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## Dimensions of Behaviour in Infant School Children

By I. KOLVIN, S. WOLFF, L. M. BARBER, E. G. TWEDDLE,  
R. GARSIDE, D. McI. SCOTT, and S. CHAMBERS

### Section A

#### INTRODUCTION

Much attention has been devoted to the classification of the behaviour disorders of childhood, and various authors have identified what they consider to be clinically homogeneous groups. The alternative to a clinical approach to classification is a multivariate approach in an attempt to identify more scientifically the main dimensions underlying the wide range of behaviour disorders that occur in children. A model for a multivariate classification was pioneered by Hewitt and Jenkins (1946), who delineated three behaviour syndromes:

- (a) socialized delinquency;
- (b) unsocialized aggressive behaviour;
- (c) over-inhibited behaviour.

The Hewitt and Jenkins research was undertaken on 500 cases of problem children referred to a child guidance clinic. Subsequently Field (1967) was able to identify only the unsocialized aggression and over-inhibited syndromes. This may reflect the population she studied (boys in a remand home). The research of Collins *et al.* (1962) was also carried out on a clinic population, as was the more recent Edinburgh study by Wolff (1967 and 1971) of primary school children. In the latter study the principal component analysis was limited to 34 symptoms which remained after the elimination of a number of rare items. Wolff identified four factors which she considered clinically sensible, and labelled them as follows:

- (i) aggressive, acting-out behaviour (14.8 per cent variance);
- (ii) manifest anxiety, *versus* antisocial behaviour (9.2 per cent variance);
- (iii) inhibition and antisocial behaviour (6.8 per cent);
- (iv) disturbances of toilet function (6.3 per cent).

Peterson (1961) used 400 'representative' child guidance cases to derive a 58-item teacher checklist, which was subsequently applied to 831 infant and junior school children (U.K. equivalent). He identified two major clusters, consisting of 'conduct problems' (essentially aggression) and 'personality problems' (essentially withdrawal). One of the few factor-analytic studies of parent symptom ratings of samples of clinic attenders and of normal children has been that of Conners (1970). Conners found reasonable agreement between patients and controls in general factor content of the first five factors, and labelled these 'aggressive conduct disorder', 'anxious inhibited', 'anti-social', 'enuresis', 'psychosomatic disorders'. However, his data suggest that the agreement holds mainly for his first factor.

#### *First aim of present research*

Our aim was to study the dimensions of behaviour, based on parents' reports, that occurred in a random sample of infant school children aged 5 years. Parents of 209 children were interviewed, this constituting a random sample of the Newcastle infant school population. There were almost equal numbers of boys and girls (106 : 103).

#### METHOD

The research instrument developed to measure these characteristics derives from a behavioural rating technique based on mothers' reports of their children's behaviour. The technique was originally devised by McFarlane (1954), and was modified by Grant (1958) and later by Wolff (1967) into a series of five-point, rating scales which are consistently one-tailed ranging from absence of abnormality (1) to extreme abnormality (5) and which yield

reliable ratings based on mothers' reports of their children's current behaviour. Wolff used a focussed interviewing technique employing standard questions and probes in a set order to elicit immediately rateable descriptions of what children do in specific situations.

Questions concerning objective items of behaviour (e.g. bedwetting), concentrate on the frequency and severity of the behaviour, while questions into more subjective items of behaviour (e.g. destructiveness) consist of a set of situation-specific probes into the likelihood of appearance of the particular item. For each item the Wolff inventory provides clear-cut definitions for every grading of severity from (1) to (5). The information upon which these items are based comes from answers to a set series of questions which are open-ended so as to allow the interviewer, if necessary, to explore the mother's description further, until a satisfactory rating can be achieved.

The choice of scales employed naturally depends on the age of the child, and at the examination at five years of age our behaviour instrument consisted of 38 items from Wolff plus two additional items. (Seven other items from the Wolff version were not used at this age range).

#### *Interviewing and scoring*

The probe questions have to be closely followed (administered in a standard and structured form). At the end of each probe additional free questioning is permitted (open-ended interview) until the interviewer feels confident about the rating. A five-point rating scale was used, with each point on the rating scale carefully defined so as to enable behaviour to be rated with an adequate degree of variation or scatter on each variable. The interview lasts three quarters to approximately one hour, the length being dependent, among other factors, on the experience of the interviewer and the presence of behavioural problems.

