A NOTE ON ALIGNING CONSTRUCTS

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The alignment of constructs (with respect to the location of the preferred pole as consistently to the right or left) is a problem for both the analysis of grids and some further investigations based on grids. It is suggested here the sign of loadings on the first principal component can be used to identify constructs that need to be reflected or reversed in order for there to be a consistent alignment of poles on constructs.

Keywords: *repertory grids, alignment of constructs*

INTRODUCTION

The nature of the poles defining constructs in personal construct psychology is important for a number of reasons. The concept of the 'preferred' pole has implications for the techniques of laddering and resistance-to-change grids (see Fransella, Bell, and Bannister, 2004, pp.65-73) as well as a more general use in therapeutic intervention. The alignment of constructs (irrespective of the values attached to the poles) can affect correlations between elements in grid data, as shown by McKay (1992). While a "work-around" is available for element correlations (Bell, 2006) it is not known how this issue might affect other indices as well as representations of grid data. McKay's (1992) demonstration of the problem was focussed on identification, however he also indicated a number of other areas of grid analysis that were affected by the orientation of the construct poles. These included the construct intraclass correlation [used as a measure of cognitive simplicity-complexity], Landfield's measures of ordination and functionally independent constructs [FIC], and some principal component analyses. Some implications are relatively trivial, such as the reversal of signs on construct loadings, but other changes are more substantial. For example, the problem affects cluster analysis representations, such as are implemented in Webgrid5 (Shaw & Gaines, 2010). *Figure 1* below shows construct clustering (using SPSS) in grids E & F from McKay (1992, p.67, Figure 3), where Grid F is identical to Grid E but for three constructs reversed.

Slow/Quick and Quiet/Talkative are both reversed in Grid F and retain their link, however the reversal of Calm/Emotional (to Emotional/Calm) enables a link to be formed with the distant (in Grid E) construct of Caring/Selfish.

The configurations from correspondence analysis [here from SPSS, but also the primary grid representation method in Gridcor (Feixas & Cornejo, 2004)] are shown in *Figure 2* and also show substantive differences in the configurations when some constructs are reversed.

Such differences will also be found in singular-value-decomposition representations where the grid data is double-centred (to remove mean effects) and in unfolding solutions, such as that shown by Leach, Freshwater & Aldridge (2001). The problem is thus not a trivial one, and requires a solution.

