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Patterns of behaviour problems among pre-school children

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ABSTRACT

Background. Previous research has suggested that behavioural problems displayed during the pre-school years are best understood as undifferentiated difficulties in manageability. The present study explored this issue, by examining the structure of British parents' ratings of their pre-school children's behavioural problems.

Method. The 19-item Behavioural Checklist (BCL; Richman, 1977) was completed by 1047 parents of 3-year-old children taking part in an epidemiological survey of child development.

Results. Factor analysis revealed six factors representing poor social adjustment, poor emotional adjustment, sleep problems, over-activity/inattention, eating problems and soiling. When these scores were used as a basis for cluster analysis, problem types clustered around six centres. The first, and largest, grouping was of children with no problems. Three further large groupings displayed specific but moderate problems (over-active, timid, and naughty children). The final two groupings displayed more extreme problems including anti-social behaviour. In one group these were accompanied by severe emotional problems and in the other by signs of hyperactivity. The reliability and validity of these clusters was supported. Parental ratings of behaviour problems taken when the children were 8-years-old suggested that the children in the hyperactive/conduct group were likely to have continued difficulties.

Conclusion. This paper argues against the homogeneity of pre-school behaviour problems but supports the idea that problems of a clinically significant level are likely to be co-morbid, with either problems of emotional regulation (neurotic) or those of behavioural regulation (hyperactive) accompanied by problems of conduct.

INTRODUCTION

One of the tenets of developmental psychopathology is the proposition that difficult early life experiences, often manifested in early signs of maladjustment during infancy and early childhood, are likely to provide the context for the development of poor mental health later on in life (Robins & Rutter, 1990). There is now a great deal of evidence to support this view. Difficult to manage pre-schoolers often go on to display disorder during the school years (e.g. Campbell, 1991), which in turn places them at risk for a range of mental health, conduct and personality problems later on in life (Huessy & Howells, 1985).

Given this evidence it is then not surprising that the attention of researchers looking for the origins of disorder has been increasingly focused on the first 2 or 3 years of life. Until recently, however, attempts to study the significance and associations of adjustment problems in this age group have been frustrated by the lack of a clear understanding of the structure of pre-school problems (Egeland *et al.* 1990).

Researchers have typically responded to this problem by employing factor analysis techniques to identify the dimensions of disorder. A number

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of studies using this 'variable' approach have isolated a broad differentiation between what have been called externalizing (e.g. aggressiveness, destructiveness and inattention) and internalizing problems (anxiety and social withdrawal) (e.g. Achenbach *et al*. 1987). In addition, there is evidence for more fine grained distinctions between dimensions within these two broad bands. Behar & Stringfield (1974) isolated a Hyperactive–Distractable factor and Achenbach *et al*. (1987) found independent dimensions of social withdrawal, depression, sleep problems, somatic problems, aggressiveness and destructiveness. These analyses suggest that patterns of disturbance among pre-schoolers share much in common with those displayed by older children (Hinshaw *et al*. 1987).

Despite this, a number of researchers have suggested that while it is possible to isolate different problem dimensions, the characteristics associated with these dimensions overlap to such an extent that different groups of children with particular problems cannot be distinguished (Campbell, 1990). To address this issue rather different approaches to examining patterns of adjustment are required. In one such approach (see Magnussen & Bergman, 1990 for details) the child, rather than the variable expressing symptom status, is the basic unit of analysis. This 'person' approach looks for configurations of relevant characteristics and attempts to isolate groupings of children with similar patterns of such characteristics. Using cluster analysis of childhood problems, Bergman & Magnussen (1987; see also Wolkind & Everett, 1974; Richman *et al*. 1982, pp. 88–96) grouped children on the basis of ratings of different behaviour problems. Interestingly, the majority of clusters were made up of shared or co-morbid characteristics and no group of children had problems in just one behaviourial domain.

In the present study we investigated the patterns of problems in a group of British pre-school children using a combination of the 'variable' and 'person' approaches. Parents' ratings of problems collected using the BCL (Richman, 1977), a widely used, 19-item, screening tool for problems in pre-school populations, were first submitted to factor analysis and then to a cluster analysis.

Previous studies using this instrument, or a variant designed for completion by nursery teachers (McGuire & Richman, 1986) support its reliability and validity. For instance, cut-offs established on the BCL successfully discriminated between a clinical and non-clinical group (Richman *et al*. 1980). In addition, these cut-offs had predictive validity in identifying problem cases following school entry. Exploration of the structure of the instrument using either cluster or factor analysis suggested the existence of rather broad band distinctions between the groups of emotional and conduct items (Richman *et al*. 1982).

