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TREATMENT CHANGES IN SYMPTOM PATTERN EVALUATED BY CONFIGURAL FREQUENCY ANALYSIS

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Configural frequency analysis (CFA) is a method of analysing n-dimensional contingency cubes formed by n binary characteristics (symptoms, effects) observed in each of a sample of N individuals (subjects, patients) proposed by the author (LIENERT, 1968) for classifying patients according to symptoms (LIENERT and v. KEREKJARTO, 1969; LIENERT and MATUSSEK, 1970) or subjects according to drug effects (LIENERT, 1970).

As will be shown, the CFA may be used also for evaluating changes in symptom pattern by comparing symptom patterns before and after treatment, where treatment means elapse of time or administration of a drug. The following example (LIENERT, 1964) stems from experimental psychopathology, where symptoms were induced by lysergic acid diethylamid (LSD) and 'treated' by mental activation.

METHODS AND OBSERVED FREQUENCIES

N = 65 volunteering subjects recieved 1,25 gamma/kg body weight LSD-25 (Delysid^{R}). Three symptoms were rated: (1) Black outs = B, (2) Thinking disturbances = T and (3) Affective reactions (compulsive laughter) = A as either present (+) or absent (—). The resulting $2^3 = 8$ symptom patterns (configurations) and the frequencies f with which they occurred in the 65 subjects are shown in table 1.

The subjects were given different tasks and tests of paper-pencil and performance type for about 4 hours. After relaxing half an hour the 3 symptoms were rated again for presence or absence. The observed frequencies f of the symptom pattern persisting are listed in table 2.

TABLE 1

Configural frequency distribution of N=65 Ss over n=3 (all-or-none) symptoms *before* treatment

B	T	A	f	e	χ^2
+	+	+	20*	12,5	4,5*
+	+	—	1	6,8	—
+	—	+	4	11,4	—
+	—	—	12*	6,2	4,8*
—	+	+	3	9,5	—
—	+	—	10*	5,2	4,4*
—	—	+	15*	8,6	4,8*
—	—	—	0	4,8	—
Sums:			65	65,0	

TABLE 2

Configural frequency distribution of (the same) N=65 Ss over (the same) n=3 symptoms *after* treatment

B	T	A	f	e	χ^2
+	+	+	1	0,5	—
+	+	—	5	3,4	0,8
+	—	+	2	1,8	—
+	—	—	9	11,3	0,5
—	+	+	1	1,5	—
—	+	—	8	9,5	—
—	—	+	5	5,1	—
—	—	—	34	31,8	0,2
Sums:			65	64,9	

METHODS AND EXPECTED FREQUENCIS

The frequencies expected under the null-hypothesis of no inter-association between the n=3 symptoms are calculated from the one-dimensional marginal sums by the general formula

$$e = f_{i..} f_{.j.} f_{..k} / N^{n-1},\ i, j, k = + \text{ or } -$$

Thus for table 1, $e_{+++} = 37.34.42/65^{3-1} = 12{,}5$ since $f_{+..} = 20+1+4+12 = 37$, $f_{.+.} = 20+1+3+10 = 34$ and $f_{..+} = 20+4+3+15 = 42$.

Analoguously, for table 2 configuration $e_{-+-} = 48 \cdot 15 \cdot 56/65^2 = 9{,}5$ since $f_{-..} = 1+8+5+34 = 48$, $f_{.+.} = 1+5+1+8 = 15$ and $f_{..-} = 5+9+8+34 = 56$.

Performing an interpreting CFA

If the expected frequencies exceed 5 or at least 2 the difference between observed and expected frequencies may be evaluated according to its component of $\lambda^2=(f-e)^2/e$ for 1 df, as has been done by setting a star to the λ^2 components of observed frequencies exceeding significantly (5% level) their expected frequencies and thus form a configural class of interelated symptoms.

As may be seen from table 1, the untreated Ss constitute 4 significant classes, one trisymptomatic class equivalent to Leuners (1964) psychotoxic syndrom and 3 monosymptomatic classes somewhat related to Kretschmers ixoid type (+——), schizoid type (—+—) and cycloid type (——+).

After treatment these classes disappear and the observed frequencies of the 8 configurations agree with the expected frequencies, as may be seen from table 2. Thus, treatment has not only reduced the number of symptoms, as is shown by comparing the respective marginal sums

	Untreated - - - - - - -	Treated
Blacks outs	$f_{+..}=37$ - - - - - - -	$f_{+..}=17$
Thinking dist.	$f_{.+.}=34$ - - - - - - -	$f_{.+.}=15$
Affective r.	$f_{..+}=42$ - - - - - - -	$f_{..+}=9$

but has changed or broken up their interassociation, which gives rise to the conclusion that at least in the experimental situation described treatment has affected change of symptom patterns by dissolving syndroms (as symptom clusters) to singular symptoms.

Discussion

Applying CFA in a sample of psychiatric patients before and after some treatment is suitable for identifying effects of new psychotropic drugs, the results being conclusive only if they are controlled by another sample of patients rated as to effects before and after a comparable time intervall without treatment, or with a standard treatment.

Of course, from an experimental point of view the following CFA-procedure is more appropriate: divide a sample of 2N patients at random in N experimental patients (new drug) and N control patients (placebo or known drug) and introduce presence or absence of treatment as a further all-or-none characteristic in a CFA with

2N patients and m symptoms. Compute then the observed and the expected frequencies as well as the χ^2 components for all $2(2^m)=2^{m-1}$ patterns and compare the resulting classes with and without treatment!

In the latter case with mutually independent groups of patients per pattern, configural change may be evaluated additionaly by $\chi^2=(f_t-f_u)^2/(f_t+f_u)$ for 1 df, where f_t=frequency of treated patients, f_u=frequency of untreated patients in a given symptom pattern.

In this case, treatment effect may be measured by an index of configural validity $r_{tu}=(f_t-f_u)/(f_t+f_u)$ (see LIENERT, 1969) varying from −1 (a pattern solely found in untreated patients) to +1 (a pattern only found in treated patients). Proceeding in this way with the frequencies of tables 1 and 2 would be incorrect as independence is lacking in a sample of patients rated twice.

SUMMARY

Configural frequency analysis is a new technique adapted here for evaluating change in patterns of all-or-none symptoms. Rating of 3 LSD induced symptoms before and after 'treatment' (=elapse of time) gave rise to the conclusion that — besides reducing the number of symptoms present — syndroms (as clusters of interdependent symptoms) disappeared in favor of singular, mutually independent symptoms.

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