

Original Articles

Use of The International Classification of Diseases-10, (ICD 10) to Recognise Pervasively Hyperactive Children in a Child-Guidance Clinic: Feasibility and Validity

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Summary. The tenth edition of the International Classification of Diseases (ICD 10) was used to identify psychiatric problems in a provincial child-guidance clinic population. Categorisation by degree of hyperactivity produced groups that differed in terms of variables that were independent of the diagnostic criteria. ICD 10 was found to be a short, precise and manageable schedule which facilitated reliable categorisation of a group of children with mixed disorders of conduct and hyperkinesia.

Key words: Hyperactivity – Conduct disorder – ICD 10 – Hyperkinesia in childhood

Introduction

“Hyperactivity” is as relatively common complaint leading to many referrals to child psychiatric departments. The term is used in several ways. It may refer to an individual behavioural symptom or a syndrome in association with distractibility and poorly sustained attention span [21]. Opinions vary as to the diagnostic significance and definition of hyperactivity. To some authors it is a nonspecific behavioural difficulty which is a part of conduct disorder [6, 13] but to others it is a cardinal feature of a specific syndrome [3]. Reports from the United States indicate a diagnosis of hyperactivity in up to 5% of primary school children and 50% of child psychiatric clinic populations [18, 23]. This contrasts with British practice where only 2 out of 2000 children in a general population [12] and 1% of a child psychiatric population [19] received a diagnosis of hyperkinetic syndrome. Some studies have demonstrated clear differences between behaviour disordered children with pervasive hyperactivity (overactivity seen in more than one situation) [7, 19], whilst others [10, 15] have raised doubts about the independence of the dimension of hyperactivity with conduct

disorder. Certainly many children show both behaviours. Although much research has been generated in this field, it is clear that all researchers do not describe children with similar problems, and there is still a need for improved diagnostic clarity. The use of imprecise definitions of behaviour instead of operationally defined criteria compound the existing confusion. Various systematic diagnostic measures have been proposed in an attempt to minimise such confusion. The third edition of the Diagnostic and Statistical Manual of the American Psychiatric Association (DSM III) [1] provided operational criteria for “attention deficit disorder with hyperactivity”. Primary consideration was given to the teacher’s account and presence of the behaviour in other settings was not required. Conduct disorder was coded separately. The ninth edition of the International Classification of Diseases (ICD 9) permitted coding of a single diagnosis only, and it was difficult to use reliably for mixed cases where both hyperactivity and conduct disorder were present [9]. The tenth edition of International Classification of Diseases (ICD 10) [5] provides clearer diagnostic rules for mixed cases whilst still allowing a single diagnosis only. Where criteria for both hyperkine-

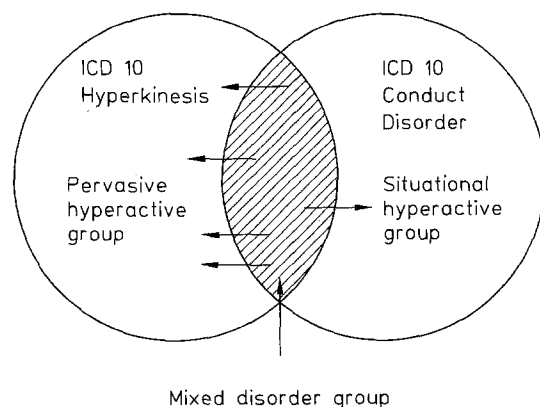


Fig. 1. Categorisation of mixed problems of hyperactive and conduct disorder according to ICD-10

tic and conduct disorder are met hyperkinetic conduct disorder is coded as a subcategory of hyperkinetic disorder.

The present study describes the use of ICD 10 criteria to distinguish hyperkinetic and conduct disorders in a child-guidance clinic population which included children with both disorders to varying degrees.

Patients and Methods

The case records were examined of 847 children who were referred with behavioural disturbances to the child-guidance clinic serving a population of 250,000 in a rural English county during the calendar years 1981 and 1982.

The present study was based on a systematic recording of clinical data of the patients who attended the child-guidance clinic. All clinical case records included a detailed questionnaire which covered symptomatology, personal history, social history, and a detailed neurological examination carried out by the clinic child psychiatrist. A detailed school report, information from the referring doctor, school medical officer, and the clinic social worker were obtained in each case. An IQ assessment was also carried out by the educational psychologist.