METHOD

Subjects

The data were derived from an epidemiological survey of all children reaching their third birthday during a 1-year period and who were living in a part of the New Forest (New Forest East) or the adjacent area of Southampton and who were registered with a general practitioner (Thompson *et al*. 1996). Data were available for 1047 children. This represented 65% of the total population. A comparison of children in this group with those children not in the study on a range of measures taken from health visitor records suggests that the data presented in this paper were representative of children in the population as a whole (Thompson *et al*. 1996). Eighty-nine per cent of this sample were from two-parent families, 60% had fathers with non-manual or professional jobs, while 12% were unemployed.

At around the time of their eighth birthday 800 of the children (those for whom current addresses were available) were re-contacted and asked to complete a second set of questionnaires. Of these 510 (64%) took part. The evidence suggests that this group appeared representative as they did not differ significantly from the remainder of the original sample in either social background or in the severity of the original problems.

Procedure

When the children were 3-years of age their mothers completed a number of questionnaires. The BCL (Richman, 1977) was designed to be an easy to use screening questionnaire for parents. It consists of 19 items and gives an aggregate score of ratings of pre-school children's

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adjustment in a range of different domains; including sleep, emotional regulation, toilet training, activity and social behaviour. EAS Temperament Scale (Buss & Plomin, 1984) is a 20-item questionnaire which conceptualizes temperament as four dimensional and has separate scales for – emotionality, activity, sociability and shyness. The General Health Questionnaire (Goldberg, 1978) is a 30-item instrument that gives a global measure of the respondents current mental health status. In the present study the standard 3/4 cut-off was used to determine the presence of non-psychotic mental disorder. The mothers of the children who were followed up at around the time of their eighth birthday completed the Child Behaviour Checklist (CBCL; Achenbach & Edelbrook, 1981). Which is a widely used 118-item questionnaire which taps both internalizing and externalizing as well as problems of thought and psychosomatic problems. For the purposes of the present study two of the eight scales, thought problems and conduct disorder, were dropped.

RESULTS

(i) Identifying problem dimensions

The data from the 19 items from the BCL questionnaire were submitted to principal components analysis. The derived factors were rotated to an orthogonal solution and factors with eigein values greater than one were extracted (see Table 1). Table 1 shows the variance accounted for by these six factors and the items with loadings greater than 0·4. Based upon the item to factor correlations these factors were labelled: (*i*) poor social adjustment (SOC); (*ii*) sleep problems (SLP); (*iii*) poor emotional adjustment (EMO); (*iv*) overactive/inattentive (OA); (*v*) soiling and wetting (SOIL); and (*vi*) eating problems (FEED). This analysis provided clear support for a distinction between factors within the behavioural domain (SOC, OA and EMO) and other developmental problems (SLP, SOIL and FEED). Scale scores were calculated by adding those items loading on each factor. SOC, OA and EMO were significantly correlated with each other ($0{\cdot}45 > r > 0{\cdot}21$). In addition, OA was correlated with FEED ($r = 0{\cdot}20$) while SLEEP was correlated with all factors except SOIL ($0{\cdot}18 > r > 0{\cdot}25$).

(ii) Isolating groups of difficult children

Cluster analysis was used in order to investigate the extent to which scale scores on the factors within the behavioural domain, derived from the above analysis, allowed the identification of distinct groups of children with particular constellations of adjustment problems. Scale scores for SOC, EMO and OA were entered into a cluster analysis. K-means cluster analysis was used in which cluster membership is determined using an algorithm based on nearest centroid sorting (Anderberg, 1973). This non-hierarchical technique assigns cases to clusters with the smallest distance between them and the cluster centres. Cluster centres were determined following iteration and the final centres were those in which there was no significant difference between cluster cases and cluster centres fol-

Table 1. *The factor structure of the items used from the BCL questionnaire showing the item to factor correlations*

