DIMENSIONS OF TEMPERAMENT IN INFANT SCHOOL CHILDREN

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INTRODUCTION

The study of the classification of behaviour disorders in childhood using a multi-variate approach has been the focus for much attention over the last twenty-five years (Hewitt and Jenkins, 1946; Peterson, 1961; Collins et al., 1962; Wolff, 1967; Kolvin et al., 1974). Such research has tended to be rather one-sided, the main concentration being on the first of the three components proposed by Cattell (1950), who considers behaviour should be investigated under:

(i) What children do—behavioural content;
(ii) How they do it—temperamental style;
(iii) Why they do it—motivation.

In pre-war years, the work of Burt (1937–1938) and Cattell (1946) demonstrated an interest in the subject of temperament but the major advances occurred post-war with the work, for example, of Thomas et al. (1968) in their New York Longitudinal Study. The earlier studies tended to be cross-sectional while the post-war ones were longitudinal, with a particular emphasis on the manner in which temperamental patterns influence the likelihood that a behaviour disorder will develop (Thomas et al., 1968).

AIMS

The present research has two aims: (1) to define dimensions of temperament of infant school children and (2) to suggest an interview procedure to measure these dimensions.

MATERIAL AND METHOD

The subjects of this research derive from the Newcastle Child Development Study (Neligan, 1973). Neligan studied some 13,000 children who constitute the total population of children born in a 3 yr period. We randomly selected 209 infant school children from a one year cohort of the Child Development Study. The sampling yielded an almost equal number of boys and girls (106 : 103). The social class distribution of this sample is very similar to that of the cohort from which it derives that is 9·9 per cent in social classes I and II, 50 per cent in social class III and 30 per cent in social classes IV and V.

*Late of Albert Einstein College of Medicine, New York. Professor Birch tragically was unable to edit this paper.

The instrument used was a semi-structured, open-ended interview with mothers, designed to elicit information on certain aspects of functioning of the child in his daily activities. The information was then converted to scores on scales with clearly defined criteria. This research instrument is based on the questionnaire approach originally devised by MacFarlane *et al.* (1954) to study behavioural content. It was later modified by Grant (1958) into a five point rating scale, which is consistently one-tailed, ranging from absence of abnormality (1) to extreme abnormality (5). Wolff (1967) modified this method and her measure consists of the employment of standard questions in a set order so as to elicit immediately rateable descriptions of what children do in specific situations. She describes her technique as "focused interviewing".

In a similar way, we developed a series of five point scales of temperamental style indicating the degree to which a particular style was present ranging from absence to extreme. Clear descriptions were provided for every point on some of the scales. However, for others this was difficult to achieve and in these, only the two extreme points and the mid-point on the scale are defined. Standard questions or probes (Appendix A) were developed. These were presented in a set sequence to elicit immediately rateable descriptions of how children do what they do, in specific situations. The probes and scales (see Appendix B) were piloted on some psychiatric clinic cases before applying them in the research. The questions were open-ended to allow, where necessary, further exploration of the mother's description until a satisfactory rating could be achieved. Nevertheless the interviewers were trained to follow, as far as possible, the probe questions so that we could be sure that they had been administered in a standard form in a semi-structured interview. The interview emphasis was on *how* the child behaved (Thomas *et al.*, 1968; Graham *et al.*, 1973) rather than on *what* he did. We concentrated on the day-to-day activities over the previous fortnight if considered representative but if not, the interviewer could chose a two week period in the previous month. Like other workers in this field (Graham *et al.*, 1973) our interviewers' ratings were based on examples of behaviour rather than maternal judgements about child behaviour.

The temperamental inventory developed employs the concepts of Thomas *et al.* (1968) and Graham (personal communication) and consists of 48 items relating to some 17 themes. For the purpose of principal component analysis, only 39 items relating to 15 supposedly distinct concepts were chosen. Two kinds of items were eliminated—those in which there were little scatter, and those questionably relevant to temperamental style.

However, this immediately created some difficulties. We had piloted the questionnaire on clinic children but when applied to normal infant school children there was only poor scatter on most of the mood items. Clearly, at this age, moodiness is rare in normal infant school children but rarity does not mean these items are unimportant, especially if the questionnaire was to be used on both normal and abnormal populations of children. We therefore decided to retain these variables in spite of their poor spread and skewness. This will be commented on again.