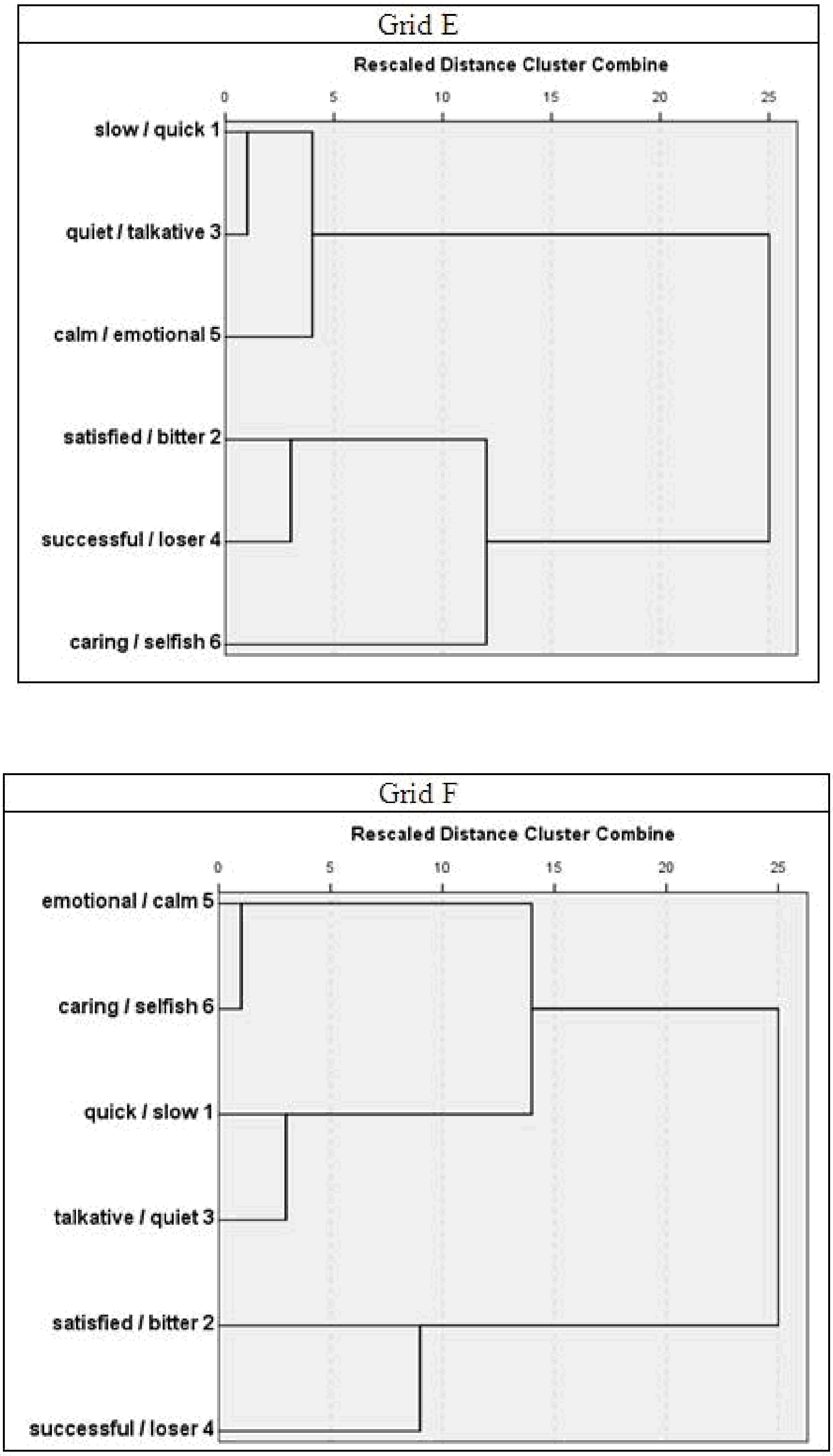

Figure 1: *Effect of construct reversal on construct cluster solutions.*

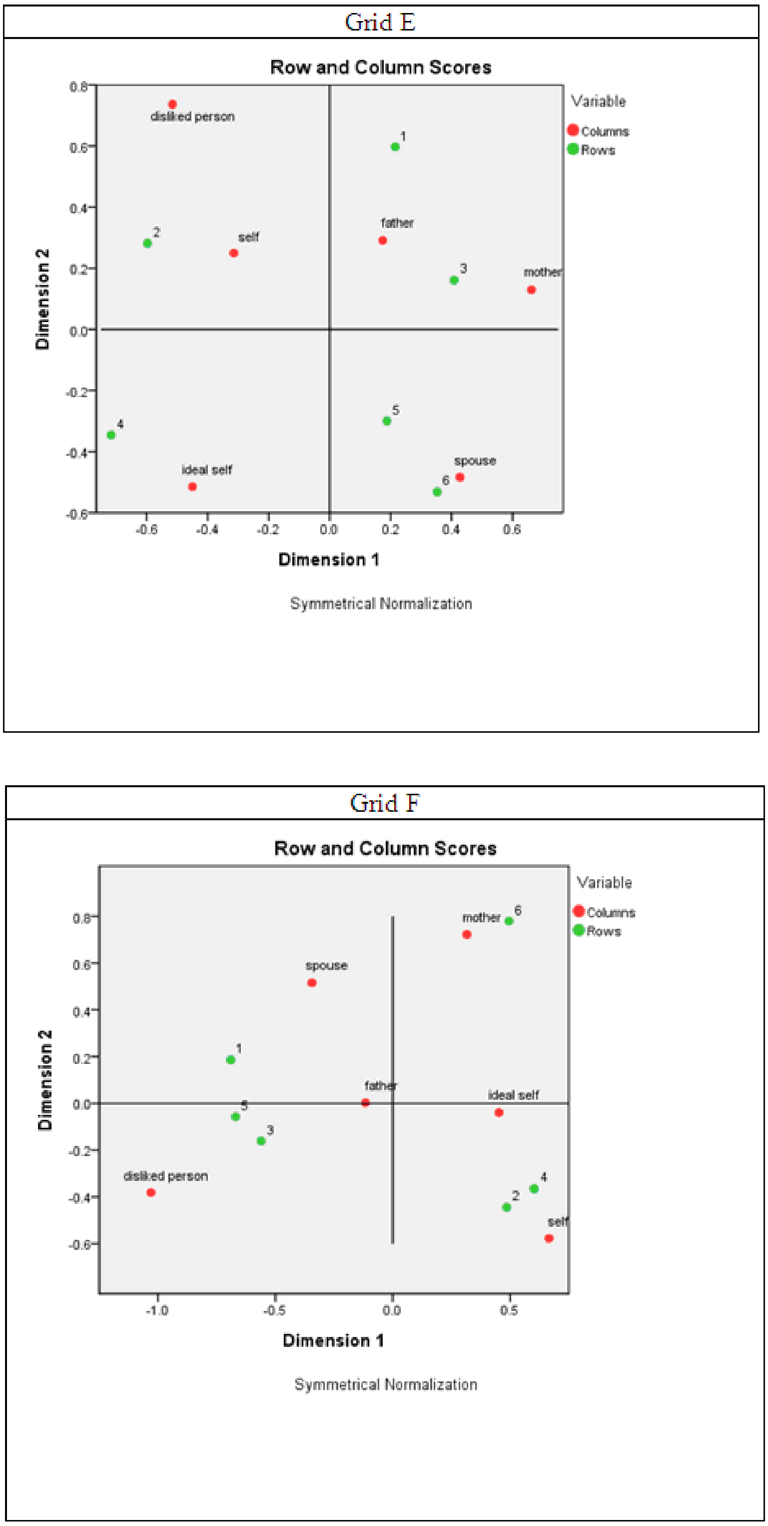

Figure 2: *Effect of construct reversal on correspondence analysis solutions.*

SOLUTIONS

In individual instances it is possible to align the grids simply by asking the respondent to indicate the preferred pole. In some cases, particularly with grids set in less personal domains, the preferred pole may not be readily identified by the respondent. In research settings with grids collected in a less individually supervised fashion respondent input may not be possible. Another approach might be to use some desirable figure, such as ideal self, to indicate the preferred pole. Again, in less personal settings, there may be no such figure, and indeed even in clinical settings it may well be that the ideal self is not aligned with either pole of a construct (see Winter, Bell & Watson, in press).

Particularly in research settings where multiple grids are involved, it might be valuable to have an approach by which constructs in different grids can be similarly aligned. Information on the alignment of constructs is provided by the construct correlations. However such information is often difficult to interpret. This is illustrated by consideration of an example, a grid from the study by Haritos, Gindidis, Doan, and Bell (2004) in which there is no Ideal Self figure to anchor construct poles (*Figure 3*).

Although some constructs may seem unaligned with others [eg *relaxed - worried* & tense or *accept it as it is – loves to argue* go against what appears to be the general trend of negative poles on the left] it is not obvious how constructs should be aligned. The correlations among constructs are shown in *Figure 4*[1].

The general trend can be identified by examining the discrepant signs of loadings on the first principal *component*. This can be used to identify constructs that should be reflected [pole labels and ratings reversed]. The construct loadings on the first principal component are shown in *Figure 5.*