	Item loading	% of original variance
Factor one; Poor social adjustment (SOC)		17·5
Temper tantrums	0·70	
Difficult to manage	0·63	
Irritable	0·59	
Poor relations with siblings	0·56	
Poor relations with other children	0·48	
Factor two; Sleep problems (SLP)		8·5
Dislikes sleeping alone	0·81	
Frequently wakes	0·77	
Difficult to settle at bedtime	0·65	
Factor three; Poor emotional adjustment (EMO)		7·7
Clingy	0·65	
Worries	0·63	
Fearful	0·60	
[Demanding]	[0·48]	
Factor four; Overactive/inattentive (OA)		7·1
Poor concentration	0·67	
Too active	0·61	
Demanding	0·56	
[Difficult to manage]	[0·43]	
Factor five; Soiling/wetting (SOIL)		6·8
Wets during the day	0·76	
Soils	0·71	
Wets bed	0·60	
Factor six; Feeding problems (FEED)		5·5
Faddy about food	0·84	
Poor appetite	0·83	

Note Items in square brackets ([]) are not used to derive the scale scores used in subsequent analysis as they load more heavily on another factor.

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Table 2. *Cluster centres and sizes of the six clusters of children grouped on the basis of scale scores on the behavioural factors of the BCL*

Cluster	*N*	SOC	EMO	OA
No problems	370	−0·75	−0·54	−0·80
Minor problems				
Active	233	—	—	0·60
Timid	170	—	1·39	—
Naughty	144	0·91	—	—
Severe problems				
Neurotic/Cd	53	2·16	2·10	0·73
Hyperactivity/Cd	54	2·16	—	2·24

Note Scores represent the mean scores for each grouping on the three behavioural factors in terms of standard deviations above or below the mean total sample score on each factor. Only scores that are greater than plus or minus half a standard deviation are reported.

lowing the immediately preceding iteration. The three factor problem scores produced a six cluster solution after a process of 12 iterations from the initial cluster centre estimates. Table 2 shows the cluster centres for these groupings of children in terms of their distance (in standard deviations) from the overall sample mean for each scale score.

This solution was selected following an inspection of the pattern of clusters. At this fusion level there was a step up in the rescaled cluster distance index using Ward's method (see next section) suggesting that when the number of clusters was reduced to five, cases with substantially distinct profiles of scores were being combined. At the more finely grained fusion levels there was evidence of chaining whereby small subgroups within the larger clusters were being separated (Everitt & Dunn, 1991). This led to very small and potentially unreliable clusters with less than one per cent of the sample included.

These groupings differed systematically from one another in terms of both the nature and the severity of their symptoms. Cluster one was the largest grouping and consisted of well adjusted children (36%). The next three largest groupings represented pure behavioural characteristics but at a level short of clinical significance. One large group of children were unusually active (23%), a second were timid (17%), while a third were characterized by mild problems with social adjustment (14%). The final two groups were the smallest, had the most severe problems and had as a defining characteristic a co-morbid association of poor social adjustment with either hyperactivity (5%) or poor emotional adjustment (5%).

(iii) The stability of the solution

The K-means cluster approach was adopted because of its ease of interpretation and computational simplicity. However, it is recognized that cluster solutions obtained from this type of data are often unstable and are likely to vary as a function of the type of cluster analysis techniques employed. For this reason the data were also submitted to a hierarchical method (Ward, 1963). This analysis corroborated the main findings of the K-means cluster analysis. The six clusters had mean factor scores close to those derived by the K-means approach. There were some differences between the two solutions in the number of children placed into each of the groups. For Ward's method, the *N*s were as follows: No problem, 154; Active, 278; Timid, 111; Naughty, 140; Neurotic/conduct disorder, 53; and hyperactive/conduct disorder, 54. The main difference between the solutions concerned the allocation of cases to the no problem and the active groups.

(iv) The reliability of the cluster pattern

The reliability of the cluster structure was assessed using a split half procedure. The total sample was divided at random into two equal sized groups. The data for each half of the sample were then submitted to a separate cluster analysis using the same principles as the main analysis reported above. The cluster centres for the two half-samples were very similar to each other and to that produced from the total sample. In each case the six clusters corresponded to the pattern established in the main analysis. With one group of children having no problems, three with pure but mild problems and two with severe and mixed problems. In addition, the mean difference between the split sample cluster centres and the total sample centre was calculated for each scale score in terms of standard deviations form the total sample cluster mean. For OA it was 0·21, for EMO it was 0·19, and for SOC it was 0·40. Each of these figures representing a high level of consistency between the total and split half samples.

