

Appendix 5.1 Kelly's manual elicitation of a grid

5.1.1 Methodology

What follows is the manual method of eliciting a grid. The methods used in this thesis were computerised and are described in full later. The subject is given:

- (i) an empty grid (the “conceptual grid”) with the constructs as rows and the role titles as columns.
- (ii) the “conceptual grid overlay sheet”, where the subject places in each row the name of a person as prompted (relating to the role title list on the conceptual grid) and
- (iii) a set of instructions.

In selected cells, chosen by the experimenter, circles are placed in cells under constructs which have clinical importance - they are prescribed by the examiner and are grouped into categories called ‘sorts’. In each row there are three boxes (a “triad”), which are of special interest to the experimenter. At the intersection of each row and column is a cell in which the client may place a check mark or not depending upon which pole this construct dimension applies to the figure. Thus all constructs in the repertory are presumed to apply one way or the other to all figures in the list.

In Kelly's original technique, of which there are many variations, the subject is asked for each row to

- Pick out two elements out of a set of three which relate to one of the poles of the

construct,

- Mark these with an 'X' .
- Write down how they are alike under the word 'construct'
- Write down how the third one is different under the word 'contrast'

Besides those marked with an 'X' consider each of the roles (who's names appear in the column headings). Mark these with a tick 'a' (as many as the subject thinks fit).

5.1.2 Calculation of 'factors'

Kelly describes how factor analysis was found to be the best technique applied to the data produced on four different protocols by conventional procedures. Moreno (1934) is one of the earliest reported procedures adaptable for use as a grid technique and Stephenson's (1935) Q-technique involved the construction of a table of correlations; these served as pre-cursors to Kelly's (1955) 'Rep Test'. The Rep Test or Repertory grid analysis or technique was developed by George Kelly and is fully described by Kelly (1955/1991), Slater (1964, 1977), Fransella and Bannister (1977), Shaw (1981), Fransella *et al.* (2004). Kelly originally posed the question of whether there is a simple way to factorise a person's psychological space. Levy (1954) with Dugan (cited in Kelly) were the first to factor analyse Rep Test protocol. Levy (1954) designed a series of studies dealing with the properties of personal constructs which make them amenable to modification or change (Kelly p232). This was in turn based on Bieri's (1953) work in conceptual grid technique

The grid (Table 1) is composed of f figures, c constructs and $f \times c$ intersects and each intersect, when the subject is complete task filling up the group, becomes either an ‘incident’ or a ‘void’. It is an incident if one pole of the construct is checked as applying if the figure; and a void if the figure is assigned to the opposite pole by the omission of a check mark.

Table 1 *An illustrative grid from Kelly (1955/1990) with details in the calculation of the first trial factor.*

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	Σ	$1t_0$	$1t_1$	$1F$
1							✓			✓		✓					☒	☒	☐	5	-10	-10	-13
2				✓	✓			✓						☒	☒	☐	✓			6	16	14	13
3	✓		✓	✓	✓	✓			✓	☒	☐	✓	☒	✓			✓			11	-12	-14	10
4		✓				☒	☒	☐					✓							4	-11	-11	-14
5	✓	☒	☒	☐	✓	✓		✓						✓	✓	✓	✓	✓	✓	12	14	14	17
6				✓	☐			✓						☒	✓			☒		5	15	15	12
22	☒			✓		☐	✓	☒					✓		✓		✓		✓	8	12	12	11
$1t_0$	7	10	7	12	10	7	8	11	2	7	4	7	8	14	13	9	13	12	10				
$1t_1$	12	13	12	17	11	6	3	16	5	6	9	8	7	19	20	16	16	17	17				
$1F$	X	X	X	X	X			X						X	X	X	X	X	X				

Protocol

Step 1. Add the incidents in each column (‘X’s plus ‘✓’ s), S

This gives us a basis for determining a nature of the most general factor or row pattern whose incidents and voids will match the greatest possible number of the cells in total.

This first factor is assigned as $1t$.

Step 2. Let N_c be the number of constructs in the particular RepTest, in Figure 1 $N_c=19$

Step 3. Select half the largest column totals to represent the incident side of the trial

factor leaving the others to represent the void side of the trial factor. Row 1_{to}.

Step 4. In row 1_{to}, there are nine numbers circled which will represent the incident or ‘positive’ pole of the construct. Use a piece of graph paper or index card with the lines coinciding with the boxes in the grid: shade in squares the same size as the cells in the grid under the circled numbers.

Step 5. Use this as your scanning pattern and place it under the first row. Here there are 2 incidents ($Ni'=2$) above the marks and 7 voids ($Nv'=7$) above the marks. These are added to make 9 which is subtracted from Nc . This can be summarized as: $Nc - (Ni' + Nv') = \pm 1_{to}$.