Five of the loadings have positive signs (although a couple are quite small) and four have negative signs. If we reflect those with negative signs (as shown in *Figure 5*) we obtain the correlation matrix shown in *Figure 7*. The reversals are as shown in *Figure 6*.

The original correlation matrix (*Figure 4*) had 18 pairs of constructs with negative correlations with eight being greater than -0.40. The correlations of reflected constructs show six negative correlations, the greatest being -0.29. Simply trying to identify constructs that need to be reflected by negative correlations would not ensure that *in general* constructs are positively correlated as the first principal component of this matrix (with these few negative correlations) shows as in *Figure 8.*

CONCLUSIONS

The problem of the effect of the alignment of construct poles on grid statistics has never been dealt with in a comprehensive way. It has been shown to have an effect on grid structure and statistics (Bell, 2006; McKay, 1992) and while some solutions have been proposed (eg restricting element comparisons to distances (McKay, 1992), or computing construct-invariant element correlations (Bell, 2006)] these have been restricted to the context of element comparisons and there has been no comprehensive solution.

The problem is analogous to the problem in factor analysis where the initial factor extraction does not result in a unique solution. There the problem has been solved (so to speak) by adopting the simple structure criterion of Thurstone (1945) and rotating the solution to best approximate that. Here it is suggested that grid analysis adopt an analogous criterion, that all constructs be aligned so as to have a similar sign in loadings on the first principal component. While this will not impact on some representations of grids (apart from reversing poles) and some indices such as intensity or PVAFF from construct correlations, it does not distort the grid data (since construct orientation is arbitrary) and might as well be routinely applied.

[1] This and subsequent figures are taken from the output of the current version of Gridstat (Bell, 2009) which contains an automatic detection of misaligned constructs and the option to automatically reverse them as indicated in this paper.