Principal component analysis

Some decisions had to be made about how to handle the mood items in any multivariate analysis. In all data there are imperfections and no solution appeared ideal. The operational decision we made was to use each item individually in some analyses and to summate them in others. Therefore, in the first Principal Component Analysis we used all 39 items (Table 1) in spite of the skewness of the mood items. It is of course true that linearity may well be upset by extreme skewness, but when the principal component method is employed, unlike factor analysis, no hypotheses need be made about the variates (Lawley and Maxwell, 1963, p. 2).

The rationale for the summation of certain of the items has been touched on elsewhere (Kolvin *et al.*, 1974). In brief it relies on the fact that component analysis is dependent on the inter-relationship of variables and that these will tend to generate components. It is clear, for example, that the following three variables are likely to be inter-related positively and/or negatively: withdrawal—in relation to (1) adults, (2) children and (3) situations.

In the study of behaviour this difficulty was overcome by combining scores on such clearly related variables and using these combined scores as variables. This model was again followed using the following combined scores:

Withdrawal—in relation to adults, children and situations.

Adaptability—adults, children and situations.

Assertiveness—dominance, spontaneous and provoked aggression.

TABLE 1. TEMPERAMENTAL VARIABLES IN INFANT SCHOOL CHILDREN
PRINCIPAL COMPONENT ANALYSIS*

Themes	Items
Mood	at meals, play, bed-time and dressing
Poor empathy	poor empathy
Sulkiness	sulkiness
Intensity	at meals, play, bed-time and dressing
Activity	at meals, play, bed-time and dressing
Irregularity	time of meals, amount at meals, bowels, falling asleep and waking
Approach/withdrawal	adults, children and situations
Adaptability	adults, children and situations
Assertiveness	dominance, spontaneous and provoked aggression
Submissiveness	general and avoids fighting
Dependency	general and specific
Malleability	at meals and bed-time
Attention span	attention, span, impersistence and distractibility
Social responsiveness	response to prohibition and praise

*Probes and definitions of the abbreviated scores can be obtained from the Research Director (I.K.).

Submissiveness—general submissiveness and avoids fighting.
Dependency—general and on parents' presence.
Malleability—at meals and bedtime.
Attention span—poor attention span and distractibility and impersistence.
Mood—mood in four different situations (play, before sleep, dressing and meals).
Intensity—intensity in four different situations.
Activity—activity in four different situations.
Regularity—in various situations.

RESULTS

Reliability and validity

The questionnaire was administered by two interviewers (L.M.B. and E.G.T.) to the mothers of the children. As in previous accounts of reliability of our behavioural instrument (Kolvin *et al.*, 1974) 43 cases were used in an inter-rater reliability assessment and a further 15 in a test–retest reliability. The inter-rater reliabilities of the 39 items ranged from 0·39 to 0·98, with a median value of 0·82. As a whole, theses reliabilities are satisfactory, although they are not as high as was obtained for the behaviour ratings (Kolvin *et al.*, 1974). However, when 4 components of temperament were derived from the 39 items (see below) the inter-rater reliabilities of these 4 dimensions were 0·92, 0·96, 0·98 and 0·94. These 4 reliabilities are higher than the item reliabilities because each relates to a summed score of items; by the Spearman–Brown formula the reliability of a sum is greater than that of its parts (Guilford, 1956). Thus, in spite of the fact that the two interviewers came from different professional disciplines, they achieved satisfactory reliabilities after training in social interviews using the instrument in question. When parents were interviewed one month later (test–retest reliability) about 50 per cent of the 39 items reliabilities were above 0·8 and 80 per cent above 0·6. These test–retest reliabilities, though less impressive than inter-rater reliabilities, are more satisfactory than those described

by Graham *et al.* (1973). We are of the opinion that these better levels were determined by the more structured character of our interview instrument.