From a total number of 847 cases notes, all 286 children who were between the ages of 6–13 years were selected for further study. Forty-three case records (15%) were incomplete and the remaining 243 cases were carefully scrutinised. The following exclusion criteria were applied: (a) presence of a neurological disorder, including major sensory impairment; (b) presence of childhood psychosis; (c) IQ below 70.

A further 75 cases were thus excluded, the final study group consisting of 168 children. The various symptoms proposed in the ICD 10 for the diagnosis of hyperkinetic and conduct disorders were operationally defined (Appendix 1). The severity of these symptoms were assessed at home, and at school using scales similar to abbreviated Conners' Rating Scale [2]. All these symptoms were rated on a scale ranging from 0 to 3 (0 = no problems, 1 = symptoms occurring between a week to a month, 2 = symptoms once a week, 3 = symptoms once daily). At the clinic consulting room observations such as running and jumping around, fidgetiness, premature breaking off from tasks and disobedient behaviour were measured and rated on a scale ranging from 0 to 3. The total scores

for each dimension (overactivity, inattention, defiance, stealing, violence) were calculated by adding the score for each item of that dimension (Table 1).

A total of 58 cases met the ICD 10 glossary definitions for hyperkinetic and/or conduct disorder. Of these 19 (12% of the sample) were diagnosed as hyperkinetic, 30 (19% of the sample) as having conduct disorder and a further 9 (8% of the sample) children as having mixed conduct and hyperkinetic disorder. This latter group (which had the ICD 10 criteria of an onset before the age of 6 years and had severe pervasive hyperactivity [5] was coded as a subgroup of hyperkinetic disorder as classified under ICD 10. Hence the subtotal of ICD 10 hyperkinetic group was calculated as 28 (18% of the total sample). The conduct disorder group consisted of 30 children, some of whom had situational hyperactivity. On the basis of the data available, diagnosis were made by two independent clinicians, who scrutinised summaries of the case records blindly. The interrater reliability for the diagnosis of hyperkinetic or conduct disorder using ICD 10 criteria showed 92% agreement (kappa value is 0.83). The null hypothesis that there would be no clear difference between the children with pervasive ICD 10 hyperkinesis and ICD 10 conduct disorder was examined.

These 58 case notes were scrutinised for the absence (0) or presence (1) of around 40 different operationally defined variables.

Results

There was a significant difference between the two groups in terms of variables which were not used to categorise the disorders into ICD 10 hyperkinetic and ICD 10 conduct disorder groups, namely co-ordination problems, parental unemployment, inflexibility of parental attitudes, family history of alcoholism, and perinatal complications. The association was less marked in speech delay, physical illness during infancy, social class, institutional upbringing and family history of criminality. There was no statistically significant difference in overcrowding, poor home circumstances and separation early in childhood. In order to identify the variables which appeared to be closely associated with diagnoses of conduct disorder and hyperkinetic disorder and to propose a rule on the basis of which a child could be allocated to either of the disorder groups, the data were analysed further. Contingency tables were examined to assess the association of each of the 40 variables (selected as those with a *P*-value of less than 0.05) were chosen for further study. These were (1) co-ordination problems, (2) unemployment of parents, (3) broken homes, (4) inflexible parental attitudes, (5) family history of alcoholism, (6) perinatal complications (Table 2).

As the statistical technique used in this study (Appendix 2) requires the variables to be independent (uncorrelated) of each other, each of these variables was cross-classified with each of the other variables within each diagnostic group separately. Almost all of the relevant associations were shown to be small with the exception of the two variables "co-ordination problems" and "perinatal complications". Although, from Table 2, it appears that a higher proportion of hyperkinetic disorder children had co-ordination problems and perinatal complications in comparison with conduct disorder children, the correlation of these two variables was statistically significant only for the conduct disorder children,

Table 1. Symptom severity score

	ICD 10 Hyperkinetic disorder (<i>n</i> = 28)	ICD 10 Conduct disorder (<i>n</i> = 30)
Hyperactivity score	H 3.4 S 2.9 I 2.0	0.3 0.2 0.1
Inattention score	H 3.3 S 3.5 I 1.8	0.5 1.0 0.1
Defiance score	H 3.4 S 2.0 I 0.3	3.2 2.0 0.5
Stealing	H 0.2 O 0.4	2.5 3.0
Violence	G 2.5	5.2