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Table 3. *A comparison of the* 6 *cluster centres derived from the entire sample*

	Mean (S.D.)	Range	Scheffé's test
Overactivity scores			
Total population	2·2 (1·1)	0–6	
1 No problems	1·3 (0·5)	0–2	
2 Active	2·8 (0·6)	2–5	1,3,4
3 Timid	2·2 (0·8)	1–4	1
4 Naughty	2·1 (0·7)	1–3	1
5 Hyp/Cd	4·4 (0·8)	3–6	All
6 Neurotic/Cd	3·0 (1·0)	1–6	1,3,4
Emotional problem scores			
Total population	1·0 (1·1)	0–6	
1 No problems	0·4 (0·5)	0–2	
2 Active	0·5 (0·5)	0–2	
3 Timid	2·4 (0·7)	2–6	1,2,4,5
4 Naughty	0·8 (0·7)	0–2	1,2
5 Hyp/Cd	1·0 (0·8)	0–2	1,2
6 Neurotic/Cd	3·2 (0·9)	2–6	All
Anti-social score			
Total population	1·9 (1·6)	0–8	
1 No problems	0·7 (0·7)	0–2	
2 Active	1·6 (0·7)	0–3	1
3 Timid	1·6 (0·8)	0–3	1
4 Naughty	3·4 (0·6)	3–6	1,2,3
5 Hyp/Cd	5·3 (1·3)	3–8	1,2,3,4
6 Neurotic/Cd	5·3 (1·0)	4–8	1,2,3,4

Note Figures in final column indicate groupings that had significantly lower scores from each group on each problem dimension.

(v) Validating the clusters of children

Concurrent validity

The validity of the problem types suggested by these groupings of children was explored in a number of ways. First, Table 3 shows the cluster means for the three behavioural problems used to establish the cluster centres. Scale scores were submitted as dependent variables in a one-way ANOVA with cluster group as the between-subject independent variable. There were extremely large and significant main effects of group membership on each of the behavioural problem scale scores (Fs $> 285{\cdot}0$). Individual group comparisons were made using Scheffé's test. In all cases differences between scale scores were as expected. Active children scored significantly higher on OA than 'no problem', timid or naughty children. Further, hyperactive/conduct disordered children scored higher on active and inattentive than any other group. Interestingly, the neurotic/conduct disordered group had higher mean OA scores than a number of other groups. Timid children had more problems with EMO than did all the other groups except the co-morbid neurotic/conduct group which had the highest EMO scores. Finally, the three groups characterized as having significantly more problems with social adjustment had higher scores on SOC had than did the other groups. In addition, the two co-morbid groups had higher SOC scores than the group of 'naughty' children.

Table 4. *The differences between the cluster on the BCL feeding, soiling and sleeping scales*

	FEED	SOIL	SLP
1 No problems	1·1 (1·0)	0·5 (0·9)	1·2 (1·3)
2 Active	1·3 (1·1)	0·8 (1·1)	1·4 (1·4)
3 Timid	1·5 (1·1)	0·8 (1·0)	1·7 (1·5)[1]
4 Naughty	1·5 (1·2)[1]	0·8 (1·2)	1·7 (1·4)[1]
5 Hyp/Cd	1·3 (1·2)	1·0 (1·3)	2·4 (2·0)[1,2]
6 Neurotic/Cd	2·1 (1·4)[1,2,3,4]	1·0 (1·3)	2·7 (1·7)[1,2,3,4]

Note Figures in parentheses are standard deviations. Superscripts indicate significant differences between cluster groups according to Scheffé's test. The number indicates which groups had significantly lower scores than that given.

Table 4 reports the differences between the clusters on the remaining three scales derived from the BCL. Once again scale scores were calculated for FEED, SOIL and SLP and were submitted to one-way ANOVA with cluster group as the between-subject variable. There were large and significant group differences on all three measures (SOIL, $F(5, 888) = 3{\cdot}34$, $P < 0{\cdot}01$; FEED, $F(5, 1014) = 10{\cdot}67$, $P < 0{\cdot}001$; SLP, $F(5, 1008) = 14{\cdot}91$, $P < 0{\cdot}001$). While there were no group differences in terms of problems with soiling, the neurotic/conduct group had significantly more problems with sleeping and feeding than did all the other groups except the hyperactive/conduct group.