Step 6. Marking a cell as either a void or incident is a 50% chance, that is, 9.5 out of 19. If $Ni' + Nv' < 9.5$, then the construct is being negatively described and a minus sign is inserted before the product.

This calculation is summarised in Table 2. .

Table 2.2 *Calculation of the first factor for the first six rows.*

Row	Ni'	Nv'	$Ni' + Nv'$	$Nc - (Ni' + Nv')$	
				(If $Ni' + Nv' < 9.5$ & insert (-))	1 _{to}
1	2	7	9	10	-10
2	6	10	16	N/a	16
3	4	3	7	12	-12
4	1	7	8	11	-11
5	8	6	14	N/a	14
6	5	10	15	N/a	15

5.1.3 Reflection

If any of the rows yield negative relationships the columns are reflected (also known as ‘reversed’) as follows:

Protocol

Step 1. In column $1t_0$, there are seven negative numbers which will represent the incident or ‘positive’ pole of the construct. Use a piece of graph paper or index card with the lines coinciding with the boxes in the grid: shade in squares the same size as the cells in the grid beside the negative numbers.

Step 2. Use this as your scanning pattern and place it beside the first column.

Step 3. Each void that appears beside one of the seven marked boxes increases the column total by one and each incident has the opposite effect.

Step 4. Call this row $1t_1$

Step 5. Repeat.

This calculation is summarised in Table 3. .

Table 3 *Reflection of $1t_0$*

Column	Total ($1t_0$)	Ni~	Effect	Nv~	Effect	New Total ($1t_1$)
1	7	1	-1	6	+6	12 *
2	10	2	-2	5	+5	13**
3	7	1	-1	6	+6	12
4	12	1	-1	6	+6	17
5	10	3	-3	4	+4	11
6	7	4	-4	3	-3	6

$$*(7-1+6=12) \quad ** (10-2+5=13)$$

The second trial scanning pattern is now used to recalculate the factor loadings for each construct. This is column 1t₁ . Row 1F = scanning pattern which should maximise the algebraic total of matches ie., where the total is >11. In this way an optional scanning pattern is arrived at.

5.1.4 Further factors and factor rotation

Thereafter a second, third or more generalised factor can be “extracted” by developing new factors to fit blocks of remaining rows that are not matched in the scanning procedure. The incident totals are summed forming 2t₀ producing a 2t₀ trial factor. If the factors carry a small number of apparently unrelated loadings and these are highly contrasted in the numerical value of the loading, then the whole grid is scanned with the pattern of an axis bearing a high loading at one pole with a low loading at the other. This will have the effect of ‘rotating’ the axis in the direction of the high value loading. A third, fourth and so on factors and their loadings can be extracted until the number of significant loadings diminishes unless an individual construct stands as worth trying, as Kelly suggests (1955, p209).

Orthogonality and non-parametricity

Kelly (1955, p209) outlined briefly three technical issues concerning the RepTest. If factors are extracted, it is generally hoped that there should be little or no overlap between them and a computational check can be performed to determine whether the

factorial scanning patterns reaches the fiducial limit, anything less and the matches between the patterns can be said to have come about by chance. Kelly (1955, p209) states clearly that this kind of factorial analysis is based on dichotomies rather than scales or scores thus it is non-parametric. There are two features of this type of factor analysis: a factor represents a group of rows with respect to (i)matchings of voids and incidents; (ii) the absolute proportion of voids and incidents. Kelly (1955) further suggests that if only (i) was adhered to, then the analysis would be effectively a *parametric factorial representation* of the rows. Rather, the factor is also ‘balanced off’ proportionately in the same way the rows are. The factor is not like a “*sliding scale which may be moved from side to side along the row; it is not equivalent to the factors one obtains by conventional factorial analysis*” (Kelly, 1955, p210).

‘Sharpening’ of the factors

Kelly found that sometimes the first factor extracted is too ‘flat’ to have any psychological significance and suggested two possible ways to overcome this: (i) creating a scanning pattern that fits the only the rows that produced the first factor, disregarding the other rows for the moment. He also suggests setting a higher fiducial limit on accepting the loadings of such a factor. This creates the possibility of generating two factors.

In the end, Kelly plotted the loadings against the constructs as a horizontal bar graph with the p-values above each total number of matches. This kind of factorial

analysis is non-parametric based on dichotomies rather than parameters or scaling. On the one hand it is quite satisfactory if somewhat tedious to complete this analysis manually.

Significance

Kelly's (1955) next step is to obtain the level of significance by expanding the binomial $(p+q)^n$ (p206). This determines the probability that any number of matchings may be obtained by chance. Kelly suggests setting a fiducial limit of 0.06, which is considered an adequate loading of a factor upon a construct. He points out that if a more rigorous level were insisted upon, more factors would be extracted than would be possible to deal with.