACTIVE ‑1.7376 ‑.0292

 7 EARLY .2737 1.2230

 8 IMPOSE ‑1.1493 .3867

 9 LEARN ‑.8091 ‑.2012

 10 GOOD ‑.7062 ‑.5612

 11 HERED 1.1133 ‑.9480

 12 CONSCI ‑1.0615 ‑.3196

 13 UNCONS 2.4200 .6935

 14 SOCIAL ‑.5909 .1727

 15 PERCEP ‑1.0926 .6262

 16 INFLU .2361 .9594

 17 TIME ‑.2709 ‑1.4354

 18 DATA .7070 ‑1.3658

 19 PARSI .1220 ‑.2902

 20 FREE ‑1.3629 ‑.4720

 21 THERA .0554 1.0593

 22 PATH 1.4080 .3780

 23 AGREE .2212 .0633



Multidimensional scaling does not have a method for determining the number of dimensions (comparable to clusters or factors) but does have a method to determine the number of dimensions [better find out what that is]. However, for our purposes of arranging the variables in groups (factors or clusters above) it is not required. Yet the Euclidean Distance model in Figure \_\_ would seem to be helpful in developing taxonomy of the variables under consideration. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ have been drawn to show the variables that might go together in a group. The problem with the dispersion is that there are no clear-cut distinctions between the variables; they seem to be on a continuum. Consequently, the divisions are somewhat arbitrary. It is a little like dividing age ranges into ten year categories.

In keeping with the models above of grouping the variables the following is the breakdown when five groups are specified.

Group 1

EARLY

THERA

INFLU

Group 2

PERCEP

IMPOSE

GOAL

SOCIAL

VALUE

AGREE

PARSI

Group 3

UNCONS

PATH

DRIVE

HEDON

Group 4

ACTIVE

COG

LEARN

CONSI

FREE

GOOD

Group 5

HERED

TIME

DATA

In the next example we use the same data set but focus on theorists rather than variables. A taxonomy of theorists seems as useful as a taxonomy of variables [must be a better way to say that]. Cattell's cube could be useful in this context. The data used in the cluster example is the same as the last cluster example but it was not transposed, it is in Frame THER1.TXT.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| FNAME | DRIVE | GOAL | HEDON | COG | VALUE | ACTIVE | EARLY | IMPOSE | LEARN | GOOD | HERED | CONSCI | UNCONS | SOCIAL | PERCEP | INFLU | TIME | DATA | PARSI | FREE | THERA | PATH | AGREE |
| FREUD | 8 | 4 | 7 | 3 | 4 | 2 | 8 | 4 | 3 | 2 | 3 | 2 | 8 | 4 | 5 | 8 | 0 | 3 | 4 | 2 | 7 | 7 | 5 |
| ADLER | 2 | 7 | 3 | 6 | 6 | 7 | 7 | 6 | 6 | 5 | 4 | 6 | 2 | 7 | 6 | 5 | 5 | 3 | 5 | 5 | 5 | 3 | 5 |
| JUNG | 3 | 5 | 2 | 4 | 5 | 5 | 4 | 4 | 3 | 5 | 5 | 5 | 7 | 3 | 5 | 5 | 5 | 2 | 3 | 3 | 6 | 5 | 4 |
| ROGERS | 2 | 7 | 2 | 6 | 6 | 7 | 5 | 7 | 5 | 8 | 4 | 6 | 3 | 6 | 7 | 7 | 4 | 4 | 5 | 7 | 7 | 3 | 5 |
| KELLY | 2 | 7 | 2 | 7 | 4 | 7 | 4 | 7 | 5 | 5 | 2 | 6 | 2 | 5 | 7 | 4 | 5 | 4 | 6 | 7 | 6 | 3 | 5 |
| HORNEY | 3 | 5 | 4 | 4 | 4 | 5 | 6 | 5 | 6 | 4 | 3 | 4 | 6 | 5 | 5 | 3 | 3 | 2 | 4 | 5 | 5 | 6 | 5 |
| SULLIVA | 4 | 5 | 4 | 5 | 5 | 5 | 6 | 6 | 6 | 4 | 3 | 5 | 4 | 6 | 6 | 5 | 4 | 4 | 4 | 4 | 6 | 5 | 5 |
| BANDURA | 1 | 6 | 2 | 7 | 5 | 6 | 5 | 5 | 7 | 5 | 2 | 6 | 2 | 6 | 6 | 6 | 4 | 6 | 5 | 6 | 5 | 3 | 5 |
| CATTELL | 3 | 5 | 3 | 5 | 4 | 5 | 4 | 5 | 6 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 6 | 5 | 4 | 3 | 4 | 4 |
| MASLOW | 4 | 7 | 4 | 6 | 6 | 6 | 5 | 6 | 5 | 6 | 4 | 6 | 3 | 5 | 6 | 6 | 5 | 3 | 5 | 6 | 3 | 3 | 5 |
| BINSWAN | 2 | 5 | 3 | 6 | 6 | 7 | 4 | 7 | 5 | 4 | 3 | 6 | 2 | 5 | 7 | 4 | 5 | 2 | 3 | 7 | 5 | 4 | 4 |
| ERIKSON | 4 | 6 | 3 | 6 | 6 | 6 | 7 | 6 | 6 | 6 | 4 | 6 | 5 | 6 | 5 | 5 | 3 | 4 | 5 | 5 | 5 | 4 | 5 |