Table 5 explores the relationship between group membership and ratings of temperament. Mean temperament scores were introduced as the dependent variables into four one-way ANOVAs with cluster membership as the independent variable. There were significant effects of group membership on all the variables (shyness, $F(5, 841) = 8{\cdot}49$, $P < 0{\cdot}001$; emotionality, $F(5, 1002) = 34{\cdot}81$, $P < 0{\cdot}001$; activity, $F(5, 1001) = 10{\cdot}51$, $P < 0{\cdot}001$; sociability, $F(5, 1001) = 4{\cdot}62$, $P < 0{\cdot}001$). When these differences were investigated further using Scheffé's tests a number of interesting patterns emerged. First, the co-morbid hyperactive/conduct group were

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Table 5. *The temperamental characteristics of the cluster members*

	Shy	Emotion	Activity	Social
1 No problems	2·4 (0·76)	2·1 (0·83)	4·0 (0·69)	3·4 (0·60)
2 Active	2·4 (0·68)	2·4 (0·91)[1]	4·2 (0·78)[3]	3·6 (0·81)
3 Timid	2·8 (0·67)[1,2]	2·7 (1·0)[1]	4·0 (0·52)	3·5 (0·64)
4 Naughty	2·6 (0·88)	2·8 (1·4)[1,2]	4·2 (0·46)	3·6 (0·66)
5 Hyp/Cd	2·4 (0·77)	3·1 (0·87)[1,2]	4·7 (0·69)[A11]	3·8 (0·67)[1,6]
6 Neurotic/Cd	2·9 (0·81)[1,2,5]	3·5 (0·86)[1,2,3,4]	4·1 (0·77)	3·3 (0·63)

Note Figures in parentheses are standard deviations. Superscripts indicate significant differences between cluster groups according to Scheffé's test. The number indicates which groups had significantly lower scores than that given.

Table 6. *Sex, social class and family characteristics (as percentages) of the children in the five problem clusters*

	Boys	Manual	Two-parent families	Depressed mothers	Unemployed
1 No problems	48	36	92	15	5
2 Active	51	40	91	24	4
3 Timid	53	44	91	32	7
4 Naughty	53	39	90	37	10
5 Hyp/Cd	76	44	92	48	6
6 Neurotic/Cd	53	41	80	64	19

rated as being significantly more temperamentally active than all the other groups including the active group. While the co-morbid neurotic group were both more shy and more emotional than a number of other groups. All problem groups were seen as more emotional than the 'no problem' group, while the timid group was seen as being shyer than both the 'No problem' group and the active group.

The problem groupings were also compared (Table 6) on some background and family characteristics that have in the past been considered to be risk factors for adjustment (Sameroff & Chandler, 1975). There was an association between group membership and child's sex ($\chi^2(5) = 14{\cdot}38$; $P < 0{\cdot}05$), parents' employment status ($\chi^2(5) = 24{\cdot}69$, $P < 0{\cdot}01$) and maternal depression ($\chi^2(5) = 79{\cdot}44$, $P < 0{\cdot}001$). However, there was no association between group membership and marital status ($\chi^2(5) = 8{\cdot}3$, NS) or social class ($\chi^2(5) = 2{\cdot}84$, NS).

These differences revealed a number of interesting effects. First, in keeping with the literature on school aged children the co-morbid hyperactive/conduct group had significantly more boys than the other groups. Secondly, the children in the co-morbid neurotic/conduct group were more likely to live in single parent families and to have an unemployed father. The incidence of depression varied considerably across the groups. The children with no problems were least likely to have a mother suffering from depression. This risk increased in the pure groups of mild problems with highest rates being reported in the 'naughty' group. The risk increased once again in the severe co-morbid groups with 64% of the children in the neurotic/conduct group having a mother scoring above cut-off on the GHQ. Interestingly, there were no differences in social class between the six groups.

Predictive validity

The extent to which cluster group membership at three could be discriminated on the basis of problem scores five years later was assessed using the internalizing and externalizing scales of the CBCL as outcome measures (Table 7). Internalizing (combined anxiety and withdrawal scales) and externalizing scores (combined attention and aggression) scores from the subsample on whom data at 8 years was available were submitted as dependent variables into two one-way ANOVAs with cluster group as the independent variable. When the externalizing score was the dependent variable there was an effect of group membership ($F(5, 481) = 16{\cdot}73$, $P < 0{\cdot}0001$).

