6 Correlational and cluster analysis

Aim

The main aim of this chapter is to take a preliminary look at the inter-correlations of some of the fundamental data on our group of Residual Speech Retarded Children. This can be done by studying significant inter-correlations within the correlation matrix and also by a simple cluster analysis of variables.

Method

Thirteen variables in all were used and the rationale for their choice is described in the next chapter. The variables can be roughly grouped as follows:

(a) *Social factors and sex*
1 Social class
2 Language literacy index of mother as rated by social interviewer
3 Sex of child

(b) *Physical and developmental factors*
4 Right–left differentiation difficulties as rated by psychologist
5 Hearing impairment as rated audiologically
6 Test of audiovisual integration (Birch and Belmont, 1964; Kahn and Birch, 1968)
7 General milestone delay

(c) *Cognitive and language factors*
8 English Picture Vocabulary Test (EPVT)
9 Usage of communication code by the child (cf. Bernstein, 1962)
10 Test of Ability to Imitate Gestures (Berges and Lezine, 1965)
11 Ratings of number of immature errors of articulation
12 WISC scatter score (as defined on p. 157)
13 ITPA scatter score

Cluster analysis

One way to identify associations between variables is to use cluster analysis of these variables. The method used on this occasion was the Elementary Linkage Analysis of McQuitty (1957) which was described by Philip and McCulloch (1966) as a rapid and objective method for clustering variables into types. It is dependent on the highest level of association which any one variable has with any of the other variables. Following Kolvin *et al.* (1973a) modifications were adopted as follows:

(i) All correlations below 0·24 were excluded ($p < 0{\cdot}02$ approximately).
(ii) Variables with the highest inter-correlations were used to label the cluster.
(iii) All the rest of the modifications described elsewhere (Kolvin *et al.*, 1973a) proved irrelevant on this occasion. However, all the previously outlined cautions about this type of analysis remain valid.
(iv) Variables from the correlation matrix of Table 15, Appendix 1, were used, but for cluster analysis purposes the variables have been recoded so that a high score indicates a positive quality (see next chapter).

The main cluster identified has been labelled a cognitive cluster (Fig. 1) with a specific focus on vocabulary comprehension as reflected by the English Picture Vocabulary Test. Indeed, the cluster demonstrates the signal importance of comprehension impairments in our Residual Speech Retarded Group. The internal associations within the cluster are clinically meaningful and plausible theories can usually be offered to explain them.

The three main cognitive measures deliberately selected for this analysis consisted of vocabulary comprehension, auditory visual integration and communication code which tap processes basic to language function. Hence, it is not surprising that these constitute a triad with the highest inter-correlations (Fig. 1). However, the salient feature of this analysis is the central and pivotal nature of the measure of vocabulary comprehension which correlates significantly (though not highly) with the majority of the remaining variables. The internal associations within this cluster merit theoretical explanation. The overall importance of *vocabulary comprehension* may be due to it being the central feature of a dysphasic syndrome in a subgroup of children within the Residual Speech Retarded Group; its associations are: gender in terms of a higher proportion of boys to girls; less in the way of hearing impairments; better occupational social class distribution of the family; greater scatter on the WISC subtests (which has been described in childhood dysphasia by de Ajuriaguerra, 1966) and, finally, relatively good motor milestone

