

Higher-order Q analysis of a range of personality and psychophysiological variables

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Summary—A battery of 40 personality and psychophysiological tests was administered to 20 subjects, each of whom participated in 30 hr of individual testing, and the measures subjected to higher-order Q analysis. Principal Components analysis with Oblimin rotation revealed two 'types' at third order, suggesting a simple two-dimensional typological structure. The first described the excitatorily strong, extraverted, sensation-seeking vs the mobile type, and the second the conditionable vs the inhibitory type.

In a previous report, Mangan (1982) described the results of a first-order Q analysis of a wide range of personality, sensori-motor and psychophysiological variables, derived from 20 undergraduate male volunteers, each of whom completed an experimental programme of 30 hr of individual testing. The battery of tests included: Eysenck's E and N measures; measures of motor speed, sensori-motor, perceptual and cognitive ('creativity') flexibility, and imagery vividness; sensory and psychophysiological variables which have been shown in a number of studies to index neo-Pavlovian nervous system properties of strength, dynamism, mobility and lability of excitatory and inhibitory processes. The forty measures, when correlated and subjected to Principal Components analysis and Oblimin rotation, generated seven 'types'. Type labels and descriptors are shown in Table 1.

Table 1. Descriptors for the seven types ranked by order of standard score differences

Type	Label	Detailed descriptors
1.	Mobile vs inert, cognitively flexible	High auditory/visual mobility, high originality/low fluency, weak internal inhibition
2.	Sexually/socially active, extravert, stable	Strong arousal to sexual stimuli, large tactual OR, frequent sexual outlet, extraverted, stable, weak internal inhibition, poor auditory imagery
3.	Stable introvert, labile, strong imagery	High introversion, stability, short after-image duration, strong auditory, visual, tactual imagery
4.	'Arousable', 'conditionable'	Large initial ORs in visual, auditory, tactual modalities, rapid appetitive/aversive CR acquisition, tactually mobile, high frequency sexual outlet
5.	Flexible in sensorimotor responding, careless	Good set reversal, low accuracy, strong internal inhibition
6.	Speedy in clerical tasks, fluent	Fast clerical speed, auditorily sensitive, strong internal inhibition, good visual imagery, fluent
7.	Perceptually (visually) flexible	Good Necker Cube alternation, short after-image duration, introverted

The types emerging from this analysis are themselves correlated. The between-type correlations were therefore entered into a higher-order analysis to reveal more general type groupings. Inter-correlations between these second-order types, in turn, served as input for a third-order analysis, which delineated the most general type distinctions between subjects.

Loadings of the seven first-order types on three second-order factors are shown in Table 2.

Factor 1 contrasts first-order type 1 (secondarily 5) with type 3 (and 6). From this, it appears that the distinction initially made between flexibility in sensori-motor, compared with simple cognitive tasks, is untenable at this level of analysis. Rather, the results provide evidence for a general factor of mobility/flexibility. The positive pole is described in terms of high general mobility and weak internal inhibition (type 1) and sensori-motor flexibility and strong internal inhibition (type 5), the negative pole in terms of stable introversion, high lability, high need for internal stimulation (type 3), and psychomotor speed/persistence and strong internal inhibition (type 6). Overall, this pattern of loadings contrasts mobility/flexibility with introversion, internal stimulation and persistence.

Table 2. Rotated loadings, second-order analysis (loadings less than 0.30 omitted)

Type	Factor		
	1	2	3
1	+0.690	—	—
2	—	—	+0.604
3	-0.716	—	—
4	—	-0.800	—
5	+0.498	+0.469	—
6	-0.359	+0.500	+0.369
7	—	—	+0.730

Table 3. Rotated loadings, third-order analysis (loadings less than 0.30 omitted)

Type	Factor	
	1	2
1	0.83	—
2	—	0.95
3	-0.58	—

It is perhaps worth noting that the mobility and flexibility measures appraise response characteristics to stimuli of predominantly exogenous origin in types 1 and 5, while the introversion/internal stimulation (imagery) attributes of type 3 tap individual differences originating in internally or self-generated modes of ideation and behaviour. The contrast—between high mobility in processing exogenous stimuli and persistence of internal excitation—suggests a general mobility versus inertness/perseveration 'type' distinction, much as Gorynska and Strelau (1979) suggest. A compelling parallel with Extraversion-Introversion is also indicated, the mobile, inventive (type 1) and flexible, careless (type 5) individual contrasting with the stable, introverted, imaginative (type 3) and fluent and sensitive (type 6) person.

Second-order factor 2 juxtaposes type 4 and types 6 and 5, that is, the 'excitable/conditionable' and the speedy, flexible and strong (internal) inhibitory types. A general factor of balance according to dynamism, or conditionability, is thus indicated.

Factor 3, which is indexed by first-order types 7 and 2 (and 6), is characterised by high visual flexibility, strong responsiveness to appetitive (sexual) stimuli, stable extraversion, and, to a minor degree, high clerical speed/fluency. In typological terms, these loadings index the positive pole of a dimension of excitatory strength-weakness, since individuals loading this factor are either sensorily flexible and non-reactive (type 7), stable, extraverted and sexually active (type 2) or speedy in psychomotor activity (type 6). These descriptors all refer to excitatory strength, or 'activity' in J. Strelau's terminology.

Results of a third-order analysis are presented in Table 3.

The first factor, which contrasts second-order factors 1 and 3, is described at the positive pole as the mobile, inventive, weak inhibitory, flexible type, versus the labile, stable, introverted, imaginative type, and, at the negative pole, as the excitatorily strong, stable, extraverted type.

Factor 2 is essentially defined by second-order factor 2, and can thus be described as balance according to dynamism, contrasting the reactive, conditionable type (type 4) with speedy, flexible types who are strong in internal inhibition (types 5 and 6).

CONCLUSIONS

From these analyses, a number of conclusions may be drawn.

In some cases, the types seem to be reflecting more general processes than the factors extracted from comparable R-factor analyses, although in others they appear to be representing more specific behavioural adaptations to the demands of temperament features. Thus, the mobile, inventive, inhibitory, active (in the social and sexual sphere), extraverted, and the 'excitable/conditionable' types have much broader reference than the mobility and conditional reflex acquisition and extinction factors extracted from the R-analyses reported by Mangan (1974; 1978a, b). These types have more in common with the higher-order factors derived from the conjoint analyses of Eysenck Personality Inventory and Strelau Inventory data reported by Strelau and Terelak (1974), Carlier (1979) and Paisey and Mangan (1980).

It may well prove to be the case that there is a hierarchical structure of nervous system properties, parallel to that for intellectual abilities and personality dimensions. The two third-order factors we have identified describe contrasts between excitatorily strong, extraverted, arousal-seeking (in sexual and social spheres) types versus mobile, flexible, inventive types, and between reactive, conditionable types versus inhibitory types; that is, excitatory strength vs mobility, and excitatory dynamism vs dynamism in inhibition. In the case of personality, we have the dimensions of sociability (extraversion), emotionality (neuroticism) and psychoticism (super-ego strength), while 'g' or general intelligence underlies many aspects of individual differences in cognitive performance. These most general descriptors, of course, can be broken down into group and primary factors, including more specific nervous system properties. Which level of analysis is most useful probably depends on the particular situation which is the object of study.

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