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Table 7. *The differences between the clusters on internalizing and externalizing problems at age 8*

	Internalizing	Externalizing
1 No problems	3·4 (3·7)	4·8 (5·2)
2 Active	4·7 (4·7)	7·6 (7·0)[1]
3 Timid	6·1 (5·1)	7·0 (7·2)
4 Naughty	4·9 (4·0)[1]	9·0 (7·0)[1]
5 Hyp/Cd	6·4 (4·3)	17·2 (12·5)[1,2,3,4]
6 Neurotic/Cd	7·0 (4·6)[1]	11·0 (8·9)[1]

Note Figures in parentheses are standard deviations. Superscripts indicate significant differences between cluster groups according to Scheffé's test. The number indicates which groups had significantly lower scores than that given.

Four groups (hyperactive/conduct problems, neurotic/conduct problems, naughty and active) were rated as significantly more disturbed than the 'no problem' group. The hyperactive/conduct group scored higher than all other groups, although this effect did not reach significance with regard to the neurotic/conduct group. Most strikingly, the hyperactive/conduct disordered group was rated as having a mean score four times higher than that of the original 'no problem' group. When internalizing scores were submitted there was an effect of group membership although this was less clear cut than with the externalizing scores ($F(5, 489) = 7{\cdot}49$, $P < 0{\cdot}0001$). Only the timid and the neurotic/conduct disordered group were rated as significantly more disturbed than the 'no problem' group.

DISCUSSION

The present analysis suggests that pre-school childrens' behavioural and developmental problems cluster in meaningful ways both at the level of the variables indexing, and at the level of children exhibiting, symptoms. The factor analysis confirmed the findings of previous studies by showing that parents' ratings of pre-school children's problems are underpinned by a coherent dimensional structure (e.g. Achenbach *et al*. 1987). Furthermore, the factor structure in the present paper shares with previous studies, some of the structural characteristics of maladjustment in older children. First, there was a distinction between internalizing and externalizing problems within the behavioural domain (Achenbach & Edelbrock, 1981). With items linked to emotional type symptoms loading on different factors than those related to hyperactivity and conduct problems. Secondly, there was a distinction between conduct problems and hyperactivity (Trites & Laprade, 1983). This particular feature of the structure of problems contradicts the findings of Achenbach *et al*. (1987). However, the subject to item ratio was low in that study, which places the reliability of the derived factor structure in some doubt. As in previous studies, this dimensional distinctiveness between hyperactivity and conduct problems was combined with a degree of association at the level of total scale scores. Taken together these two features provide further support for the view proposed by Hinshaw (1987), that hyperactivity and conduct problems are usefully regarded as partially independent. In addition, there was also a distinction between what might be called developmental (such as eating, wetting and sleeping) and other behaviour problems. Although once again problems in these areas were somewhat correlated with the three behavioural dimensions. Overall, it can be seen that parents' reports of pre-school children's problems made on the BCL have similar properties to those made for older children using different instruments.

Having established the dimensional structure of parental reports, we went on to explore the extent to which separate groups of children exhibiting pure dimensions of these problems could be identified. Scale scores were used to cluster children according to their problem types. This procedure produced a coherent and intuitively convincing typology. The clusters that emerged could themselves be distinguished one from another along three dimensions. (i) *Co-morbidity*; the groups differed in the extent to which they were primarily defined by high scores on one or two problem dimensions. Three groups represented relatively pure expressions of individual scale scores (naughty, timid and active) and two groups were clearly co-morbid. These two groups both displayed signs of conduct problems. However, in one group these problems were of a neurotic type while in the other they were of a hyperactive type. (ii) *Severity*; the groups of children also differed in terms of the severity of problems. Interestingly, the three groups of children with pure expressions were also characterized by mild problems, while the problems associated with the two co-morbid

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groups were much more severe and of potential clinical significance. (iii) *Size*; the groups also differed in terms of their size. Unsurprisingly, the more extreme the problems the smaller the groups.

Given the potentially arbitrary nature of the solution provided by cluster analysis techniques it was important to examine the stability, validity and reliability of the solution. In the present study the process of establishing the reliability of the cluster structure was aided by the large data set available. This allowed us to examine the cluster structure in two randomly selected half samples and then compare these with the solution from the total sample. A comparison of cluster centres showed that clusters produced by analysis of each half sample were similar to each other and to those derived from the whole sample. This suggested a stable and reliable solution.