In this study at this age range we had very little opportunity for assessing validity although, of course, the items included in the questionnaire have content and (as we shall show later) construct validity. However, the psychologists and the psychiatrists, during interview with the children, rated the children in terms of shyness, negativism and distractibility. Shyness as rated by either the psychiatrist or the psychologist correlated significantly with approach/withdrawal as reported by the parents, but there was little or no correlation between malleability, distractibility, or attention span scores derived from our instrument and negativism and distractibility rated by the psychologist or by the psychiatrist. These low correlations between the psychologist's and the psychiatrist's ratings and the ratings of children's behaviour dependent on reports by the parents are probably explicable in terms of the different interview or observation situations and different definitions of the variables under study. It was our clinical impression that unfamiliar interview situations often exaggerated shyness, but attenuated distractibility and negativism. Further, these reported correlations are not in themselves adequate measures of consistency since they are correlations of global descriptions obtained from mothers with a mere sample of observations in an interview situation. A more systematic assessment of validity will be the task of the next phase of this research.

Principal component analyses

Table 2 shows the first four components which proved sensible clinically. (Only those variables which appear important have been included in the table.) The first three components account for 28 per cent of the variance. However, this is greater than the 20 per cent of the first three components of 40 behavioural variables on the same group of children (Kolvin *et al.*, 1974).

The *first component* extracted was *bipolar* and was labelled *"withdrawal" versus "assertiveness"*. The "withdrawal" pole had loadings on such features as withdrawl from adults and children, takes a long time to adapt to or get used to people or situations, and the child is over-dependent on parents. At the other pole, there are loadings on such features as showing assertiveness or dominance over the other children and responding assertively in the face of provocation.

The *second component* was a general one labelled *"activity, intensity, poor malleability"* and accordingly has high loadings on such features.

The *third component* was a *bipolar* one which proved difficult to interpret. At one pole was a series of features representing *mood* and at the other end was the single feature of *distractibility*.

The *fourth component* was again *bipolar* consisting of *poor malleability/irregularity vs poor attention span* and *impersistence*.

The next strategy consisted of reducing the number of variables used as described above. We have also added three variables, namely sulkiness, low empathy and poor social responsiveness. In addition we have included sex and social class as variables. Social class can certainly be regarded as a continuous variable. Sex is a dichotomy, but the inclusion of such data in principal component analysis is common (Moran, 1966). For economy of space we have not included the relevant

TABLE 2. FIRST PRINCIPAL COMPONENT ANALYSIS—WEIGHTS (STANDARDISED)

Named temperamental attributes	CI*	CII**	CIII***	CIV****
Withdrawal—children	0·33	−0·04	−0·04	0·04
Poor adaptability—adults	0·33	−0·05	0·13	0·02
Poor adaptability—children	0·32	−0·07	0·07	−0·01
Poor adaptability—situations	0·30	−0·13	0·02	0·00
Withdrawal—adults	0·29	−0·03	−0·03	−0·04
Withdrawal—situations	0·27	−0·03	−0·14	0·01
Dependency general	0·29	−0·02	−0·03	0·12
Dependency on parents	0·23	0·08	−0·13	0·17
Avoids fighting	0·28	−0·11	0·01	−0·05
Submissiveness	0·21	−0·06	0·04	−0·08
Assertiveness—provoked	−0·19	0·09	−0·04	0·02
Assertiveness—dominance	−0·22	0·02	0·06	0·04
High activity at play	−0·04	0·31	−0·02	−0·19
High activity at dressing	−0·02	0·24	0·21	−0·13
High activity at bed-time	0·03	0·23	0·09	0·13
High activity at meals	0·02	0·28	0·13	0·01
High intensity at bed-time	0·09	0·29	0·05	0·15
High intensity at play	0·09	0·28	−0·09	−0·06
Poor malleability at meals	0·03	0·26	0·09	0·14
Poor malleability at bed-time	0·04	0·26	0·06	0·24
Poor responsiveness to prohibition	0·12	0·24	0·03	−0·11
Spontaneous aggression	−0·11	0·24	−0·06	0·09
Poor attention span	0·09	0·23	−0·05	−0·25
Impersistence	0·05	0·13	−0·04	−0·30
Distractibility	0·01	0·23	−0·17	−0·19
Low empathy	−0·03	0·03	0·22	−0·15
Mood at dressing	−0·01	−0·07	0·53	0·00
Mood at play	0·03	−0·04	0·48	0·05
Mood at meals	0·05	−0·05	0·13	0·09
Mood at bed-time	0·00	−0·06	0·31	−0·04
Sulkiness	0·04	0·11	0·23	0·02
Irregularity—meal amount	−0·06	−0·01	0·06	0·17
Irregularity—mealtimes	0·06	0·15	−0·07	0·33
Irregularity—bed-times	0·03	0·09	−0·03	0·46
Irregularity—waking	−0·06	−0·04	0·02	0·38
Variance	13%	9%	6%	5%
Type of Component	Bipolar	General	Bipolar	Bipolar