#### FINDINGS

Table I contains the 40 items included in the first principal component analysis. Table II provides profiles of the first four components

TABLE I  
*Behaviour features—random sample, principal component analysis*

1. Absence of guilt	21. Frequency of tantrums
2. Infantilism	*22. Destructiveness
*3. Restless sleep	23. Truthfulness
*4. Dreams	24. Pilfering
*5. Night waking	25. Wandering
*6. Poor appetite	*26. Solitariness
7. Greedy eating	*27. Relationships with sibs
*8. Finickiness	*28. Nail biting
*9. Obsessionality	29. Finger sucking
*10. Day wetting	30. Sucking, chewing
11. Night wetting	31. Tics
*12. Day soiling	*32. Modesty
*13. Constipation	33. Headache
*14. Cautiousness	34. Abdominal pain
*15. Recklessness	*35. Vomiting
*16. Sensitivity	36. Psychosomatic disorder
*17. Anxiety	*37. Social isolation
*18. Phobias	38. Stammer
*19. School resistance	39. Enunciation
*20. Tantrums	*40. Imagination

\* These features are subsequently selected as constituting the abbreviated behavioural interview scale. See text.

which proved sensible clinically (items with very low loadings have been left out of the table). The first three account for 20 per cent of the variance, which is slightly more than in the Maudsley Study (Collins *et al.*, 1962), of 18 per cent, but less than in the Edinburgh Study where the corresponding figure was 30.8 per cent.

The first component extracted was bipolar and was labelled 'neurotic introversion *versus* recklessness'. One pole had positive loadings on such items as anxiety, sensitivity, social isolation, food finickiness and school resistance, and therefore resembles the manifest anxiety pole of component II of the Edinburgh analyses (Table III). The other pole, which contains the single item of recklessness, has no analogy in the other studies.

The second component was also bipolar. The first pole was an acting-out dimension compounded of sleep and bowel and bladder disorders and aggressive conduct and has been labelled 'externalizing vegetative'. This bears a slight resemblance to Wolff's Factor I in that it includes items of destructiveness, recklessness

TABLE II  
*Principal component analysis*

Variables	Component I	Component II	Component III	Component IV
Anxiety ..	+ .33	- .11	- .13	+ .04
Sensitivity ..	+ .32	- .01	- .20	+ .22
Cautiousness ..	+ .31	- .20	- .22	- .21
Finickiness ..	+ .29	+ .09	+ .20	+ .03
Solitariness ..	+ .27	- .07	- .02	- .12
Social isolation ..	+ .24	- .05	+ .04	+ .10
Obsessionality ..	+ .22	- .16	+ .06	- .04
School resistance ..	+ .19	- .03	+ .22	+ .23
Recklessness ..	- .25	+ .24	+ .18	+ .28
Night waking ..	+ .03	+ .30	- .08	+ .08
Day wetting ..	+ .06	+ .29	+ .01	- .22
Night wetting ..	+ .02	+ .15	- .05	- .20
Destructiveness ..	- .06	+ .27	- .02	+ .18
Vomiting ..	+ .14	+ .26	- .09	- .10
Restless sleep ..	+ .06	+ .23	- .21	+ .08
Relationships with sibs ..	- .02	+ .22	- .16	- .01
Nightmares ..	- .02	+ .20	+ .00	+ .14
Constipation ..	+ .07	+ .20	+ .25	- .24
Tantrums ..	+ .12	+ .20	- .09	+ .33
Poor appetite ..	+ .21	+ .03	+ .35	+ .03
Stammer ..	+ .04	+ .03	+ .29	+ .00
Articulation ..	+ .02	+ .20	+ .10	+ .00
Greedy eating ..	- .17	+ .08	- .28	- .03
Nail biting ..	+ .01	+ .06	- .29	- .08
Phobias ..	+ .16	+ .08	- .17	.00
Modesty ..	+ .12	- .06	- .23	.00
Frequency of temper tantrums ..	+ .17	+ .08	+ .01	+ .34
Lying ..	+ .02	+ .09	- .14	+ .20
Pilfering ..	+ .08	+ .17	+ .01	- .08
Sucking, chewing ..	+ .06	+ .18	- .05	- .27
Finger sucking ..	.00	+ .19	- .06	- .21
Day soiling ..	+ .09	+ .07	+ .16	- .17
Imagination ..	+ .01	+ .04	+ .17	+ .06
% variance	8%	7%	5%	4%
Type of component	Bipolar	Bipolar	Bipolar	Bipolar

*Interpretation :*  
 Component I Neurotic introversion *v.* recklessness  
 Component II Externalizing vegetative *v.* cautiousness  
 Component III Neurosis with anorexia or bulimia  
 Component IV Antisocial school resistance *v.* oral/anal bladder disturbance and cautiousness

and tantrums. However, the other pole of cautiousness has no analogy in the Edinburgh analysis.

