CHAPTER VIII

CROSS-VALIDATION OF ITEMS

8.1 INTRODUCTION

It is not common in this country or anywhere else to validate individual items against the external or independently selected criteria. The usual procedure is to apply the experimental form of the test to a representative sample of the population and find out the item-total correlation known as internal-consistency index for each item. It is on the basis of these indices that the items are selected for the final test or rejected. The test as a whole is subjected to cross validation at the end, but this too is not a very common practice. Cross validation of test is, in fact a very essential feature if any one is to make use of it subsequently. It is, on the basis of this information, that one can estimate the validity of the tool. Sometimes

cross validation of test as a whole is used as a substitute procedure to cross validation of individual items, because, the latter procedure is still more laborious. But as the proverb goes, "more pain, more gain", the cross validation of individual items guarantees the validity of the test as a whole. It also results in shortening the length of the test by eliminating all the non-functioning items. When the whole test is cross-validated there is a possibility that a few non-discriminating items might still be present in spite of which the test as a whole might be proving valid. The item validation procedure eliminates this possibility by weeding out each and every non-discriminating item.

8.2 ITEM VALIDATION

For validating individual items, they were tested by Chi-square procedure. The whole test was administered to the criterion groups selected. The data was tabulated to find out the differential responses of the opposite groups in the criteria. The data is analysed below:

TABLE VIII-1

Differential Responses of the Criterion Groups to the Individual Items of the Introversion-Extraversion Scale

Item No.	Number of introverts endorsing		Number of extraverts endorsing		X^2
	a	b	a	b	
1	34	68	40	56	1.13
2	77	25	37	59	26.15*
3	71	31	42	54	12.46*
4	34	68	50	46	6.37**
5	72	30	76	20	1.50
6	43	59	54	42	3.39
7	38	64	53	43	5.72**
8	81	21	54	42	11.18*
9	58	44	44	52	1.99
10	53	49	70	26	8.36*
11	31	71	44	52	4.38**
12	63	39	78	18	8.23*
13	56	46	67	29	4.05**
14	37	65	18	78	6.72*
15	61	41	41	55	5.12**

Item No.	Number of introverts endorsing		Number of extraverts endorsing		X^2
	a	b	a	b	
16	52	50	34	62	4.26**
17	69	33	86	10	12.74*
18	81	21	53	43	12.16*
19	62	40	77	19	7.48*
20	70	32	40	56	15.69*
21	35	67	49	47	5.00**
22	49	53	20	76	14.95*
23	66	36	82	14	10.17*
24	75	27	48	48	10.66*
25	50	52	56	40	1.37
26	63	39	64	32	0.33
27	31	71	28	68	0.001
28	33	69	26	70	0.42
29	47	55	35	61	1.51
30	59	43	43	53	2.87

* Significant at .01 level of confidence.

** Significant at .05 level of confidence.

(At 1 degree of freedom minimum value of 6.635 is significant at .01 and 3.841 is significant at .05).

TABLE VIII-2

Differential Responses of the Criterion Groups to the Individual Items of the Normal-Neuroticism Scale

Item No.	Number of normals endorsing		Number of neurotics endorsing		X^2
	a	b	a	b	
31	28	32	31	21	1.39
32	12	48	18	34	2.33
33	21	39	27	25	2.60
34	25	35	30	22	3.39
35	35	25	28	24	0.08
36	42	18	41	11	0.72
37	27	33	31	21	1.83
38	31	29	33	19	1.14
39	14	46	10	42	0.09
40	21	39	33	19	7.93*
41	21	39	29	23	4.06**
42	40	20	47	5	7.72*
43	36	24	46	6	11.51*
44	28	32	14	38	3.83
45	23	37	32	20	5.05**

Table VIII-2 (Comtd.)