Interpretation: *Component I—Withdrawal vs assertiveness. **Component II—Activity intensity, poor malleability, distractibility. ***Component III—Mood vs distractibility. ****Component IV—Irregularity/poor malleability vs poor attention span/impersistence.

tables. The first three components take up 42 per cent and the first four some 50 per cent of the variance. If compared to the analysis of personality data this is quite considerable; Eysenck (1947) found that his first three components took up 34 per cent of the variance.

The first component was a *bipolar* one of *"assertiveness vs withdrawal"*. The second was a *bipolar* one of *"submissiveness vs high activity and poor social responsiveness"*. The third component was also *bipolar*, and appears to be influenced by sex and consists of *"irregularity vs low adaptability*, empathy and poor response to social learning". The

fourth component again appeared to be influenced both by sex, social class and it was a *bipolar* one of negative mood versus poor attention span and low social class.

If each pole of a bipolar component is regarded as a separate dimension then a comparison is possible of the findings of the two principal component analyses.

	First P.C.F.A.	Second P.C.F.A.
1.	Withdrawal	Withdrawal
2.	Assertiveness	Assertiveness
3.	High activity/intensity	Activity/intensity
4.	Negative mood/low empathy	Negative mood
5.	Poor attention span/impersistance	—
6.	—	Submissiveness
7.	—	Poor adaptability
8.	Irregularity	Irregularity in females

As can be seen there is a broad overlap of dimensions derived from the two component analyses. What emerges is that the normal infant school children can be described in terms of the following main dimensions: their withdrawal and poor adaptability; their assertiveness; their high activity and intensity; mood; their distractibility and attention span; and irregularity. The above component analyses have, therefore, delineated components and dimensions of behaviour which would appear to make a significant contribution to an understanding of temperamental organization (Thomas *et al.*, 1968).

Analysis of the components derived from behavioural (Kolvin *et al.*, 1974) and the present temperamental data reveals what can be interpreted as a broad correspondence between some of the major dimensions extracted—for instance "neurotic withdrawal" and "acting-out behaviour disorder" in the behaviour analysis; and "withdrawal" and "activity/intensity" in the temperamental analysis. Of course, it is important to know what the correlations are between those dimensions. If indeed they are highly correlated it would lead to some interesting hypotheses about the relationship between temperamental dimensions and a particular form of behaviour disorder. The two most plausible hypotheses which could be advanced and merit consideration are that either the temperamental patterns influence the emergence of a particular behaviour or that temperamental style may just be another way of describing or viewing behavioural phenomena utilizing another jargon or set of terms.

The next point of interest is that temperamental components take up a very high percentage of variance, i.e. with the 39 variables, 28 per cent on the first three components and 42 per cent in the second component analysis. This compares favourably with the component analyses of the behavioural data on the same group of children of 20 and 34 per cent respectively. In the Edinburgh study (Wolff, 1967) using factor analysis, the first three factors account for 31 per cent on 34 variables, and a high percentage of variables were already eliminated because of the small amount of scatter. Indeed, since the component analysis of the temperamental data (especially when using a reduced number of variables) takes up so much of the variance, it seems reasonable to suggest that components deriving from this type of data constitute more fundamental and homogeneous phenomena than components deriving from analysis of behavioural content data.

Finally there are two ways of applying the above findings when providing a

behavioural profile of a particular child. Firstly, one can locate (i.e. classify) the child in a mutually exclusive temperamental category (i.e. being mainly withdrawn or mainly displaying a negative mood). Alternatively, one can locate the child on a series of dimensions deriving from the principal components. This would appear to be a more accurate and meaningful way of describing a child's temperament with potential for more clearly defining individual behavioural differences in infant school children (Thomas *et al.*, 1963).

Measurement of temperament dimensions

Although a series of check lists, questionnaires and inventories have been developed to measure behaviour so far no such instrument has been developed to quantify temperament. This is the main aim of this part of the research.