The third component appears to represent manifestations of neuroticism associated either with over-eating or under-eating, and was labelled 'neurosis with anorexia or bulimia'.

The fourth component was also bipolar. The one pole was labelled 'antisocial school resistance' and has loadings on such items as tan-

trums, lying and recklessness, but also sensitivity and school resistance. This closely resembles Wolff's third factor and would appear to validate her inference that in primary (here infant) children antisocial behaviour is associated with overinhibited behaviour. The other pole called 'cautiousness and oral/anal bladder disturbance' again resembles Wolff's fourth component.

To summarize, four components were deli-

TABLE III  
*Comparison of behaviour dimensions—between two studies*

Edinburgh maladjusted		Newcastle normative study	
Component	Label	Component	Label
I	Aggressive acting out	IIa	Externalizing vegetative
IIa	Manifest anxiety	Ia	Neurotic withdrawal
IIb	Antisocial		
III	Inhibited and antisocial	IVa	Sensitive, antisocial, school resistance
IV	Inhibited and elimination disorder	IVb	Oral/anal bladder disorder (excretory)
		IIIa	Neurotic anorexic
		IIIb	Modesty and bulimia
		Ib	Recklessness
		IIb	Cautiousness

neated. Each of these was bipolar; there were therefore eight poles, four of which overlapped with the poles described in the Edinburgh research (Table III).

#### *Second component analysis*

The next strategy consisted of reducing the number of variables used in the first component analysis. The rationale for this is twofold—firstly, some pairs of variables mean much the same, such as solitariness or social isolation; and secondly, summing scores on similar items to produce general features provides a better definition of the feature and reduces the small variance within single items (Conners, 1970). Further, this technique substantially increases the variance taken up by each component. The following combinations were used:

Sleep = addition of each child's scores on items of restless sleep, dreams and night waking.

Neurotic inhibition = cautiousness, sensitivity, anxiety, phobias and school resistance.

Excretory disorders = day and night wetting, soiling and constipation.

Antisocial behaviour = recklessness, destructive-

ness, lying, pilfering, wandering.

Bodily mannerisms = nail-biting, finger-sucking, sucking and chewing and tics.

Psychosomatic symptoms = headache, abdominal pain and vomiting.

Temper = tantrums, severity and frequency of.

Social isolation = solitariness, social isolation.

In the second principal component analysis seven variables were added to the above eight sets of summated scores. The first three components accounted for 37 per cent of the variance. In labelling the components only loadings above .30 were considered. The first component extracted was general and was labelled as 'neurotic introversion'. The second component was labelled 'conduct disorder *versus* obsessional neuroticism', with the first pole resembling one of those of the first components analysis (second component). The third component again is bipolar and is more difficult to interpret, but the variables of poor appetite and modesty (associated with neuroticism) appear to be at the opposite poles and so again it bears a slight resemblance to the third component of the first analysis (Table IV).

TABLE IV  
*Behaviour dimensions—Newcastle infants*

First component analysis	Second component analysis	Third component analysis
Neurotic introvert	Neurotic introvert	Neurotic introvert
Recklessness		
Externalizing vegetative	Conduct disorder	Conduct disorder
Cautiousness		
Neurotic/anorexic	Imaginative anorexic	
Neurotic bulimic		Bulimic neurotic
Antisocial school resistance		Antisocial anorexic
Vegetative disturbance (oral/anal/bladder)		
	Neuroticism and modesty	Modesty
	Inhibited obsessional	
		Greedy eating