Item No.	Number of normals endorsing		Number of neurotics endorsing		X^2
	a	b	a	b	
46	29	31	40	12	8.46*
47	33	27	44	8	10.03*
48	48	12	25	27	11.14*
49	26	34	34	18	4.57**
50	37	23	17	35	8.24*
51	22	38	30	22	4.14**
52	43	17	24	28	6.52**
53	13	47	25	27	7.53*
54	28	32	36	16	4.91**
55	21	39	31	21	5.83**
56	27	33	36	16	5.70**
57	32	28	41	11	6.90*
58	20	40	23	29	0.98
59	31	29	12	40	6.55**
60	34	26	28	24	0.01
61	40	20	30	22	1.91
62	25	35	35	17	6.37**
63	40	20	18	34	10.21*

Table VIII-2 (Contd.)

Item No.	Number of normals endorsing.		Number of neurotics endorsing		X^2
	a	b	a	b	
64	41	19	29	23	4.30**
65	28	32	23	29	0.05
66	37	23	25	27	1.57
67	39	21	40	12	1.37
68	25	35	26	26	0.48
69	33	27	22	30	1.32
70	35	25	31	21	0.30
71	30	30	14	38	5.29**
72	34	26	21	31	2.34

* Significant at .01 level of confidence.

** Significant at .05 level of confidence.

8.3 THE FINAL SELECTION OF ITEMS

On the basis of the results of this cross validation by Chi-square method, twenty items from the introversion-extraversion scale and twenty-two

from the normal-neuroticism scale were finally selected. The Chi-square values for all of the selected items are significant either at .01 or at .05 level of confidence.

The values for the rest of the items as given in the tables VIII-1 and VIII-2 were below the significance level even at .05. The items with such values were rejected.

The summary of the values for the selected items of the two scales in terms of preference indices, internal consistency indices and validity indices are given below in tables VIII-3 and VIII-4.

TABLE VIII-3

Preference Indices (P), Internal Consistency Values (r) and Validity Indices (X^2) for the Items Selected for the Introversion-Extraversion Scale (Item Numbers refer to the Final Form of the Inventory.)

Item No.		P Value	r	X^2
1	a	34	.26	26.15
	b	36	.15	

Table VIII-3 (Contd.)

Item No.		P Value	r	X^2
3	a	37	.25	12.46
	b	39	- *	
5	a	40	.39	6.37
	b	37	.10	
7	a	47	.44	5.72
	b	49	.20	
9	a	53	.52	11.18
	b	53	.08	
11	a	52	.25	8.36
	b	54	.18	
13	a	57	.64	4.38
	b	58	.12	
15	a	59	.30	8.23
	b	58	.07	
17	a	57	.16	4.05
	b	58	.29	
19	a	63	.31	6.72
	b	62	.07	
21	a	63	.31	5.12
	b	62	- *	

Table VIII-3 (Contd.)

Item No.		P Value	r	X^2
23	a	63	.22	4.26
	b	63	.42	
25	a	63	.05	12.74
	b	60	.39	
27	a	62	.37	12.16
	b	62	.21	
29	a	65	.17	7.48
	b	65	.43	
31	a	65	.31	15.69
	b	64	.05	
33	a	72	.04	5.00
	b	72	.26	
35	a	77	.09	14.05
	b	77	.26	
38	a	75	.46	10.17
	b	74	.11	
41	a	77	.29	10.66
	b	74	.20	

* r was not calculated for these items because they were not included in the scoring keys. These were used as dummy items, and were not included in the scoring keys of the 2nd and the 3rd forms also.

TABLE VIII-4

Preference Indices (P), Internal Consistency Values (r) and Validity Indices (X^2) for the Items Selected for the Normal-Neuroticism Scale

Item No.		P Value	r	X^2
2	a	22	.45	7.93
	b	20	.23	
4	a	20	.32	4.06
	b	22	.24	
6	a	23	.21	7.72
	b	23	.28	
8	a	23	.31	11.51
	b	19	.03	
10	a	25	.30	5.05
	b	27	.01	
12	a	24	.35	8.46
	b	25	.21	
14	a	26	.27	10.03
	b	27	- *	
16	a	25	.19	11.14
	b	26	.40	

Table VIII-4 (Contd.)