|  |
| --- |
| File Name = percls2.sps |

1 1

 Adler 2 2

 Jung

|  |
| --- |
| get file = '\proeval\ther1.sav'/keep= FNAME DRIVE GOAL HEDON COG VALUE ACTIVE EARLY IMPOSE LEARN GOOD HERED CONSCI UNCONS SOCIAL PERCEP INFLU TIME DATA PARSI FREE THERA PATH AGREE. cluster drive to agree  /id=fname  /METHOD=WARD /print=distance  /print=schedule cluster(4)  /plot=dendrogram hicicle.  |

 PERCLS2.LIS

Cluster Membership of Cases using Ward Method

 Number of Clusters

 Label Case 4

 Freud 3 3

 Rogers 4 2

 Kelly 5 2

 Horney 6 4

 Sulliva 7 4

 Bandura 8 2

 Cattell 9 4

 Maslow 10 2

 Binswan 11 2

 Erikson 12 4

Dendrogram using Ward Method

 Rescaled Distance Cluster Combine

 C A S E 0 5 10 15 20 25

 Label Seq +‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+‑‑‑‑‑‑‑‑‑+

 C B A

 Sulliva 7 ‑+‑‑‑+

 Erikson 12 ‑+ +‑‑‑‑‑‑+

 Horney 6 ‑‑‑‑‑+ +‑‑‑‑‑+

 Cattell 9 ‑‑‑‑‑‑‑‑‑‑‑‑+ +‑‑‑‑‑‑‑‑+

 Jung 3 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+ |

 Adler 2 ‑+‑‑‑‑‑+ +‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+

 Maslow 10 ‑+ +‑‑‑‑‑‑+ | |

 Binswan 11 ‑‑‑‑‑‑‑+ +‑‑‑‑‑‑‑‑‑‑‑‑+ |

 Kelly 5 ‑‑‑+‑‑‑‑‑+ | |

 Bandura 8 ‑‑‑+ +‑‑‑‑+ |

 Rogers 4 ‑‑‑‑‑‑‑‑‑+ |

 Freud 1 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑+

Using the rules of \_\_\_\_\_\_\_\_\_ the line should be drawn at line "A" giving 2 clusters. They are not very interesting in that Freud is in a cluster alone and every other theorist is in the second cluster. The next greatest horizontal distance is identified by line "B" which forms two clusters. This might be the might be interpretable set but line "C" forming 6 clusters seems the most \_\_\_\_\_\_. The clusters formed by this solution are as follows:

Cluster 1

Sullivan

Erikson

Horney

Cluster 2

Cattell

Cluster 3

Jung

Cluster 4

Adler

Maslow

Binswanger

Cluster 5

Kelly

Bandura

Rogers

Cluster 6

Freud

In this next set of data takes same data as and

|  |
| --- |
| File Name = perals6.sps |
| get file = '\proeval\therdis1.sav' /keep=Freud Adler Jung Rogers Kelly HorneySulliva Bandura Cattell Maslow Binswan Erikson.ALS VAR=Freud to Erikson /LEVEL=interval(disSIMILAR) /criteria=dimens(1) /METHOD=INDSCAL /PLOT=ALL. |

 PERALS6.LST

KELLY ‑1.0647

ROGERS ‑0.9488

BANDURA ‑0.865

BINSWAN ‑0.75

ADLER ‑0.6355

MASLOW ‑0.3176

CATTELL 0.0888

ERIKSON 0.145

SULLIVA 0.3638

HORNEY 0.591

JUNG 0.7265

FREUD 2.6668



|  |
| --- |
| File Name = perals3.sps |
| get file = '\proeval\therdis1.sav' /keep=Freud Adler Jung Rogers Kelly HorneySulliva Bandura Cattell Maslow Binswan Erikson.ALS VAR=Freud to Erikson /LEVEL=interval(disSIMILAR) /METHOD=INDSCAL /PLOT=ALL. |