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                              self
                              | Closest friend of the same sex
                              |  | The unhappiest person you know
                              |  |  | A person of the opposite sex that you don't get along with
                              |  |  |  | A teacher you respected
                              |  |  |  |  | Mother (or the person who filled that kind of role)
                              |  |  |  |  |  | A person of the opposite sex that you like more than you dislike
                              |  |  |  |  |  |  | The most confident person you know
                              |  |  |  |  |  |  |  | A person you work well with (at job or on sports team etc)
                              |  |  |  |  |  |  |  |  | A teacher you did not respect
                              |  |  |  |  |  |  |  |  |  |
                    relaxed   4  4  6  5  3  6  5  2  2  6  worried & tense
not so smart (academically)   6  7  6  5  7  4  6  7  4  7  smart (academically)
              dislikes sport  6  3  7  6  4  4  2  3  6  3  loves sports
             not interactive  6  7  5  6  6  5  6  7  7  4  loves people
             not transparent  6  4  5  7  3  7  6  5  6  3  transparent
                 insensitive  4  6  5  4  4  6  5  3  4  2  sensitive
             fearful & timid  5  4  4  6  5  3  5  6  5  5  fearless
                       rough  5  6  6  4  5  7  7  3  5  6  gentle
             accept as it is  5  5  6  7  4  4  6  7  5  5  loves to argue
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Figure 3: *The grid*

	1	2	3	4	5	6	7	8	9
1	1.00	-0.10	0.03	-0.83	0.12	0.23	-0.49	0.66	-0.08
2	-0.10	1.00	-0.47	-0.01	-0.80	-0.35	0.28	-0.19	0.12
3	0.03	-0.47	1.00	-0.04	0.36	0.04	-0.01	-0.24	0.08
4	-0.83	-0.01	-0.04	1.00	0.17	0.21	0.34	-0.49	0.25
5	0.12	-0.80	0.36	0.17	1.00	0.38	-0.05	0.01	0.29
6	0.23	-0.35	0.04	0.21	0.38	1.00	-0.71	0.55	-0.26
7	-0.49	0.28	-0.01	0.34	-0.05	-0.71	1.00	-0.78	0.65
8	0.66	-0.19	-0.24	-0.49	0.01	0.55	-0.78	1.00	-0.54
9	-0.08	0.12	0.08	0.25	0.29	-0.26	0.65	-0.54	1.00

Figure 4: *Construct inter-correlations.*

Un-Rotated Construct Factor Loadings

	1
relaxed / worried & tense	0.73
not so smart (academically) /	-0.39
dislikes sports / loves sports	0.03
not interactive / loves people	-0.55
not transparent / transparent	0.18
insensitive / sensitive	0.64
fearful & timid / fearless	-0.91
rough / gentle	0.91
accept as it is / loves to arg	-0.59

Figure 5: *Construct loadings on the first principal component*

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"not so smart (academically) / smart (academically)" is now "smart (academically) / not so smart (academically)"
"not interactive / loves people" is now "loves people / not interactive"
"fearful & timid / fearless" is now "fearless / fearful & timid"
"accept as it is / loves to argue" is now "loves to argue / accept as it is"
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Figure 6: *Reversal of negative loading constructs.*

	1	2	3	4	5	6	7	8	9
1	1.00	0.10	0.03	0.83	0.12	0.23	0.49	0.66	0.08
2	0.10	1.00	0.47	-0.01	0.80	0.35	0.28	0.19	0.12
3	0.03	0.47	1.00	0.04	0.36	0.04	0.01	-0.24	-0.08
4	0.83	-0.01	0.04	1.00	-0.17	-0.21	0.34	0.49	0.25
5	0.12	0.80	0.36	-0.17	1.00	0.38	0.05	0.01	-0.29
6	0.23	0.35	0.04	-0.21	0.38	1.00	0.71	0.55	0.26
7	0.49	0.28	0.01	0.34	0.05	0.71	1.00	0.78	0.65
8	0.66	0.19	-0.24	0.49	0.01	0.55	0.78	1.00	0.54
9	0.08	0.12	-0.08	0.25	-0.29	0.26	0.65	0.54	1.00

Figure 7: *Construct inter-correlations with some constructs reversed.*

Un-Rotated Construct Factor Loadings

	1
relaxed / worried & tense	0.73
smart (academically) / not so	0.39
dislikes sports / loves sports	0.03
loves people / not interactive	0.55
not transparent / transparent	0.18
insensitive / sensitive	0.64
fearless / fearful & timid	0.91
rough / gentle	0.91
loves to argue / accept as it	0.59

Figure 8: *Construct loadings (with some constructs reversed) on the first principal component.*

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