Item	No.	P Value	r	X^2
18	a	26	.41	4.57
	b	26	.01	
20	a	27	.18	8.24
	b	24	.26	
22	a	29	.29	4.14
	b	31	- *	
24	a	29	.08	6.52
	b	29	.34	
26	a	31	.24	7.53
	b	28	.29	
28	a	34	.26	4.91
	b	35	.02	
30	a	27	.08	5.29
	b	25	.31	
32	a	33	.30	5.83
	b	35	.14	
34	a	35	.40	5.70
	b	33	- *	

Table VIII-4 (Contd.)

Item No.		P Value	r	X^2
36	a	60	.24	4.30
	b	63	.48	
37	a	34	.28	6.90
	b	33	.12	
39	a	48	.21	10.21
	b	48	.26	
40	a	50	.38	6.37
	b	46	.21	
42	a	40	.29	6.55
	b	41	.19	

The selected items were assembled into the third form of the Inventory. It contained 42 pairs of items. Items belonging to the two scales were mixed up. Instructions were kept unchanged from the second form. New answer-sheet was prepared and scoring keys for the two scales were developed. Glossary of difficult words was again prepared as

before, by giving the final form of the test to ten preparatory class students and asking them to mark words which they did not understand. To these were added words previously marked while preparing glossaries for the first and the second forms. Only those words from the previous lists were selected, which came within the scope of the selected 42 items and the instructions.

The final form of the Inventory, answer-sheet and glossary are appended at the end (Appendices L, M and N).

8.4 SCORING OF THE INVENTORY

Scoring keys for the two scales were developed just as for the previous forms. Keyed answers are given in the Appendices O and P. The actual scoring stencils which were used for the final scoring purposes are also given in the Appendix Q. These stencils greatly facilitate scoring work. With the help of these, less than half a minute is required to score one answer-sheet. Scoring can be done by

anybody who is moderately educated and oriented a little in this kind of work.

As the number of items in the introversion-extraversion scale are twenty and on normal-neuroticism scale, twenty-two, maximum scores on the two scales can be twenty and twenty-two respectively. High score on the former scale denotes introversion, and low score extraversion. High score on the latter scale denotes neuroticism and low score, normal condition.

8.5 SUMMARY

Cross validation of tests cannot be over-emphasized in psychological measurement. Once the test is constructed, the concurrent and the predictive validities should be determined on the basis of independent criteria. It was discussed in the last chapter that so far as the present test was concerned, the concurrent validity was to be determined. Data for this purpose was collected from the criterion groups selected independently. It yielded the

validity indices in terms of Chi-square values. The items with significant Chi-square values were selected and the others were rejected. They were assembled into the third and the final form of the Inventory; a separate answer-sheet and glossary were prepared; and the scoring keys were developed. The final form of the Inventory contained forty-two pairs of items, twenty belonging to the IE scale and twenty-two to the NN scale.

REFERENCES

1. American Psychological Association, Technical Recommendations for Psychological Tests and Diagnostic Techniques. Supplement to Psychol. Bull., LI, No.2, 1954.

2. Anastasi, Anne, Psychological Testing. New York: The Macmillan Company, Ch. VI, 1955.

3. Cureton, E.E., 'Validity' Chap.XVI in Educational Measurement, E.F.Linquist (Ed.),Washington D.C., American Council on Education, 1951.

4. Davis, F.B., Item Analysis Data. Cambridge: Harvard University Press, 1949.

5. Davis, F.B., "Item Analysis in Relation to Educational & Psychological Testing". Psychol. Bull., XLIX, 97-111, 1952.

6. Edwards, A.L., Experimental Design in Psychological Research. New York: Rinehart & Co., Ch. V., 1960.

7. Guilford, J.P., Psychometric Methods. New York: McGraw Hill Book Co., Ch.XV, 1954.

8. Long, John A., et al., The Validation of Test Items. Bulletin No.3 of the Department of Educational Research, University of Toronto, 1935.

9. Thorndike, R.L., Personnel Selection. New York: John Wiley & Sons Inc., 1949.

10. Vernon, P.E., "Indices of Item Consistency and Validity". Brit. J. Psychol. (Statistical Section): I, 155-166, 1948.