|  |
| --- |
| File Name = therdis1.sav |
| FREUD | ADLER | JUNG | ROGERS | KELLY | HORNEY | SULLIVA | BANDURA | CATTELL | MASLOW | BINSWAN | ERIKSON |
| 0 | 249 | 145 | 276 | 295 | 121 | 126 | 270 | 189 | 218 | 263 | 167 |
| 249 | 0 | 96 | 33 | 34 | 66 | 33 | 29 | 52 | 23 | 34 | 24 |
| 145 | 96 | 0 | 103 | 110 | 46 | 55 | 115 | 58 | 77 | 82 | 66 |
| 276 | 33 | 103 | 0 | 33 | 101 | 60 | 38 | 81 | 36 | 49 | 39 |
| 295 | 34 | 110 | 33 | 0 | 84 | 55 | 27 | 64 | 39 | 28 | 54 |
| 121 | 66 | 46 | 101 | 84 | 0 | 23 | 83 | 50 | 65 | 62 | 38 |
| 126 | 33 | 55 | 60 | 55 | 23 | 0 | 44 | 31 | 38 | 43 | 19 |
| 270 | 29 | 115 | 38 | 27 | 83 | 44 | 0 | 43 | 42 | 47 | 41 |
| 189 | 52 | 58 | 81 | 64 | 50 | 31 | 43 | 0 | 39 | 62 | 40 |
| 218 | 23 | 77 | 36 | 39 | 65 | 38 | 42 | 39 | 0 | 35 | 25 |
| 263 | 34 | 82 | 49 | 28 | 62 | 43 | 47 | 62 | 35 | 0 | 54 |
| 167 | 24 | 66 | 39 | 54 | 38 | 19 | 41 | 40 | 25 | 54 | 0 |

 PERALS3.LST

 Dimension 1 Dimension 2

KELLY ‑1.4323 JUNG ‑0.9577

ROGERS ‑1.2329 CATTELL ‑0.7267

BANDURA ‑1.1546 BINSWAN ‑0.653

BINSWAN ‑0.9693 KELLY ‑0.2254

ADLER ‑0.8148 HORNEY ‑0.0529

MASLOW ‑0.3965 FREUD 0.1277

CATTELL 0.0739 SULLIVA 0.1736

ERIKSON 0.2 BANDURA 0.3124

SULLIVA 0.51 ERIKSON 0.4641

JUNG 0.8239 ADLER 0.4963

HORNEY 0.84 ROGERS 0.5

FREUD 3.545 MASLOW 0.5358

It produced the following chart:



Cluster analysis and multidimensional are the similar when multidimensional scaling uses only one dimension. This can be seen in comparing Dimension 1 and the Dendogram (to real sure of this one at this point--I'll check it further).

The manner in which the data is entered for these programs makes a major difference in the results. It is as important as choosing the proper statistics. In the above example there were \_\_\_\_\_\_ manipulations of the data before it was entered into the program. The participants completed a questionnaire about the theorists, each item was summed across the participants within each theorist, and the squared multiple distances between each theorist was computed. It was the squared multiple distances that was used as input to the multidimensional scaling program. In the following example the input to the program are direct judgments of a single judge. The judge makes a decision about the distance between each pair of objects (in these instance personality theorists) based on personal attitudes, information, or \_\_\_\_\_\_\_\_\_\_.

A single judge compared each theorist by using a scale from 0 to 8. A zero (0) indicated that the theorists were identical and an 8 indicated that the theorists were most dissimilar. The judge rated Freud and Adler as similar with a 3, and rated Jung as slightly more similar to Freud with a 2. The rating of Bandura to Freud with an 8 indicates most dissimilarity.

|  |
| --- |
| File Name = therate.sav |
| THEORIST | FREUD | ADLER | JUNG | ROGERS | KELLY | HORNEY | SULLIVA | BANDURA | CATTELL | MASLOW | BINSWAN | ERIKSON |
| FREUD | 0 | 3 | 2 | 5 | 6 | 4 | 4 | 8 | 8 | 5 | 6 | 5 |
| ADLER | 3 | 0 | 3 | 4 | 3 | 4 | 2 | 5 | 4 | 3 | 3 | 4 |
| JUNG | 2 | 3 | 0 | 4 | 3 | 4 | 3 | 7 | 7 | 2 | 2 | 4 |
| ROGERS | 5 | 4 | 4 | 0 | 3 | 5 | 3 | 5 | 6 | 2 | 3 | 5 |
| KELLY | 6 | 3 | 3 | 3 | 0 | 2 | 2 | 2 | 3 | 3 | 5 | 3 |
| HORNEY | 4 | 4 | 4 | 5 | 2 | 0 | 2 | 4 | 3 | 4 | 4 | 2 |
| SULLIVA | 4 | 2 | 3 | 3 | 2 | 2 | 0 | 3 | 2 | 3 | 4 | 1 |
| BANDURA | 8 | 5 | 7 | 5 | 2 | 4 | 3 | 0 | 2 | 4 | 4 | 3 |
| CATTELL | 8 | 4 | 7 | 6 | 3 | 3 | 2 | 2 | 0 | 3 | 3 | 2 |
| MASLOW | 5 | 3 | 2 | 2 | 3 | 4 | 3 | 4 | 3 | 0 | 1 | 4 |
| BINSWAN | 6 | 3 | 2 | 3 | 5 | 4 | 4 | 4 | 3 | 1 | 0 | 3 |
| ERIKSON | 5 | 4 | 4 | 5 | 3 | 2 | 1 | 3 | 2 | 4 | 3 | 0 |