Elsewhere (Kolvin *et al.*, 1974) we have used principal component analyses to identify the main dimensions of behaviour and we have described the principles underlying the development of a brief behavioural questionnaire for infant school children, based upon the relevant principal component analysis. In this paper we utilize similar principles and methods to develop a parallel temperamental questionnaire.

As already described, we decided to use statistical techniques for selecting items for inclusion on the abbreviated temperament questionnaire. The principles were as follows:

1. We used the four major components of the first principal component analysis.
2. The most important variables in each of the components were selected according to their weight. This is the data which is provided in the subsequent tables. We left out negative weights where these were small and variables which were really the reverse of other variables. The requirement of having positive weights only has meant that occasionally we have had to leave out items with numerically higher loadings. The rationale for this is that many physicians have difficulty in conceptualizing a dimension which has both positive and negative signs and hence we opted for scales with only positive signs. In only one instance have we had to devise a method for dealing with an important negative sign (see below).
3. No variable has been included in more than one component.

This selection of items resulted in there being only one negative weight over the four dimensions. This was assertive/dominance in the first component (Table 3).

Thus, the first component is a bipolar one but can be regarded as unipolar if the assertive negative item is reversed; the first component then becomes one of withdrawal, poor adaptation, dependence and lack of assertiveness. This component can be estimated by adding the scores of the first nine items in Table 2 and subtracting score for assertiveness or, alternatively, by reversing the scoring of this item. The other three dimensions can be estimated by adding the raw scores of the appropriate items together. These items are given in Tables 4–6, together with their unstandardised weights*, reliabilities and standard deviations. Sufficient variables were chosen so that they accounted for 70–75 per cent of the variance of each component.

*Understandardised weight = standardised weight × $\sqrt{\text{eigen value}}$.

The selection procedure resulted in 30 variables being chosen (i.e. about three-quarters of the total of 39). Thus at least three-quarters of the available information is used.

TABLE 3. FIRST COMPONENT, 10 VARIABLES: WEIGHTS, RELIABILITY COEFFICIENTS, *s.d.* AND MEANS

Variable (Unstandardised)	Weights	Reliability	*s.d.*	Means
Withdrawal —children	0·75	0·81	0·82	1·76
Poor adaptability —adults	0·75	0·79	0·81	1·35
Poor adaptability —children	0·73	0·95	0·56	1·17
the situation	0·68	0·60	0·71	1·30
Withdrawal —adults	0·65	0·77	0·88	2·84
Dependence —parent–general	0·65	0·68	0·84	1·85
Avoids fighting	0·63	0·94	1·11	1·65
Withdrawal situation	0·61	0·80	0·83	2·33
Dependence —parent–specific	0·53	0·83	0·90	1·98
Lack of assertiveness	0·48	0·57	0·90	4·04

Estimated reliability of sum of 10 variables = 0·96.
Interpretation: Withdrawal, poor adaptation, dependence, lack of assertiveness.

TABLE 4. SECOND COMPONENT, 8 VARIABLES: WEIGHTS, RELIABILITY COEFFICIENTS, *s.d.* AND MEANS

Variable (Unstandardised)	Weights	Reliability	*s.d.*	Means
High activity at play	0·61	0·81	0·78	1·85
High intensity before sleep	0·56	0·80	0·66	1·47
High intensity at play	0·53	0·71	0·74	1·89
High activity at meals	0·49	0·89	0·65	1·49
High activity at dressing	0·47	0·94	0·44	1·18
High activity before sleep	0·44	0·91	0·60	1·62
Distractibility	0·44	0·82	1·26	3·05
Poor attention span	0·43	0·84	0·84	1·81

Estimated reliability of sum of 8 variables = 0·98.
Interpretation: High activity, distractibility.

TABLE 5. THIRD COMPONENT, 6 VARIABLES: WEIGHTS, RELIABILITY COEFFICIENTS, *s.d.* AND MEANS

Variable (Unstandardised)	Weights	Reliability	*s.d.*	Means
Mood at dressing	0·82	*	0·19	1·03
Mood at play	0·76	0·37	0·24	1·03
Mood before sleep	0·49	0·71	0·12	1·01
Sulkiness	0·35	0·61	0·38	1·08
Low empathy	0·35	0·87	0·85	1·33
Mood at meals	0·20	0·64	0·22	1·05

Estimated reliability of sum of 6 variables = 0·91.
Interpretation: Moodiness/Sulkiness.
*No data because of lack of scatter.