TABLE V  
*Behaviour*  
*Second principal component analysis*

		Component I	Component II	Component III
Isolation	..	+·39	+·14	-·14
Obsessionality	..	+·36	+·29	+·26
Neurotic inhibition	..	+·35	+·28	-·22
Poor appetite	..	+·34	+·16	+·35
Solitariness	..	+·33	+·16	-·21
Antisocial	..	+·06	-·52	+·24
Tantrums	..	+·25	-·41	-·04
Sibling rivalry	..	+·12	-·30	-·31
Sleep disorder	..	+·28	-·29	+·10
Imagination	..	-·02	+·14	+·57
Modesty	..	+·02	+·16	-·36
Excretory disorder	..	+·26	-·14	-·09
Bodily mannerisms	..	+·18	-·14	-·07
Psychosomatic disorder	..	+·29	-·12	+·19
Speech problems	..	+·10	-·18	-·03
% variance	..	15%	13%	9%
Type of component	..	General	Bipolar	Bipolar

*Interpretation*

Component I Neurotic introvert

Component II Obsessional neurotic *v.* conduct disorder

Component III Imaginativeness and poor appetite *v.* neuroticism and modesty

*Third component analysis*

In the third component analysis (Table VI) the composition of the data set was again changed, and additionally the variable sex was included. The first three components take up 34 per cent of the variance. The first component was bipolar and was labelled 'neurotic introvert *versus* bulimia'. It is likely that the bulimia pole arises as an artefact of the procedure of including in a component analysis symptoms which are the direct inverse of each other. This component again resembles the first component of the first factor analysis. The second component is interesting in that it contains at the one pole conduct disorder features while at the other there are minor loadings on excess modesty and female gender. It would appear reasonable to hypothesize that such aggressive antisocial features are basic to this second component and to males, and the inclusion of the sex variable has better defined the poles. Such hypotheses can only be tested by undertaking sex-specific analyses. It is to be noted that excretory disorders appear on the conduct disorder pole. The third component is bipolar and again broadly resembles the third

TABLE VI  
*Behaviour*  
*Third component analysis*

	Component I	Component II	Component III
Obsessionality	..	+ .47	+ .15
Poor appetite	..	+ .43	+ .04
Neurotic inhibition	..	+ .37	+ .11
Social isolation	..	+ .38	+ .01
Speech disorder	..	+ .02	- .22
Greedy eating	..	- .31	- .13
Sex	..	+ .17	+ .15
Modesty	..	+ .04	+ .14
Antisocial	..	- .10	- .50
Sleep	..	+ .17	- .45
Psychosomatic disorder	+ .05	+ .09	- .03
Excretory	..	+ .18	- .25
Imagination	..	+ .05	+ .11
Bodily mannerisms	..	+ .12	- .27
Temper tantrums	..	+ .11	- .38
Bodily symptoms	..	+ .25	- .29
% variance	..	14%	11%
Type of component	..	Bipolar	Bipolar

*Interpretation*

- Component I Neurotic introvert *v.* greedy eating (bulimia)  
 Component II Conduct disorder *v.* modesty  
 Component III Neurotic bulimic *v.* antisocial anorexic

component of the first component analysis, with poor appetite and over-eating at opposite poles. While an association of over-eating and neuroticism again emerges, the other pole now becomes more clearly a poor appetite-cum-antisocial one.

**DISCUSSION—PRINCIPAL COMPONENT ANALYSES**

There are two ways of describing children. The first consists of using a classificatory approach and the allocation of children to mutually exclusive categories. The second consists of the use of a dimensional model where the dimension consists of a number of symptoms which have been summated. Such quantification also provides a measure of the intensity of the disorder (Quay, 1972), and the child can be located on any number of meaningful dimensions. It is of importance to demonstrate that such patterns can, with reasonable regularity, be identified in different populations of children.

Certain researchers have confined themselves to 'normal' populations, while others have turned their attentions to abnormal populations. It is therefore to be expected that multivariate analysis of data deriving from research with different basic methods, sets of behavioural items collected with different techniques on different populations, will lead to the emergence of different factors or components and hence dimensions.

The two major behaviour patterns which have emerged from principal component or factor-analytic studies have been given different labels, but tend to be broadly similar in feature content:

Hewitt and Jenkins, 1946	Overinhibited neurotic personality	Unsocialized aggressive
Peterson, 1961	Personality Disturbed	Conduct
Quay, 1964	neurotic	Unsocialized psychopathic
Jenkins, 1966	Inhibited	Aggressive
Achenbach, 1966	Internalizers	Externalizers
Wolff, 1967	Anxiety <i>versus</i> anti-social behaviour	Aggressive acting out
Connors, 1970	Anxious inhibited	Aggressive conduct

The features most consistently represented in the neurotic pattern are solitariness, anxiety, sensitivity and shyness, self consciousness and the like. Those in the conduct disorder pattern are: aggressive assertiveness, tantrums, destructiveness, recklessness, disobedience and the like. The universality of these two patterns is borne out by the fact that they emerge in delinquent research (Field, 1967); child psychiatry research (Hewitt and Jenkins, 1946; Collins *et al.*, 1962; Wolff, 1967; Connors, 1970) and children in ordinary schools (Peterson, 1961; and Connors, 1970).