The job stream used to run the multidimensional scaling program in SPSS is as follows:

|  |
| --- |
| File Name = perals9.sps |
| get file = '\proeval\therate.sav' /keep=THEORIST FREUD ADLER JUNG ROGERS KELLY HORNEY SULLIVA BANDURA CATTELL MASLOW BINSWAN ERIKSON.ALS VAR=FREUD TO ERIKSON /LEVEL=INTERVAL(disSIMILAR) /PLOT=ALL. |

It should be noted that the text file "THERATE.TXT" did not contain the names of the theorists on the first line. The output of that computer run is in Frame PERALS9.LST. One might ask the whether the two matrices are different. For example, the group of judges might have been a panel of experts and the single rater might be a student and the question would be how close to the expects is the student? On the other hand the categories might be diagnosis and the question might be different methods of establishing diagnoses: (1) structured interview, (2) psychological testing, or (3) clinical judgment. There could seem to be a whole set of clinical judgment questions that these methods could be applied to.

We indicated in the above section that there is not a statistical method for determining thether the grouping solutions of cluster analysis, factor analysis, or multidimensional scaling was different among themselves. However, there are methods for determining whether the matrices themselves are significantly different. So that if we use multidimensional scaling we can test the matrices to determine if they are different. This next example, tests the matrix of the single judge against the graduate students [it is not here].

 PERALS9.LST

 Dimension

Stimulus 1 2

 Name

Freud 2.1751 .8550

ADLER .8344 .3116

JUNG 1.5860 ‑.1741

ROGERS .6082 ‑1.5110

KELLY ‑.6659 .3442

HORNEY ‑.2005 1.1608

SULLIVA ‑.1193 .4693

BANDURA ‑1.8848 ‑.1841

CATTELL ‑1.7805 .1339

MASLOW .1183 ‑.9897

BINSWAN ‑.0561 ‑1.2390

ERIKSON ‑.6148 .8230

That data from Frame PERALS9.LST was used to create the following plot:



If the categories are known then it might be desirable to predict the theorist. Discriminant analysis allows one to determine which variables are most effective in predicting theorists and to develop taxonomy for both the theorist and the variables.

|  |
| --- |
| File Name = perdsc2.sps |
| get file = '\proeval\perall4.sav'/keep=THID CLUS DRIVE GOAL HEDON COG VALUE ACTIVE EARLY IMPOSE LEARN GOOD HERED CONSCI UNCONS SOCIAL PERCEP INFLU TIME DATA PARSI FREE THERA PATH AGREE .value labels thid 1 'freud'  2 'Adler'  3 'Jung'  4 'Rogers'  5 'Kelly'  6 'Horney'  7 'Sulliva'  8 'Bandura'  9 'Cattell'  10 'Maslow'  11 'Binswan'  12 'Erikson'.missing values drive to agree (9).DSC GROUPS=thid(1,12)  /VAR=drive to agree  /METHOD=MINRESID  /PIN=.05  /FUNCTIONS=6,100,.05 /STATISTICS=MEAN STDDEV COEFF RAW TABLE. |

 Degrees of Freedom Signif. Between Groups

 Wilks' Lambda .00238 18 11 172.0

 Approximate F 6.73348 198 1487.7 .0000

 RESIDUAL VARIANCE 12.98197

 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑ Variables in the analysis after step 18 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑

 Variable Tolerance F to remove Residual Variance

 DRIVE .8086075 4.4085

 GOAL .6885392 2.8517

 HEDON .8205188 4.2216

 VALUE .6899227 1.8635

 EARLY .7400657 4.8709

 LEARN .7701072 2.5441

 GOOD .7114397 8.9138

 HERED .8461894 3.0091

 CONSCI .5652705 3.7762

 UNCONS .5666565 4.9305

 SOCIAL .6762921 2.1756

 PERCEP .8453969 3.0534

 INFLU .7347672 9.9031

 DATA .7400053 7.9982

 FREE .7024298 3.1230

 THERA .6631685 4.7735

 PATH .6396031 4.2841

 AGREE .7558803 2.3188

 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑ Variables not in the analysis after step 18 ‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑‑

 Minimum Signif. of

 Variable Tolerance Tolerance F to enter Residual variance

 COG .7229042 .5566498 .6106

 ACTIVE .5912503 .5277644 .2419

 IMPOSE .6659893 .5559298 .6726

 TIME .7545682 .5623679 .0731

 PARSI .7565332 .5601723 .2784

 Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

 Group FUNC 1 FUNC 2 FUNC 3 FUNC 4 FUNC 5

 1 5.95297 .15154 .28629 .05561 ‑1.15760

 2 ‑.63536 ‑.27522 ‑.00035 1.83737 ‑.15173

 3 1.02702 1.23000 .55006 ‑1.87012 .81240

 4 ‑1.46471 1.63556 1.68544 .26381 ‑.08564

 5 ‑2.42486 .46351 ‑.56310 ‑.62008 ‑1.47778

 6 .87926 ‑.12746 ‑2.36745 .13268 1.08705

 7 .37195 ‑.86906 ‑.85952 .27647 .40472

 8 ‑1.46161 ‑1.49840 .54719 .30448 ‑.86419

 9 ‑.59271 ‑2.65032 1.03258 ‑1.18762 .46617

 10 ‑.35662 .98185 .87905 .46556 .93586

 11 ‑1.59251 .96399 ‑1.73615 ‑.52494 ‑.44835

 12 .31087 ‑.05714 .48770 .58778 1.10934

 Group FUNC 6

 1 ‑.26492

 2 .35772

 3 .83661

 4 .56233

 5 .58221

 6 .63629

 7 .35528

 8 .01865

 9 ‑.44479

 10 ‑1.26531

 11 ‑1.41790

 12 .27400

 Pooled‑within‑groups correlations between discriminating variables

 and canonical discriminant functions

 (Variables ordered by size of correlation within function)

 FUNC 1 FUNC 2 FUNC 3 FUNC 4 FUNC 5 FUNC 6

 UNCONS .48407\* .03096 ‑.09763 ‑.35571\* .26928 .43638\*

 DRIVE .45355\* .01335 .05730 ‑.03132 .06143 ‑.3268\*

 CONSCI ‑.44664\* .02689 .14508 .15771 .00853 ‑.08340

 ACTIVE ‑.41748\* .02171 .18051 .18981 ‑.10032 ‑.03243

 FREE ‑.37396\* .27632 .00144 .13380 ‑.16393 ‑.28372

 HEDON .33958\* ‑.05369 ‑.10844 .32823\* .00075 ‑.17824

 PATH .32608\* ‑.00935 ‑.31459\* ‑.10368 .08268 .15747

 TIME ‑.31732\* .14655 .07322 ‑.02276 ‑.11320 .03428

 COG ‑.28334\* ‑.01902 .17173 .14983 ‑.06110 ‑.12010

 DATA ‑.15986 ‑.46128\* .36008 ‑.07347 ‑.14761 .06128

 LEARN ‑.25227 ‑.38030\* ‑.03127 .34017\* .16834 .15273

 PARSI ‑.03410 ‑.12764 .09310 ‑.00652 ‑.04193 ‑.04799

 INFLU .22419 .10896 .57515\* .13349 ‑.29370 ‑.05110

 EARLY .26233 ‑.04628 ‑.10997 .51862\* .03825 .27307

 SOCIAL ‑.12369 ‑.12257 .03867 .49163\* .13589 .01540

 GOAL ‑.20539 .14144 .25223 .30214\* ‑.06513 .00034

 VALUE ‑.09861 .13987 .12987 .29536 .28964 ‑.26646

 AGREE ‑.01220 .18610 .06580 .25217 ‑.14317 .12416

 GOOD ‑.33015\* .36429\* .32580\* .29638 .44471\* .18545

 HERED .04960 ‑.11310 .24118 ‑.18815 .36794\* ‑.06445

 PERCEP ‑.23170 .20847 .00742 .19155 ‑.28685\* ‑.03778

 IMPOSE ‑.14642 .12907 .00069 .13448 ‑.17966\* .01658

 THERA .12568 .27235 .02229 .00194 ‑.45201\* .50039\*

 No. of Predicted Group Membership

 Actual 1 2 3 4 5 6 7 8 9 10 11 12

 Freud 100.0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0

 Adler .0 58.8 .0 11.8 .0 .0 11.8 11.8 .0 .0 .0 5.9

 Jung .0 .0 100.0 .0 .0 .0 .0 .0 .0 .0 .0 .0

 Rogers .0 .0 .0 81.3 .0 .0 .0 .0 .0 12.5 .0 6.3

 Kelly .0 11.8 .0 5.9 76.5 .0 .0 .0 .0 .0 5.9 .0

 Horney .0 .0 6.7 .0 6.7 73.3 6.7 .0 .0 .0 6.7 .0

 Sulliva .0 18.8 12.5 .0 .0 18.8 37.5 .0 .0 .0 6.3 6.3

 Bandura .0 6.3 .0 .0 12.5 .0 6.3 75.0 .0 .0 .0 .0

 Cattell .0 .0 6.7 .0 .0 .0 .0 6.7 86.7 .0 .0 .0

 Maslow .0 11.8 5.9 .0 .0 .0 .0 .0 .0 76.5 5.9 .0

 Binswan .0 .0 .0 .0 .0 .0 .0 .0 .0 6.7 93.3 .0

 Erikson .0 8.3 8.3 8.3 .0 .0 8.3 .0 .0 .0 .0 66.7

Percent of "grouped" cases correctly classified: 77.25%

The Y-hat formula that was generated by these shows that level of prediction of each of the categories or in this case the theorists. That is, by knowing how the theorist is rated on each of the items it can be predicted which theorists it is. The level that each theorist is predicted is known.