TABLE 6. FOURTH COMPONENT 6 VARIABLES: WEIGHTS, RELIABILITY COEFFICIENTS, s.d. AND MEANS

Variable (Unstandardised)	Weights	Reliability	s.d.	Means
Bed-time irregularities	0·64	0·98	1·24	1·49
Waking irregularities	0·53	0·85	0·81	1·19
Meal-time irregularities	0·46	0·57	1·15	1·43
Call to bed malleability	0·34	0·90	0·85	1·76
Meal-amount irregularities	0·24	0·91	0·82	1·23
Call to meals malleability	0·20	0·86	0·80	2·05

Estimated reliability of sum of 6 variables = 0·94.
Interpretation: Irregularities and poor malleability.

Description of dimensions obtained

The first dimension has already been described. The second was a unipolar dimension compounded of high activity, intensity and distractibility. The third dimension is also unipolar and is essentially concerned with mood. The final dimension again is unipolar and is composed of irregularity and poor malleability. The average correlation of each dimension with its constituent items is as follows:

Withdrawal $r = 0·67$; Irregularity $r = 0·50$; activity, etc. $r = 0·55$; mood $r = 0·41$.

While these correlations are only moderate they are highly significant in relation to the size of the population under study. On the other hand, the intercorrelation of the dimensions with each other are low enough to encourage optimism that they are measures of relatively independent facets of temperament.

	Activity	Irregularity	Mood
Withdrawal	0·07	0·04	−0·02
Activity		0·25	−0·01
Irregularity			+0·01

Means and s.d. of components and their constituent items

Table 7 provides what could be considered tentative sex specific norms for each of these component scores calculated as described above. From this and previous tables a difficulty specific to mood items and dimension becomes apparent. Because of skewness the standard deviations of some mood items and the mood dimension are misleading. The only way of handling such data is to regard mood as a dichotomous variable of low and high mood, scores of 6 and 7 being low and 8–11 being high. This overcomes the problem of calculating a standard deviation on skewed data and allows the data to be correlated in a more valid fashion.

The table also provides scores at the level of one standard deviation above the mean for the other three dimensions. This implies that high levels of withdrawal consist of scores of 26 and above for boys, 27 and above for girls, high levels of activity 18 and above for both boys and girls; and high levels of irregularity 12 and above for boys and 14 and above for girls. We venture to suggest that most research workers and clinicians would find this instrument useful in identifying infant school

TABLE 7. SEX SPECIFIC NORMS FOR TEMPERAMENT—5 yr OLD INFANT

Feature			Boys and Girls		Boys		Girls		Sig
			Mean	s.d.	Mean	s.d.	Mean	s.d.	
	+1	s.d.	25·98		25·16		26·74		
Withdrawal		M.	20·33	5·65	19·59	5·57	21·08	5·66	NS
	−1	s.d.	14·68		14·02		15·42		
	+1	s.d.	17·62		17·88		17·38		
Activity		M.	14·32	3·30	14·44	3·44	14·21	3·17	NS
	−1	s.d.	11·02		11·00		11·04		
	+1	s.d.	12·14		11·01		13·12		
Irregularity		M.	9·09	3·05	8·66	2·35	9·53	3·59	$p < 0.05$
	−1	s.d.	6·04		6·31		5·94		
Mood		M.	6·50	1·02	6·71	1·19	6·28	0·75	
Mood	High %		18·7		29·2		8·4		
	Low %		81·3		70·8		91·6		$p < 0.01$

children with such high levels of temperamental style and that scores at the other extremes of these dimensions would just be regarded as evidence of normal temperamental functioning.

DISCUSSION

Method

It could be argued that the difficulties inherent in using items with poor spread are such that the data from the second component analysis, where summated scores of similar items were used, could constitute a better basis for establishing a temperamental state. However, we have demonstrated that components derived from the second analysis are already in a sense a summary, and we wished to use the original items to generate our dimensions. A re-analysis of our data reveals that in practice it would have made little difference but the advantage is that the method we employed leaves the user a clear picture of the constituent items. Questions could also be raised about the design of the mood items. These have been subsequently adjusted but to no great effect as it appears that moodiness is not characteristic of most infant school children. Nevertheless, it is conspicuous in a small percentage of children and in these it is clinically important. Furthermore we have subsequently examined the mood dimension in slightly older maladjusted children during the course of major studies at this research department. Here we have found a more adequate spread which gives rise to a greater degree of confidence in the use of this dimension with maladjusted children.