A further pattern has emerged from factorial research, though not consistently, which has been described as immaturity (Patterson, 1964; Quay and Quay, 1965; Dreger *et al.*, 1964). Since many of these features are appropriate to earlier ages or stages of development they could quite easily be described as a 'developmental' behaviour pattern. The features most frequently

described are immaturity/passivity; restlessness; day-dreaming, and preference for younger playmates and activities (Quay, 1972).

The current research into behaviour of normal infant school children uncovers two dimensions (neurotic and conduct) which are broadly similar to those of the authors quoted above. However, Table II reveals four meaningful components, and if one views the poles as separate dimensions there are at least eight groups of features or dimensions. Four of the Newcastle eight overlap with four of the five groups extracted by Wolff. This consistency between different childhood populations suggests the possibility that these four are fundamental poles. The other Newcastle four may be more specific for the infant range. It is interesting that two of these consist of isolated items at a pole (recklessness and cautiousness) in the first two components of the first principal component analysis. The other two which may also be specific to this age range indicate that extremes of appetite in each direction (hyper and hypo) are both associated with evidence of neuroticism.

The other explanation for the difference between our findings and those of the Edinburgh Study is the fact that the Newcastle cohort consists of 'ordinary' and not psychiatrically referred children, and hence the variance of disturbance may be insufficient for the appearance of certain factors or components, particularly since abnormal extremes occur only rarely in a normal population. Abnormal populations are more likely to facilitate the emergence of dimensions with abnormal extremes. It is of interest to note that in our normal population the first factor analysis yielded four bipolar factors, while in the Edinburgh Study of psychiatrically referred children only one of the four factors was bipolar, the rest having items clustering at a single pole.

The Iowa Research (Peterson, 1961), like the Newcastle research, was of normal childhood. The Iowa researchers, however, used teachers' reports, and they describe two factors of 'conduct problems' and 'personality problems.' It is likely that such factors are partly determined both by the source of information and the items included in the study. The large number of dimensions or components described in the

present study attests to the heterogeneity of the behaviour disorders of childhood (Collins *et al.*, 1962). However, since ours was a 'normal' population it is perhaps preferable to describe the behaviours recorded as behavioural patterns which in their extreme form may represent disorders. Further, we have no evidence about the stability of the dimensions found, and some may well be developmental variations which remit spontaneously with maturation (Lapouse and Monk, 1958). Thus the obvious interim explanation for the smallness of overlap between the two studies (Edinburgh and Newcastle) is that one study was based on a clinic sample (Edinburgh) and that some of the emergent dimensions in the other may be specific for the infant school age.

Our conclusions from the present study are that infant school children can be described in terms of the following main dimensions:

- (a) neurotic introvert type behaviour (anxiety);
- (b) acting-out behaviour with positive symptomatology;
- (c) antisocial school resistance;
- (d) bowel/bladder/oral behaviour;
- (e) eating behaviour;
- (f) modesty;
- (g) recklessness-cautiousness.

Except for the major dimensions there does not seem to be a congruence of factors or components between Newcastle five-year-olds and Edinburgh primary school children. One researcher (Conners, 1970) has described such a congruence of factor structure across age especially for conduct disorders and anxiety. However, in the present study a clear-cut conduct disorder dimension does not emerge from the first component analysis and appears only in the second and third analyses where behavioural items have been summated. Only then does the relationship of the externalizing vegetative pattern of the first component analysis with the conduct disorder pattern of the second and third component analyses become apparent. Hence, though there appear to be advantages in adding variable scores as outlined above in terms of reducing the variance within single

items and clarifying some patterns, there is the distinct disadvantage that other patterns may be submerged. For instance, when using the reduced set of variables in the second component analysis, antisocial and excretory items fall into the same pole of the second component; whereas in the first component analysis, while the externalizing vegetative pole of the second component contains excretory features, the fourth component has two dimensions which demonstrate a polarization of antisocial behaviour and excretory behaviour. In other words, the summation of feature scores means that such features cannot exert an independent action in the correlation matrix.