The validity of the cluster structure was explored in a number of ways. First, in terms of temperament, those children classified in groups with hyperactive symptoms were rated as more active, those in groups with emotional problems were rated as shy and those with anti-social or emotional problems were rated as high on emotionality. Secondly, children displaying the neurotic type of conduct problems were at a particular risk of problems in the areas of eating, sleeping and soiling. Thirdly, in terms of family and demographic factors the children with neurotic type conduct problems were particularly likely to live in difficult circumstances. Their mothers were more likely than not to show signs of poor mental health, they were more likely to live in one parent families and that where their fathers were cohabiting they were more likely to be unemployed. This finding is supported by previous research suggesting that 'difficult to manage' preschool children come from less well functioning families than normal children (Sonuga-Barke *et al.* 1996). Interestingly, in keeping with previous research with older children, hyperactive-type problems were more likely to be exhibited by boys (Emde, 1979). Finally, the 8-year outcome for children included in the different clusters was compared. The pattern of differential outcomes for the different clusters gives further support to the validity of the cluster structure. The two groups of potential clinical significance fared worse at eight than any of the other groups. Of these two groups the neurotic/conduct group had the most internalizing problems and the hyperactive/conduct group had the most externalizing problems.

These results must be interpreted in the light of two design weaknesses. First, the data were collected using standard questionnaire measures. Clearly, a complete picture of the clinical significance of the problems identified would be possible only following clinical observation and diagnostic interviews. Secondly, the information about behaviour problems at both 3 and 8 years came from the childrens' parents. Consequently, it is possible that continuities in development were the result of persistence of parent characteristics (such as mental state) rather than child pathology. Further analysis of the relationship between these factors will clarify the significance of these continuities. However, such an analysis is beyond the scope of the current paper.

These results are important in a number of ways. First, they suggest that while there are groups of children with essentially 'pure' expressions of problem dimensions, the levels of problems experienced by children in these groups are typically in the normal range and are on the whole likely to be neither of clinical concern or developmental significance. Secondly, problems of potential clinical concern that are likely to represent a risk to development are typically not present in a pure form. Both groups exhibiting serious problems of hyperactivity and neuroticism had co-morbid symptoms of conduct problems. At the same time the results suggest that simply lumping together all children with problems and calling them 'difficult to manage' may not be a useful strategy. The two groups with potentially clinically significant problems shared symptoms of conduct problems, and were probably difficult to manage. However, they could be distinguished in terms of coexistent symptoms and other associated variables. In this regard it is of particular interest that the two groups of children with conduct problems displayed distinctive patterns of family background. With those with neurotic problems more likely to come from a background indicative of family adversity.

These differences in patterns of co-morbidity, and the pattern of associations which accompany them, are clearly important in terms of the

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nature of the developmental course of the problem. For instance, they are in keeping with the idea that neurotic type conduct problems represent a developmental response to family and psychosocial adversity and that improvement will depend on changes in family functioning. This was investigated by Egeland *et al*. (1990). While, they found considerable levels of stability in problems over a 3- to 4-year period following school-entry, the factor that best predicted discontinuity was an improvement in mother's mental health and the quality of the home environment.

The data are also in keeping with the idea that hyperactivity is the result of biogenetic factors (Taylor *et al*. 1991). A recent finding that pre-school hyperactive children have lower IQs than either normal or conduct disordered children also provides support for this view (Sonuga-Barke *et al*. 1994). This means that the children in the hyperactive/conduct group will have faced a major challenge following school entry when they were required to adapt to the educational and social constraints of the classroom (Sonuga-Barke *et al*. 1994).

As far as our own longitudinal data are concerned it should be noted that while it might be predicted that the neurotic/conduct group are at particular developmental risk given the compromised nature of available parenting, and those risks associated with unemployment and divorce (Campbell *et al*. 1991), the longitudinal data do not support this expected pattern. They show that, while both clinical groups have more problems than the other groups, the most disadvantaged group, by quite a considerable margin, is the hyperactive/conduct group. This was so despite the fact that this group had a relatively normal family background. Furthermore, it is interesting to note that disturbance shown by this group at eight was not restricted to the externalizing domain. This suggests that between the ages of 3 and 8, this group of children developed problems in the internalizing domain.

These considerations, taken together, would indicate that the appropriate clinical response to signs of conduct problems would be determined by the nature of the associated disorder. In the case of hyperactivity, approaches aimed at the management of behaviour and the preparation for school-entry are likely to prove most effective, while for those problems associated with neurotic type symptoms a more family based approach to psychotherapy combined with an increase in social support for the mother may prove beneficial.

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