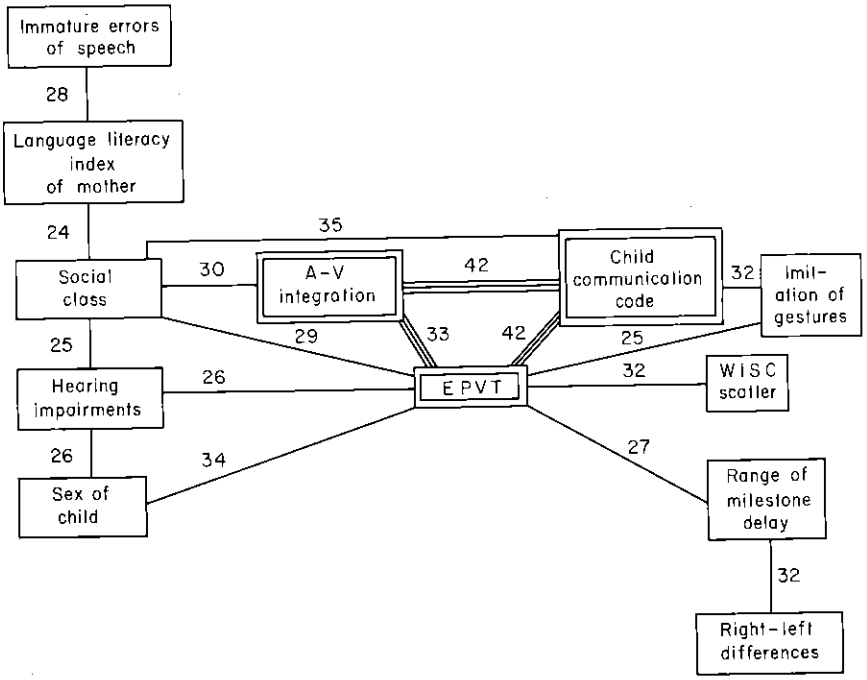

Fig. 1 Cognitive cluster (focuses on comprehension). A–V = audio visual integration; EPVT = English Picture Vocabulary Test. All measures have been scored in the same direction. Treble lines indicate the key links; variables with double margins are key chosen variables. Only significant correlations are included. Immature errors of speech, Hearing impairments, Right–left differences are positive scores (i.e. 'absence of').

development.

The sub-cluster which includes the variable 'language literacy index of mother' merits particular comment. It is discussed further in the next chapter but the feature of particular note is the association between poor language literacy index of the mother and the immature errors of articulation in the child. Does this mean that immature errors are related to slow or uneven developments of speech and language or are they at least in part artefacts of inadequate speech 'training' or conditioning by mothers from poor environments? We would like to hypothesize from these findings that the influence of a poor environment cannot be ignored but our method does not permit firm statements about causal relationships.

Discussion of correlational analysis (see Table 15, Appendix 1)*

Comment will only be made on those associations which were not discussed in the section on cluster analysis.

* Note that the variables have not been recoded in this table.

It will be seen that social class correlates significantly but not highly with the language literacy index of the mother (0·24) and the child's communication code (0·35). From the literature (Bernstein, 1962; Hess and Shipman, 1965; Jones and McMillan, 1973) one would have expected much higher correlations between social class and these other features. Furthermore, the language literacy index of the mother bears no relationship here to the child's communication code. This is surprising, especially as the principles employed in developing both measures were broadly similar. On the other hand, the language literacy index of the mother correlates positively with the articulatory ability of the child and with the child's achievements on the auditory visual integration test. Social class correlates with the test of comprehension (the EPVT) and also with intersensory integration as measured by the auditory visual test. These findings can be interpreted in a number of ways. First, our language literacy score may not be an adequately sensitive measure of mother's language literacy skills. Alternatively, it may be that widespread influences of social factors make a greater contribution to the child's cognitive development than do mother's language literacy characteristics alone.

Over 25% of the other inter-correlations are statistically significant and some merit special comment. While scatter on the ITPA has no significant correlations, scatter on the WISC correlated with the EPVT and auditory visual integration. Why do higher scatter scores go with higher achievements on the two measures of cognition that we have included? One explanation is that if the children scored evenly on the WISC they would obtain a low scatter score; if they did patchily better on certain subtests they would obtain a high scatter score; hence a high scatter score may represent considerable unevenness of abilities. This may occur with children of either good or poor intellectual potential provided they have some special skills. It can also be argued from previous research that such unevenness of abilities is likely to occur in that group of children with dysphasic difficulties (Olson, 1961; de Ajuriaguerra, 1966). If this latter explanation has any validity then a number or a subgroup of children in the Residual Speech Retarded Group must be viewed as having residual speech and language difficulties of a dysphasic nature.

A contribution to our understanding of the associations of our measure of comprehension within the Residual Speech Retarded Group can be gleaned from checking correlations with the non-cognitive variables used in other analyses. The EPVT in fact correlates significantly with a family history of development difficulties (–0·30).

The above correlations are consistent with a dysphasic syndrome in a subgroup of children within the Residual Speech Retarded Group. Some of the previously described clinical features of such a syndrome are reminiscent of the correlations described above and include the male

preponderance, a high family incidence of developmental difficulties, evidence of milestone delay, right/left orientation difficulties, comprehension difficulties and an association with a fairly wide scatter on the WISC.