Finally, there is no evidence of an immaturity

component in our principal component analysis of infant school children's behavioural data.

The only evidence of a developmental component in our principal component analysis of infant school children's behavioural data is found in the negative pole of the fourth component in the first component analysis. It has loadings of oral features (sucking and chewing) and eliminative features (wetting, constipation and soiling). However, the features described in the maturity pattern by previous researchers (Patterson, 1964; Quay and Quay, 1965; Dreger *et al.*, 1964) are not similar to those we have found. Such an immaturity pattern may, of course, emerge only in an older age group of children.

## Section B

### INTRODUCTION

There now exist standard ways of measuring and studying behaviour using checklists rated by either parents or teachers (Rutter, 1967 and 1970). The greatest merits of such checklists are that they are simple and easy to complete. Criticisms in terms of weaknesses in that they are dependent on differing sets of standards and interpretations of each individual parent and teacher may be countered by reports of adequate levels of reliability (test-retest— $r = 0.89$  and inter-rater = 0.72 for the teacher scale but reduces to  $r = 0.64$  for scales completed independently by mothers and fathers). But questions about social response and acquiescence set have so far not been adequately answered. Nevertheless, such questionnaires provide a simple and rapid way of rating a large number of children and thus constitute a convenient and simple screen.

However, Rutter *et al.* (1970) report that 'though questionnaire responses from teachers and parents were of similar value in the screening procedure, when it came to more intensive study, parents were able to provide the most useful information'. Indeed, they conclude that parental interview was the 'single most useful method of gathering evidence for the final diagnosis of psychiatric disorder'. Systematic

interviewing is therefore the most sensitive way of eliciting information either for measuring change or for making a contribution towards a diagnostic formulation. Such interviewing can vary through a range from total structure and standardization to their complete absence and arguments have been advanced in favour of both extremes. For research purposes it is particularly important to gather information systematically using a reasonably structured and standard interview.

While depth interviewing is considered important in clinical practice, many practitioners would question the need for interviewing to be undertaken as a standard semi-structured open-ended technique (as used in the current research). Nevertheless, such an instrument may prove useful for those practitioners who are seeking a reliable and standard way of describing behaviour.

### *Second aim of the present research*

In looking at the range of instruments available we considered that the greatest gap was a behavioural inventory geared towards infant school children which would combine intensive interviewing with reliable and valid ratings of childrens' behaviour. We were particularly interested in seeking ways to identify and

measure subcomponents of behaviour in addition to rating behaviour disturbance globally. Although one should ideally try to obtain a comprehensive picture of all possible areas of behavioural deviance, this is often precluded by limited resources. We therefore aimed at developing a research instrument of manageable proportions.

#### METHODS AND FINDINGS

##### *Reliability and validity*

The questionnaire was administered by two interviewers (L.M.B. and E.G.T.) to parents of children with a mean age of 5 years 8 months and with a range of three months on either side of the mean. The two interviewers came from different disciplines and their professional training had been different (psychiatry and health visiting). Both were given rigorous theoretical and practical training in social interviewing. Forty-three cases were rated independently by both the above interviewers (Reliability A). In another fifteen cases test-retest reliability was undertaken by a single rater seeing the same cases more than one month later for re-interview (Reliability B). In ten cases the second interviewer rated the interview using a tape recording made by the first (Reliability C). Overall reliability was obtained by converting product moment correlation coefficients into z scores, which were then summated and transformed back to a correlation. Those items in which there was no scatter were excluded. The mean transformed correlations were 0.89, 0.91 and 0.95 respectively. In the first instance there was a 95 per cent confidence limit that the obtained correlation lay between 0.81 and 0.94; in the second instance between 0.75 and 0.97 and in the third instance between 0.79 and 0.97. We consider, therefore, that there is substantial evidence that our questionnaire has significant reliability.

In all three methods of reliability testing only about 10 per cent of cases had reliabilities below 0.7, and these showed no systematic pattern.

The reliability levels obtained are high. This can probably be attributed to the semi-structured nature of the interviews and the definitions of each point on the rating scales.

Whatever the explanation it gives rise to cautious optimism. Although the behaviour inventory has 'construct validity', at this point in time we had no way of assessing its clinical validity. This will be possible when the questionnaire is used again when the children are 7 years old, at which time independent psychiatric examinations of the children will be undertaken. Comparisons between a random sample of children and children 'administratively' identified as maladjusted (i.e. children attending institutions for the maladjusted) are also planned. The results will be reported in due course.