Two sets of data from the output are useful in interpreting this data: (1) "Structure Matrix", and (2) the "Canonical Discriminant Functions evaluated and Group Means (Group Centroids)." Plotting these two sets of data presents pictures of the taxonomy of characteristics of variables and theorists. It is necessary to first define the Structure Matrix and the Functions/Centroids.

The discriminant function is a prediction equation much like an in multiple regression. The definition in chapter \_\_ defines this general linear model. In discriminant as set of predictor variables predicts a set of groups. The first discriminant function separates the groups most effectively and if the variables contain variance (information) such that the groups can be more accurately separated a second discriminant function is computed and so on until there is no more variance among the groups that can be separated by the variables. The discriminant functions can be described by the variables that load on them in much the same manner as factor analysis.

The discriminant function can be used to make a prediction for each case. When these cases are summed within each group and divided by the number of cases in that group these means is called centroids. The greater difference among the means is the goal of discriminant function. These means can be plotted to identify which functions are separating which groups. Further, when the functions are defined by the variable loadings then taxonomy of the variables can be related to the groups. In the case we are dealing with this means that the characteristics of a theory can be empirically related to the theory.

We arbitrarily requested 6 functions in the program (realizing that 9 function are significant) to demonstrate how the discriminant function can be interpreted. Further we plot the group centroids to show their discriminating power for the various theorists. We used only 3 2-way plots even though there is a possibility of 15. It does show the discriminating power of all 6 functions for all 12 theorists; it just does not show all combinations. For example, it shows function 1 with function 2 but does not show function 1 with 3, 4, 5, or 6. Although these might be interesting space does not allow presentation of all combinations. The three presented should be useful in the interpretation.... In fact, it might have been as useful to show the discriminating power for each of the functions independently.

The functions are also like the dimensions in multidimensional scaling, but are different in that there is a criterion variable in the discriminate function. Further, the discriminant function allows ... The graphs are created by using (1) "Structure Matrix", and (2) the "Canonical Discriminant Functions evaluated and Group Means (Group Centroids)" as mentioned above. First the plots are created by using the data from the Group Centroids. For example, if Figure \_\_ notice that Freud is to the far right with a score of 5.95 on Function 1. Jung, Horney, Erikson, and Sullivan are near the center with scores of 1.03, .88, .31 and .37 respectively. On Function 2 Rogers has the most positive score of 1.64 while Cattell has the most negative score of -2.65. These functions are defined by the variables that correlate with them. Function 1 is made up of Uncons, Consci, Drive, Active, Free, Hedon, Path, and Time. Function 2 is made up of Data, Learn, and Good.

These functions can be interpreted like factors of factor analsysis. The first function might be labeled "unconscious motivation" at one pole and conscious decision making at the other. It is this that separates Freud from most other theorists. Kelly, Bandura, and Cattell are at the conscious decision making end of the continuum. Function 2 is made up of Data, Learn, and Good. Good is in the positive direction and Data and Learning are at the negative end of the function. So that Rogers sees individuals as good, his theory is not based on empirical evidence and learning does not account for much of peoples' actions. On the other hand, the theories of Cattell and Bandura data and learning have considerable impact on individuals but they are not seen as intrinsically good (one cannot conclude that they assume people are intrinsically bad).





In Figure \_\_ Function 3 is not as clear Influ (influence), Data, Good, and Path (negative) do not seem to hang together very well. However, they are the variables that separate Horney and Binswanger from Rogers, Maslow and Cattell.



Seventy-seven percent correctly classified is decent prediction so that one would conclude that the instrument is reliable is distinguishing among different personality theories. However, the instrument was not very effective in predicting Adler (58%) and Sullivan (37%), further Erikson with 67% could also be improved. In diagnosing the problem it can be seen that the misses for Adler were with Rogers (12% misses for Adler were predicted to be Rogers), Sullivan, and Bandura (each with 12%). One might hypothesize that the theory of Adler is similar to that of Rogers, Sullivan, and Bandura and it is not the problem with the measuring device. Further, it might be hypothesized that Sullivan is similar to Adler, Jung, and Horney (19%, 13%, and 19% respectively). This notion could be tested by combining the theories such that similar theorist would be in the same categories. Another analysis was run with Adler and Sullivan combined into

a single category and the overall percentage of correct predictions went up slight to 79%. The Adler Sullivan category was 54% correctly predicted, still somewhat low. Further, this did not correct some of the overlap indicated. It would be more advantages to see if there might be a way to separate the theorists.