H, Home; S, school; I, interview; O, outside home; G, general

Table 2. Clinical and demographic variables

Factor	% of children with factor positive		χ^2 on 1 df	P
	H.D	C.D		
Co-ordination problems	68	10	20.5	0.001
Unemployment of parents	21	67	11.9	0.001
Broken homes	36	77	9.9	0.005
Inflexibility of parental attitudes	57	13	12.3	0.001
Family history of alcoholism	4	37	9.6	0.005
Perinatal complications	57	7	17.2	0.001

HD-ICD 10, Hyperkinetic disorder ($n = 28$); CD-ICD 10, conduct disorder ($n = 30$)

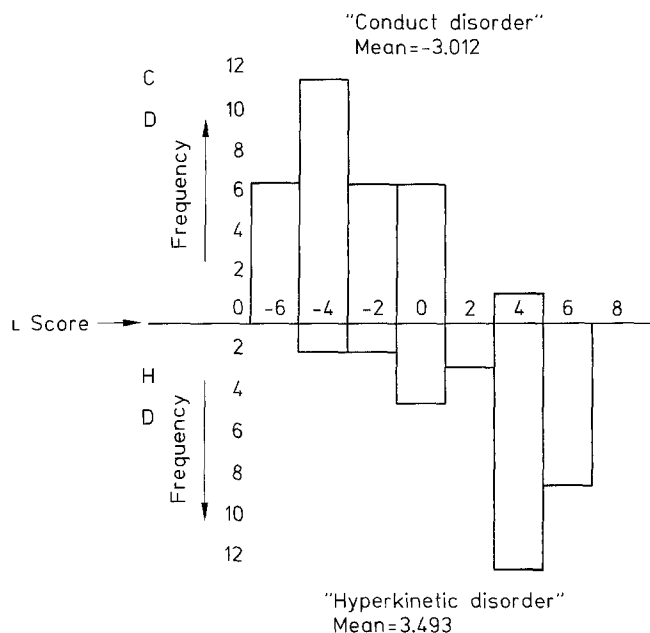
Table 3. Calculation of L (diagnostic score)

Variables	Weights
Parental unemployment over 6 months	-1.99
Broken home either due to divorce, death or separation	-1.78
Inflexible parental attitude	2.16
Family history of alcoholism	-2.75
Coordination problems and/or perinatal complications	3.99

and not for the hyperkinetic disorder group. To make the variables independent of each other, these two variables were amalgamated to define a new variable "co-ordination problems and/or perinatal complications". This new variable was taken to be absent, i.e. 0, if both the above-mentioned variables were absent, and was taken to be present, i.e. 1, if one or both of these variables were present. This new variable was found to be roughly independent of the remaining four variables. The log relative risk for the new variable was 3.99. The main statistical analysis was thus undertaken using the variables in Table 3.

Since these five variables could be assumed to be approximately independent of each other, a simple point-scoring method of constructing a diagnostic score was used (see Appendix 2). Essentially the diagnostic score, L , is a weighted sum of these variables, in which the weights are the log-relative risks of each variable with the diagnosis [4]. To calculate the value of L for a particular child, the weights of those variables (Table 3) which are present for a particular child are added together.

Figure 2 shows the distribution of the value of L for the ICD 10 conduct disorder and ICD 10 hyperkinetic disorder children; the strength of the differential between the two groups is clearly shown by the separation of the two histograms. The mean value of L is -3.01 for the ICD 10 conduct disorder group and 3.49 for the ICD 10 hyperkinetic group. The standard deviation of L is about 2.6 for both groups. This suggests that a suitable cut-off value for the discriminant score is the mid-point of the two averages, namely 0.24. Thus the proposed statistically indicated diagnosis is "if the value of L (diag-

**Fig. 2.** Histogram of diagnostic score (L)**Table 4.** Comparison of the ICD 10 diagnosis vs statistical diagnosis

ICD 10 diagnosis	Statistical allocation	
	"Conduct"	"Hyperkinetic"
ICD 10 conduct	28	2
ICD 10 hyperkinetic	4	24

nostic score) for a particular child is less than 0.24, the child will be allocated to the ICD 10 conduct disorder group. If the value of L is more than 0.24 the child will be allocated to the ICD 10 hyperkinetic disorder group". For example, if a given child has a history of parental unemployment over 6 months, inflexible parental attitude, and a family history of alcoholism, using Table 3, the value L could be calculated as -2.58 ($-1.99 + 2.16 - 2.75$). Since this value is less than 0.24, this child would be allocated to the ICD 10 conduct disorder group.