##### *Principles of reduction of items in the behaviour questionnaire*

We decided that we would seek statistical techniques for selecting items for inclusion in an abbreviated behaviour questionnaire for more rapid administration. The principles of selection were as follows:

- (i) We used the first principal component analysis already described. Only the first three components were taken into account, because they seemed clinically meaningful and important.
- (ii) The most important variables in each component were selected according to their weight. We left out negative loadings where these were small and variables which were really the reverse of the other variables. In this way the first two components become unipolar, but the third component remains bipolar. Sufficient variables were chosen so that they accounted for about 60 per cent of the variance of each component.
- (iii) No variable was included in more than one component. One of the variables was excluded from component 3 because of the relatively small number of children demonstrating this feature. Overall, the 24 variables then accounted for not less than 66 per cent of the total information. For ease of identification these 24 variables have been indicated with an asterisk on Table I.

#### RESULTS

The three components of behaviour are

summarized in Table VII. Components 1 and 2 may now be estimated by summing the raw score of the variables, as they are unipolar; but not component III, which is bipolar. The first component becomes a neuroticism dimension; the second an acting-out, bowel and bladder behaviour disorder (anti-social behaviour disorder) type of dimension. As far as component III is concerned, it is best regarded as consisting of two unipolar dimensions. They seem to be dimensions of, firstly, psychosomatic symptoms (mainly anorexia) and, secondly, phobic disorders with modesty.

By the above method, we have reduced more than 40 behavioural items to 26 without losing more than a third of the total information. Furthermore, we now have a logical way of summing the information so as to provide us with a global score of either the entire questionnaire or sub-component scores in terms of dimensions.

Table VIII gives the inter-correlation between each of the four scales, together and their correlation with the global scores. The average

correlations of the constituent items of each of the four scales with their respective scale scores are also given. In the bottom row of the table are given the average item scale correlations with the global score. It can be seen that the item correlations with their own scales are greater than their correlations with the global scores. This suggests that the differentiation between scales is meaningful. Further evidence in support of this notion is provided by the low intercorrelation between scales. Our scales are not component scores because they consist of unweighted sums of items, but if they had been true component scores the correlations would have been minimal.

The next table (Table IX) provides means and standard deviations by sex for each of the dimensions and for global behaviour. These constitute sex-specific provisional norms which are, of course, very rough, being based on only 100 cases. Elsewhere (Garside *et al.*, 1973) we discuss the prevalence of behaviour disorders. In brief, we point out that while Brandon found a rate of 17.9 per cent in Newcastle, a

TABLE VII  
*Items selected for inclusion in abbreviated behaviour questionnaire and dimensions*

Component I	Component II	Component III
7 variables	9 variables	5+3 variables
Anxiety	Night wakening	+ Poor appetite
Sensitivity	Day wetting	+ Constipation
Cautiousness	Destructiveness	+ Finickiness
Solitariness	Vomiting	+ Imagination
Social isolation	Recklessness	+ Day soiling
Obsession	Restless sleep	- Phobias
School resistance	Poor relationship with siblings	- Modesty
	Nightmares	- Nail biting
	Tantrums	
Interpretation	Interpretation	Interpretation
Neuroticism and withdrawal	Externalizing vegetative (acting-out behaviour disorder)	Psychosomatic symptoms (mainly anorexia) <i>versus</i> phobias and modesty
Estimated reliability of seven variables 0.95	Estimated reliability of nine variables 0.97	Estimated reliability of eight variables 0.98

Note: The reliability of individual items, their means, standard deviations and weights, are available from the first author (I.K.), on request.

TABLE VIII  
*Intercorrelations of items, dimensions (scales) and global scores*

	Neurotic scale	Antisocial scale	Psychosomatic scale	Phobic scale	Global score
Neurotic scale		-.19	.18	.21	.45
Antisocial scale			.07	.11	.66
Psychosomatic scale				-.08	.45
Phobic scale D					.51
Global score					
Average of item correlations with respective scale score	0.58	0.460	0.52	0.61	
Average of item correlations with global scores	0.27	0.31	0.25	0.33	