The output from the first run indicates that there are more than 6 functions that are significant. In fact there are 9 functions that are significant. A job stream was run requesting 9 functions and the percent correctly predicted rose to 85%.

|  |
| --- |
| File Name = perdsc9.sps |
| get file = '\proeval\perall4.sav'/keep=THID CLUS DRIVE GOAL HEDON COG VALUE ACTIVE EARLY IMPOSE LEARN GOOD HERED CONSCI UNCONS SOCIAL PERCEP INFLU TIME DATA PARSI FREE THERA PATH AGREE .value labels thid 1 'freud'  2 'Adler'  3 'Jung'  4 'Rogers'  5 'Kelly'  6 'Horney'  7 'Sulliva'  8 'Bandura'  9 'Cattell'  10 'Maslow'  11 'Binswan'  12 'Erikson'.missing values drive to agree (9).DSC GROUPS=thid(1,12)  /VAR=drive to agree  /METHOD=MINRESID  /PIN=.05  /FUNCTIONS=6,100,.05 /STATISTICS=MEAN STDDEV COEFF RAW TABLE. |

 Canonical Discriminant Functions

 Pct of Cum Canonical After Wilks'

 Fcn Eigenvalue Variance Pct Corr Fcn Lambda Chisquare DF Sig

 : 0 .0024 1014.589 198 .0000

 1\* 4.9499 45.38 45.38 .9121 : 1 .0142 714.982 170 .0000

 2\* 1.4590 13.38 58.76 .7703 : 2 .0349 563.823 144 .0000

 3\* 1.3565 12.44 71.19 .7587 : 3 .0822 419.820 120 .0000

 4\* .8325 7.63 78.82 .6740 : 4 .1506 318.062 98 .0000

 5\* .7967 7.30 86.13 .6659 : 5 .2706 219.621 78 .0000

 6\* .5371 4.92 91.05 .5911 : 6 .4159 147.401 60 .0000

 7\* .2945 2.70 93.75 .4770 : 7 .5383 104.040 44 .0000

 8\* .2782 2.55 96.30 .4666 : 8 .6881 62.799 30 .0004

 9\* .1903 1.75 98.05 .3999 : 9 .8191 33.525 18 .0144

 10 .1662 1.52 99.57 .3775 : 10 .9552 7.693 8 .4640

 11 .0469 .43 100.00 .2116 :

Structure Matrix:

Pooled‑within‑groups correlations between discriminating variables

 and canonical discriminant functions

(Variables ordered by size of correlation within function)