Using this procedure, Table 4 illustrates that 90% of children in the study were correctly allocated to their diagnostic groups. The strong separation between the diagnostic groups obtained by a simple statistical discriminator based on variables not directly used in making these diagnosis supports the validity of the ICD 10 criteria in distinguishing between ICD 10 hyperkinetic and ICD 10 conduct disorders.

It must be emphasised that the discriminant procedure has been developed on a relatively small sample, and so the percentage of cases correctly classified and the numerical values of the log-relative risks are subject to statistical sampling error. However, the highly significant associations reported in Table 2 suggest that these variables are clearly established as important diagnostic indicators.

Discussion

Although precisely defined diagnostic criteria have been used increasingly in research into children with behaviour disorders, there are fewer reports of their use in clinical situations. The main findings of the present study were the practicality of using the ICD 10 criteria to differentiate between conduct and hyperkinetic disorders in a busy child-guidance clinic and validating the differentiation between these two disorders in terms of variables that were relatively independent of the diagnostic criteria. Of the 28 cases which fulfilled the ICD 10 criteria for hyperkinetic disorder, only a small minority had this diagnosis given at the clinic. The majority were diagnosed as management problems, anxiety disorders etc. This may reflect the narrower British usage of the diagnosis of hyperkinetic disorder in the clinical practice [9, 22]. Although varying sample characteristics preclude us from making direct comparisons, this may also explain the different prevalence figures we found in our study. We established that in a sample 6–13 years old, behaviourally disturbed child-guidance clinic attenders, 18% had a diagnosis of ICD 10 conduct disorder and 16% obtained a diagnosis of ICD 10 hyperkinetic disorder. This contrasts with previous prevalence figures of 40% for conduct disorder in a child-guidance clinic population [11], but the total figure of 34% is similar. The differences in diagnostic rates may have arisen from the different weighting of symptoms into categories rather than from a lack of recognition of symptoms. The tenth revision of the ICD has clearly defined the boundaries of this disorder. Using ICD 10 criteria there is an increase in the number of children regarded as showing hyperkinetic disorder compared with previously reported European studies. The problems of the mixed cases showing both hyperactivity and conduct disorder were more easily resolved.

The importance of using rigorous defining criteria in research to obtain a better understanding of these syndromes cannot be over emphasised. Stewart et al. [17] used operationally defined criteria to define hyperactivity and to study a group of clinic attenders referred to the University of Iowa Child Psychiatric Department. They found that a history of alcoholism in the parents was not associated with hyperactivity but with antisocial disturbances of conduct. This contrasts with the earlier findings of Stewart et al. [18], where the association was found in an ill-defined group of hyperactive children. Using the ICD 10 criteria we found that the ICD 10 conduct disordered group had a statistically significant association with parental alcoholism. In a study of three child psychiatry clinics, Taylor et al. [20] used standardised measures to validate these two syndromes. They found cognitive impairment, motor immaturity and a history of developmental delay in a group of pervasively and severely hyperkinetic children. This was not apparent in children with conduct disorder not associated with pervasive hyperactivity. In line with their observations, we found that pervasive hyperactivity was related more strongly to perinatal adversities and co-ordination difficulties, whilst family and social adversities were related

to conduct disturbances. They found no relationship between hyperactivity measures and social factors, and this was replicated in our survey.

In a study based on systematic documentation of clinical data Steinhausen and Gobel [16] supported the concept of concurrent validity of hyperkinetic disorder. They found that an early onset, persistent developmental delay in motor and speech developments, and increased risk of co-ordination deficits were significant clinical correlates of hyperkinetic disorder. Using a similar investigatory technique we replicated their findings. These observations are in accord with Barkley's [2] views that comprehensive clinical assessment could facilitate categorisation of disorders into valid subgroups.

In an another survey of clinic attenders some differences were found in a small group of children who obtained scores for hyperactivity on teacher's rating scale, parents' rating scale and direct observation [14] in comparison with the rest of the sample, who were situationally hyperactive. This small group showed abnormal results on neurological examination, had a more rapid cognitive style and had an earlier onset of hyperactivity. We obtained comparable results in a large sample of clinic attenders who showed generalised hyperactivity.