Value of instrument

Thomas *et al.* (1968) provide extensive evidence to support their hypothesis that a wide range of personality characteristics (i.e. temperamental characteristics) interacting with the parental environment are predictive of the development of behaviour disorders in young children. However, they report that no single temperamental trait acted alone but rather that combinations of traits or clusters

tended to influence behaviour. Furthermore, different combinations of temperamental patterns appeared to be associated with different types of behaviour disorders. Graham *et al.* (1973) point out that the useful distinction between mental illness and personality (or temperament) in adults is less easy to uphold in childhood. Nevertheless they see it necessary to consider separately the adverse temperamental characteristics "and symptoms of behaviour and emotional disorder, even though, to some degree, the symptoms of psychiatric disorder can reasonably be regarded as extreme deviation of personality traits". Further Graham *et al.* (1973) and Thomas *et al.* (1968) have demonstrated that such adverse temperamental characteristics predict the later development of disturbance in both middle class and working class populations respectively. Patterns of temperamental characteristics are therefore of fundamental importance to psychiatric assessment. A systematic developmental history can provide data upon which judgments about the child's early temperamental characteristics can be formed, especially of those extreme patterns which appear to be associated with the present behaviour disorder. The picture is completed by the collation of current temperamental characteristics which is always more valid and less liable to distortion than retrospective data (Thomas *et al.*, 1968). It also will tell us quite a bit about the temporal stability of the temperamental characteristics in the child under scrutiny.

So far there has been little in the way of easily utilizable research instruments developed for the express purpose of collecting such data. To our knowledge there are no other studies which provide temperamental data on such a large series of randomly selected infant children. Nor have there been many attempts to ascertain whether there are scientifically identifiable clusters of traits which, when converted to dimensions, allow quantification of that cluster. We hope that the current research will make just this type of contribution to our knowledge in this area.

The research also provides tentative temperamental norms for infant school children. These indicate that at this age girls tend to be more withdrawn than boys but not significantly so and are significantly more irregular. However, a significantly higher percentage of boys show high levels of moodiness.

SUMMARY

A Principal Component Analysis of 39 temperamental attributes on a random sample of 209 infant school children produced four meaningful components. These identified components make an important contribution to an understanding of temperamental organization. A brief questionnaire using the above data has been developed for measuring temperament in infant school children. There are 30 questions with appropriate probes which relate to four components (dimensions): (a) Withdrawal, poor adaptation, dependence, etc.; (b) High activity, intensity, distractibility, etc.; (c) Moodiness, sulkiness; (d) Irregularity. Tentative norms are provided for the above dimensions.

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REFERENCES

BURT, C. (1937–1938) The analysis of temperament. *Brit. J. Med. Psychol.* **17,** 158–88.

CATTELL, R. B. (1946) *Description and Measurement of Personality.* World Books, Yonkers-on-Hudson.

CATTELL, R. B. (1950) *Personality: A Systematic and Factual Study.* McGraw-Hill, New York.

COLLINS, L. F., MAXWELL, A. E. and CAMERON, K. (1962) A factor analysis of some childhood psychiatric data. *J. Ment. Sci.* **108,** 274–85.

EYSENCK, H. J. (1947) *Dimensions of Personality,* p. 35. Keegan, London.

GRAHAM, P., personal communication.

GRAHAM, P., RUTTER, R. and GEORGE, S. (1973) Temperamental characteristics of predictions of behaviour in children. *Am. J. Orthopsychiat.* **43,** 328–339.

GRANT, Q. A. F. R. (1958) Age and sex trends in the symptomatology of disturbed children. D.P.M. Dissertation, University of London.

GUILFORD, J. P. (1956) *Fundamental Statistics in Psychology and Education.* McGraw-Hill, New York.

HEWITT, L. E. and JENKINS, R. L. (1946) *Fundamental Patterns of Maladjustment.* Michigan Child Guidance Institute, Illinois.