 FUNC 1 FUNC 2 FUNC 3 FUNC 4 FUNC 5 FUNC 6

UNCONS .48407\* .03096 ‑.09763 ‑.35571\* .26928 .43638\*

CONSCI ‑.44664\* .02689 .14508 .15771 .00853 ‑.08340

ACTIVE ‑.41748\* .02171 .18051 .18981 ‑.10032 ‑.03243

FREE ‑.37396\* .27632 .00144 .13380 ‑.16393 ‑.28372

HEDON .33958\* ‑.05369 ‑.10844 .32823\* .00075 ‑.17824

TIME ‑.31732\* .14655 .07322 ‑.02276 ‑.11320 .03428

COG ‑.28334\* ‑.01902 .17173 .14983 ‑.06110 ‑.12010

DATA ‑.15986 ‑.46128\* .36008\* ‑.07347 ‑.14761 .06128

LEARN ‑.25227 ‑.38030\* ‑.03127 .34017\* .16834 .15273

INFLU .22419 .10896 .57515\* .13349 ‑.29370 ‑.05110

EARLY .26233 ‑.04628 ‑.10997 .51862\* .03825 .27307

SOCIAL ‑.12369 ‑.12257 .03867 .49163\* .13589 .01540

VALUE ‑.09861 .13987 .12987 .29536\* .28964 ‑.26646

AGREE ‑.01220 .18610 .06580 .25217\* ‑.14317 .12416

GOOD ‑.33015\* .36429\* .32580\* .29638\* .44471\* .18545

THERA .12568 .27235 .02229 .00194 ‑.45201\* .50039\*

GOAL ‑.20539 .14144 .25223 .30214\* ‑.06513 .00034

DRIVE .45355\* .01335 .05730 ‑.03132 .06143 ‑.32682\*

PERCEP ‑.23170 .20847 .00742 .19155 ‑.28685 ‑.03778

IMPOSE ‑.14642 .12907 .00069 .13448 ‑.17966 .01658

HERED .04960 ‑.11310 .24118 ‑.18815 .36794\* ‑.06445

PATH .32608\* ‑.00935 ‑.31459\* ‑.10368 .08268 .15747

PARSI ‑.03410 ‑.12764 .09310 ‑.00652 ‑.04193 ‑.04799

 FUNC 7 FUNC 8 FUNC 9

UNCONS ‑.18115 ‑.00945 .01236

CONSCI .09633 ‑.10474 ‑.17831

ACTIVE ‑.02584 ‑.06411 .09399

FREE .04931 ‑.09084 .30007\*

HEDON .10374 .22748 .11044

TIME .08627 .02253 .03357

COG ‑.01675 ‑.03132 .09982

DATA .14982 .12043 .24718

LEARN .26302 .08228 .29436

INFLU .28069 ‑.17830 .17723

EARLY ‑.06572 ‑.14613 ‑.15911

SOCIAL .30753\* ‑.00789 ‑.23385

VALUE .27222 ‑.24204 ‑.08582

AGREE ‑.06715 ‑.04745 .24494

GOOD .17276 .04759 .14258

THERA .40108\* .05956 ‑.35879

GOAL ‑.33333\* .09962 ‑.09469

DRIVE .05246 .54241\* ‑.08198

PERCEP ‑.02293 .47956\* ‑.08374

IMPOSE ‑.08930 .19274\* ‑.12481

HERED ‑.28983 ‑.07839 ‑.45725\*

PATH .27487 .15742 ‑.43764\*

PARSI .09651 ‑.03737 .25767\*

Canonical Discriminant Functions evaluated at Group Means (Group Centroids)

 Group FUNC 1 FUNC 2 FUNC 3 FUNC 4 FUNC 5

 1 5.95297 .15154 .28629 .05561 ‑1.15760

 2 ‑.63536 ‑.27522 ‑.00035 1.83737 ‑.15173

 3 1.02702 1.23000 .55006 ‑1.87012 .81240

 4 ‑1.46471 1.63556 1.68544 .26381 ‑.08564

 5 ‑2.42486 .46351 ‑.56310 ‑.62008 ‑1.47778

 6 .87926 ‑.12746 ‑2.36745 .13268 1.08705

 7 .37195 ‑.86906 ‑.85952 .27647 .40472

 8 ‑1.46161 ‑1.49840 .54719 .30448 ‑.86419

 9 ‑.59271 ‑2.65032 1.03258 ‑1.18762 .46617

 10 ‑.35662 .98185 .87905 .46556 .93586

 11 ‑1.59251 .96399 ‑1.73615 ‑.52494 ‑.44835

 12 .31087 ‑.05714 .48770 .58778 1.10934

 Group FUNC 6 FUNC 7 FUNC 8 FUNC 9

 1 ‑.26492 ‑.06609 .05194 .02423

 2 .35772 ‑.65579 ‑.38601 ‑.62244

 3 .83661 .03531 ‑.61179 ‑.22382

 4 .56233 .49353 .17086 ‑.14415

 5 .58221 ‑.69567 .57408 .29868

 6 .63629 ‑.19940 ‑.22853 .54813

 7 .35528 .97323 1.08427 ‑.31534

 8 .01865 .78145 ‑.79608 .61210

 9 ‑.44479 ‑.50719 .17872 ‑.29761

 10 ‑1.26531 ‑.27827 .38276 .59534

 11 ‑1.41790 .32617 ‑.40514 ‑.55439

 12 .27400 ‑.13150 ‑.20468 ‑.07838

Classification Results ‑

 No. of Predicted Group Membership

 Actual 1 2 3 4 5 6 7 8 9 10 11 12

Freud 100.0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 .0

Adler .0 70.6 .0 5.9 5.9 .0 .0 .0 .0 5.9 .0 11.8

Jung .0 .0 93.8 .0 .0 .0 .0 .0 .0 .0 .0 6.3

Rogers .0 .0 .0 100.0 .0 .0 .0 .0 .0 .0 .0 .0

Kelly .0 5.9 .0 11.8 76.5 .0 .0 5.9 .0 .0 .0 .0

Horney .0 .0 .0 .0 6.7 86.7 6.7 .0 .0 .0 .0 .0

Sulliva .0 .0 12.5 .0 .0 18.8 56.3 .0 .0 .0 .0 12.5

Bandura .0 .0 .0 .0 6.3 .0 .0 93.8 .0 .0 .0 .0

Cattell .0 .0 .0 .0 .0 .0 6.7 .0 93.3 .0 .0 .0

Maslow .0 5.9 5.9 5.9 .0 .0 .0 .0 .0 70.6 11.8 .0

Binswan .0 .0 .0 .0 .0 .0 .0 .0 .0 .0 100.0 .0

Erikson .0 8.3 .0 8.3 .0 .0 .0 .0 .0 .0 .0 83.3

Eighty-Five of the cases were correctly classified. This represents an improvement over the previous run where 77% of cases were correctly classified. It was noted above the that the 6 function solution did not discriminate well on the theorists Adler, Jung, Rogers, Horney, Sullivan, Bandura, and Erikson. Figures \_\_ and \_\_ demonstrate that Functions 7, 8, and 9 performed that task. Figure \_\_ shows Functions 7 and 8; on Function 7 Sullivan and Bandura are on one



end of the continuum and Kelly and Adler at the other end of the continuum. Further, Erikson and Horney are to the left while Rogers is to the right. Function 8 separates Sullivan and Kelly from Erikson, Horney, Adler, Jung and Bandura. And finally Function 9 separates Adler and Sullivan from Bandura and Horney.