Using a different methodology and statistical techniques in a busy provincial child psychiatry clinic, we were able to replicate some of the findings of methodologically sound prospective studies [20]. Although we validated the ICD 10 diagnostic criteria for hyperkinetic disorder and conduct disorder in one sample of clinic attenders, further research would be necessary to establish the predictive validity of these criteria. Currently we are conducting a research project in a community sample of mentally handicapped children to achieve this objective.

Conclusion

This study shows the feasibility of using ICD 10 criteria to differentiate conduct and hyperkinetic disorders in clinical practice. ICD 10 was found to be an uncomplicated schedule with clearly defined operational criteria. It appears to facilitate categorisation of data into easily defined diagnostic groups.

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Appendix 1

Criteria for defining individual behaviour problems

Overactivity – running and jumping around and/or excessive restlessness in situations requiring relative calm

and/or excessive talkativeness and noisiness or fidgeting and wriggling while still in situations that require a high degree of self-control.

Inattention – premature breaking off from tasks and leaving things unfinished or frequent change from one activity to another.

Defiance – having temper tantrums when unable to have his/her way or disobedient behaviour which is difficult to control.

Physical violence – disturbing others when playing, e.g. pushing (to other people) or kicking.

Physical violence – purposeful damage amounting to a financial loss. (to property)

Family Background and Associated Factors. The following associated factors were scored on a binary scale and were defined as follows:

Enuresis – persistent bed wetting after the age of 5 years.

Soiling – chronic incontinence of faeces after the age of 3 years.

Sleep disturbance – waking more than twice a night.

Speech disorder – delay in sentence construction or abnormal word production.

Co-ordination difficulties – based on finger nose co-ordination and lower limb co-ordination.

Family Data

Social class – defined by the chief bread winner's occupation.

Family size – determined by the number of children under 17 years living in the household

Parental unemployment – continuous unemployment by the chief bread winner over a period of 6 months at the time of development of symptoms

Family history – having a member of the immediate family with a criminal history

Institutional care – spending time in an institution for more than 2 months between the ages of 3 and 11 years.

Mental illness in the family – diagnosis of any mental illness in the immediate family members by the general practitioner or by a consultant psychiatrist.

Chronic physical illness – an illness lasting over 6 months in a member of the immediate family who live at home.

Appendix 2

Statistical method used to calculate diagnostic score

Since the variables are roughly independent, it could be said that the probability of simultaneous presence of all the variables in the hyperkinetic disorder group is equal

to the product of the probabilities of the presence of each of the variables in the hyperkinetic disorder group. Similarly, the probability of simultaneous presence of all the variables in the conduct disorder group is equal to the probabilities of the presence of each of the variables in the conduct disorder group. The ratio of these two overall probabilities is known as the "Likelihood ratio", and it is the logarithm of this quantity which is taken as the diagnostic score: relatively high values are indicative of hyperkinetic disorder group, relatively low values indicating conduct disorder group.

Explicitly, suppose that the binary variables are x_1, x_2, \dots , each taking the values 0 or 1. The relative risks, estimated in Table 3, are defined as

$$R_i = \frac{P_i(1 | \text{H.D.}) P_i(0 | \text{C.D.})}{P_i(0 | \text{H.D.}) P_i(1 | \text{C.D.})}$$

For example, $P_i(1 | \text{H.D.})$ denotes the probability of a child in the hyperkinetic disorder group having the value

$x_i = 1$, etc. R_i measures the strength of relationship between the i th symptom and the diagnosis. It is important to note here that R_i assumes that neither of the denominators are zero.

The log likelihood ratio for a child with symptoms values x_1, x_2, \dots , is

$$\sum \log \frac{P(x_i | \text{H.D.})}{P(x_i | \text{C.D.})}$$

which could be shown to equal

$$\sum \log \frac{P_i(0 | \text{H.D.})}{P_i(0 | \text{C.D.})} + \sum x_i \log R_i = \text{constant} + \sum x_i \log R_i$$

Note that $\sum x_i \log R_i$ is simply the sum of the log relative risks added over those symptoms which have $x_i = 1$. By choosing appropriate cut-off value for the diagnostic score, the constant term in the above derivation can be ignored.