KOLVIN, I., WOLFF, S., GARSIDE, R. F., SCOTT, D., TWEDDLE, E., BARBER, L. and CHAMBERS, S. (1974) Dimensions of behaviour in infant school children (In press).

LAWLEY, D. N. and MAXWELL, A. E. (1963) *Factor Analysis as a Statistical Method.* Butterworths, London.

MACFARLANE, J. W., ALLEN, L. and HONZIK, M. P. (1954) *A Developmental Study of Behaviour Problems of Normal Children between* 21 *months and* 14 *years.* University of California Press, Berkeley.

MORAN, P. (1966) The establishment of a psychiatric syndrome. *Brit. J. Psychiat.* **112,** 116.

NELIGAN, G. reported in GARSIDE, R. F., HULBERT, C. M., KOLVIN, I., VAN DER SPUY, H. I. J., WOLSTENHOLME, F. and WRATE, R. M. (1973) Evaluation of psychiatric services for children in England and Wales. In *Roots of Evaluation* (Edited by WING, J. K. and HAFNER, H.), Oxford University Press, London.

PETERSON, D. R. (1961) Behaviour problems of middle childhood. *J. Consult. Psychol.* **25,** 205–209.

THOMAS, A., BIRCH, H. G., CHESS, S., HERTZIG, M. E. and KORN, S. (1963) *Behavioural Individuality in Early Childhood.* New York University Press, New York.

THOMAS, A., CHESS, S. and BIRCH, H. G. (1968) *Temperament and Behaviour Disorders in Children.* New York University Press, New York.

WOLFF, S. (1967) Behavioural characteristics of primary school children referred to a psychiatric department. *Brit. J. Psychiat.* **113,** 885–93.

APPENDIX A. PROBES—EXAMPLES

Probe—approach/withdrawal—in relation to adults

How shy is he with other people? With adults that he knows? Does he ever make the first approach to them? Is he ever shy and lost for words? How is he with adults that he meets for the first time? Is he a bit quiet and subdued with them at first? How quickly does he get over his initial shyness? Has he ever been exceptionally shy—eaten up with embarrassment? Has he ever avoided meetings with adults?

Probe—approach/withdrawal—in relation to children

How shy is he with other children that he knows? Does he have difficulty speaking to them? Does he wait for other children to make the first approach? How is he with children that he meets for the first time? Will he join in their play or chatter easily? Is he a bit quiet and subdued with them at first? How quickly does he get over his initial shyness? Has he ever been exceptionally shy with other children? Has he ever avoided meeting them?

Probe—approach/withdrawal—in relation to new situations and experiences

Situation and experiences. How readily does he take to new situations when he meets it for the first time? e.g. visiting a new place or building he hadn't been in before, or trying some new kind of food? Does he try a new thing immediately? Does he ever show some hesitations? Is he ever really worried about a new experience? Does he need much encouragement? Does he ever turn his back on a new situation altogether? (Make sure that parent understands that first encounter *only* is referred to.)

APPENDIX B.—EXAMPLES

Scale—approach/withdrawal—adults

Usually at ease with others. Will answer readily when spoken to	1
Shows some shyness initially with new contacts but this wears off fairly quickly	2
At ease with people he likes but usually show some shyness and reticence with most acquaintances	3
Shy, anxious, uncomfortable with others. Always waits for them to make the first approach (with the exception of close relatives and friends)	4
Exceptionally shy with others. Acute discomfort amounting to panic. Avoids meeting individuals even though he has known them a long time. Includes children who show no verbal communication with adults outside the family circle	5

Scale—approach/withdrawal—children

Usually at ease with other children. Will answer readily when spoken to	1
Shows some shyness initially with new contacts, but this wears off fairly quickly	2
At ease with people he likes but usually shows some shyness and reticence with most acquaintances	3
Shy, anxious, uncomfortable with others. Always waits for them to make first approach	4
Exceptionally shy with others. Acute discomfort amounting to panic. Avoids meeting individuals even though he has known them for a long time. Includes children who show no verbal communication with children outside the family circle	5

Scale—approach/withdrawal—situations and experiences

Always able to approach and try a new experience/situation immediately	1
Usually tries a new experience immediately, but sometimes hesitates initially	2
Always hesitates a little before deciding to try a new experience	3
Usually worried by new situations and requires time and persuasion before he will try it	4
Always worried by a new situation and always refuses to try it	5