TABLE IX  
*Sex-specific norms of behaviour—5-year-old infant*

Feature	Boys and girls		Boys		Girls		$t = 2.97$	$p < .01$
	Mean	S.D.	Mean	S.D.	Mean	S.D.		
Neuroticism and withdrawal +1 SD	14.29	13.89	14.60	14.19	12.27	2.33		
M	11.72	2.57	11.19	2.70	12.27	2.33		
Antisocial acting out +1 SD	20.44	20.80	20.07	16.52	3.55	N.S.		
M	16.58	3.86	16.64	4.16				
Psychosomatic symptoms +1 SD	9.38	9.48	9.27	7.42	1.85	N.S.		
M	7.35	2.03	7.29	2.19				
Modesty and phobia +1 SD	8.61	8.15	9.04	6.78	2.26			
M	6.40	2.21	6.04	2.11			$t = 2.35$	$p < .05$
Global behaviour deviance +1 SD	47.95	47.51	48.25	42.99	5.26			
M	42.06	5.89	41.16	6.35			$t = 2.05$	$p < .05$

lesser rate was reported by Atkins and Kolvin (1973) with a circumscribed younger age range. It would not be unreasonable to suggest that 10 per cent of infant school children are clearly disturbed and another 5 to 6 per cent are at least marginally disturbed. When looking for practical guides this percentage (16 per cent) constitutes a particularly convenient cut-off point, as it constitutes a point above one standard deviation from the mean of a normal distribution.

Such cut-offs may prove to be rough but useful guides as to which children require further diagnostic investigation. The abbrevi-

ated questionnaire, therefore, could identify children who merit investigation and could also provide clues as to the type of disorder from which the child is suffering. Subsequent clinical evaluations of the children will indicate whether this is so.

Table IX reveals that at the infant stage girls show significantly more neuroticism and withdrawal, more modesty and fears, and globally more evidence of 'deviant behaviour'.

#### DISCUSSION

The usual procedure of trying to place patients clinically into a small number of

mutually exclusive diagnostic categories cannot cope with borderline cases or with certain unusual disorders. Further, this classificatory approach to disorders is not intended to provide a full and adequate descriptive account of the patients' symptomatology. Some authors have used multivariate techniques in an attempt to identify diagnostic categories more scientifically, but this too has not proved very successful. For instance, less than two-fifths of Hewitt and Jenkins' (1946) 500 cases could be so classified. On the other hand, the greatest strength of the multivariate approach is that the components or factors which are derived can be used to describe children's behaviour along dimensions, and these allow a more accurate representation of the clinical picture. The decision whether to employ categorical breakdown or a dimensional description will be determined by the purpose of the clinical or research exercise. In certain circumstances there may be good reasons for using both.

Two of our four dimensions, namely neurotic withdrawal and externalizing vegetative (which resembles the aggressive acting-out or antisocial factors of other studies), are similar in form, but not in content, to those found in all factor or principal component analyses of child behaviour symptoms. The third dimension relates to a whole series of symptoms centred around poor appetite (anorexia) which is not unexpected in an infant school population. The final dimension is less clearly identifiable, but suggests that modesty is an important component of behaviour at this age range. Finally we have to pose the question of whether behavioural dimensions derived from a normal population can be usefully applied to abnormal populations of children. Evidence from Conner's (1970) research suggests that this technique is valid, since the factors he derived from clinic and non-clinic samples differed only quantitatively. Quay (1972) too has stated that 'the normal and the abnormal only differ in degree'. Additional support derives from Rutter *et al.* (1970), who argue that, with certain exceptions, 'disorders of emotions and behaviour in childhood do not constitute "disease" or "illness" which are qualitatively different from the normal'.

#### SUMMARY

1. The behaviour of infant school children can be described along two dimensions: conduct disorder and neurotic disorder, which are universally recognizable in other multivariate studies. The additional dimensions which have emerged in this study may be more specific to younger children. The content of these first two dimensions and the form and structure of other dimensions described in various studies are determined by the source of information about the children's behaviour (parents, teachers, etc.), the method of eliciting descriptions of behaviour (checklists, interviews, etc.), the population studied, i.e. age (this study), sex (Collins *et al.*, 1962) type of sample (normal, clinic, etc.), items included in the behaviour scales, and whether item scores are summated (Conners, 1970 and this paper). The first two dimensions appear ubiquitous in form though not in content.

2. A brief questionnaire has been developed for quantifying behaviour in infant school children. It consists of 24 questions with appropriate probes which relate to four dimensions. Tentative norms are provided for the above four dimensions.

3. Probes and definitions of scales are available on request (to I.K.).

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