

# Idiopathic epilepsy and school achievement

M G Sturniolo, F Galletti

Department of Child  
Neuropsychiatry,  
University of Rome  
'La Sapienza', Italy  
M G Sturniolo  
F Galletti

Correspondence to:  
Dr M G Sturniolo,  
Dipartimento di Scienze  
Neurologiche e Psichiatriche  
dell'Età Evolutiva, via dei  
Sabelli 108, I-00185, Rome,  
Italy.

Accepted 17 November 1993

## Abstract

Forty one children (20 boys, 21 girls) aged 6-10.8 years (mean age 8.6 years) who were affected with idiopathic epilepsy underwent neuropsychological (Wechsler Intelligence Scale for Children, Bender test) and behavioural assessment (Personality Inventory for Children; this was also used in a matched control group). Further information was obtained by teachers' reports.

School underachievement occurred in 25 children (61%). Statistical analysis showed no influence of sex, social background, age of onset, seizure type, duration of illness, features seen on electroencephalography, and treatment. School failure was due to poor performance in almost all academic fields, and was associated with higher visuomotor impairment; children showing good school performance had a higher mean IQ and less visuomotor impairment. The behaviour of children with epilepsy who had a good academic

performance did not differ from that of their healthy peers. Emotional maladjustment (social skill impairment, depression, poor motivation, and low self esteem) was associated with poor school performance.

Such problems, that may complicate the course of idiopathic epilepsy and require an appropriate educational programme, should be carefully considered by the clinician.

(Arch Dis Child 1994; 70: 424-428)

Various studies have shown evidence of poor school achievement in children with epilepsy. Several factors underlying this academic vulnerability have been suggested, including both seizure related and non-seizure related variables.

Generally, school achievement seems to be better in children with a normal IQ; therefore in idiopathic epilepsies, characterised by normal IQ,<sup>1</sup> school problems should be absent or at least less evident. In the sporadic studies on cognitive function in idiopathic epilepsy, academic prognosis was not found to be impaired,<sup>2-4</sup> and in 16 Swedish children with benign epilepsy with centrotemporal spikes, near normal academic performance was reported by Heijbel and Bohman in spite of impairment of visuomotor coordination.<sup>5</sup> However, a discrepancy between intellectual level and school achievement in children with epilepsy has been reported by many authors, and it is known that children with epilepsy and normal intelligence may have school underachievement.<sup>6-12</sup>

We followed up a group of Italian children affected with idiopathic epilepsy attending ordinary schools. The aim of our study was to examine their academic achievement, and to detect neuropsychological and/or behavioural factors responsible for eventual school failure.

## Patients and methods

Among the children with epilepsy admitted to our department from January to December 1991 there were 41 (20 boys, 21 girls) aged from 6 to 10.8 years (mean age 8.6 years) who were affected with idiopathic epilepsy (22 with localisation related and 19 with generalised epilepsy) diagnosed according to international criteria.<sup>1</sup> The characteristics of these patients are shown in table 1. In all cases, frequency of paroxysmal activity seen on electroencephalography (EEG) was classified as mild to moderate. The absence of major neurological deficits and neuroradiological changes, implicit in this diagnosis, had

Table 1 Details of patients

Case No	Sex	Age (years)	Social class	Epilepsy variables				Treatment†
				Onset age (years)	Seizure type	Duration (years)	EEG	
1	F	7.9	L	0.7	Partial	7.1	Right focus	VPA
2	F	9.0	L	2.0	Partial	7.0	Right focus	VPA
3	M	8.7	L	6.0	Typical absence	2.7	Generalised	ETS
4	F	8.1	L	5.9	Typical absence	2.3	Generalised	ETS
5	F	8.0	L	5.9	Typical absence	2.2	Generalised	ETS
6	F	8.2	M	2.9	Typical absence	5.4	Generalised	VPA
7	F	8.7	L	6.7	Partial	2.0	Right focus	CBZ
8	F	6.9	L	1.1	Partial	5.9	Generalised	VPA
9	M	6.6	L	3.8	Partial	2.9	Right focus	CBZ
10	M	8.1	L	5.0	Partial	3.3	Right focus	CBZ
11	M	7.8	L	2.0	Partial	2.8	Left focus	CBZ
12	F	6.2	M	1.0	Typical absence	5.2	Generalised	PB
13	M	8.5	L	4.5	Typical absence	4.0	Multifocal	CBZ
14	F	10.0	L	7.0	Typical absence	3.0	Generalised	VPA
15	F	10.8	L	8.1	Partial	2.7	Right focus	VPA
16	M	6.0	L	3.0	Tonic-clonic	3.7	Left focus	PB
17	F	9.9	L	5.8	Partial	4.3	Multifocal	VPA
18	M	7.7	L	4.1	Tonic-clonic	3.5	Generalised	PB
19	F	9.2	L	2.5	Tonic-clonic	6.8	Generalised	VPA
20	M	9.6	M	3.1	Partial	6.4	Multifocal	CBZ
21	M	8.3	M	6.3	Partial	2.0	Right focus	CBZ
22	M	10.0	M	2.0	Tonic-clonic	8.0	Generalised	VPA
23	M	9.4	M	3.0	Partial	6.4	Non-fixed focus	CBZ
24	M	7.6	L	6.0	Partial	1.6	Multifocal	CBZ
25	F	10.5	M	6.9	Partial	3.6	Left focus	VPA
26	F	10.0	L	5.0	Partial	5.0	Non-fixed focus	VPA
27	M	9.9	M	2.5	Typical absence	7.2	Generalised	VPA
28	F	8.1	L	1.0	Tonic-clonic	7.0	Generalised	CBZ
29	F	10.9	L	3.0	Partial	7.0	Non-fixed focus	VPA
30	F	9.0	M	2.5	Typical absence	6.5	Generalised	VPA
31	M	10.6	L	7.9	Typical absence	1.5	Generalised	VPA
32	M	7.6	L	4.0	Partial	3.5	Multifocal	CBZ
33	M	7.3	L	1.0	Partial	6.2	Right focus	VPA
34	M	10.5	L	7.5	Partial	3.0	Right focus	VPA
35	M	7.9	L	3.6	Partial	4.2	Right focus	CBZ
36	F	6.4	M	3.5	Partial	2.9	Left focus	CBZ
37	F	10.0	L	2.0	Tonic-clonic	8.0	Generalised	VPA
38	M	7.8	L	5.0	Typical absence	2.8	Generalised	VPA
39	F	10.0	M	7.0	Typical absence	3.0	Generalised	VPA
40	M	6.8	M	5.6	Partial	1.2	Right focus	CBZ
41	M	8.2	L	1.0	Partial	7.0	Left focus	VPA

\*L=lower; M=middle class. †VPA=valproic acid; ETS=ethosuximide; CBZ=carbamazepine; PB=phenobarbitone.

been confirmed by previous investigations: neurological examination had shown evidence of only minimal neurological disfunction in some cases (numbers 2, 15, 21, 34, 38, 39). Seizure history (including possible febrile seizures) ranged from 1.2 to 8 years (mean 4.5 years). All children were treated with first line antiepileptic drugs, with serum concentrations ranging within therapeutic limits. Social background was also considered according to the parents' profession: higher class (professional worker, manager), middle class (skilled worker, office worker, shopworker), lower class (unskilled worker). We found that 11 children belonged to the middle class and 30 to the lower class. These data and features seen on EEG are summarised in table 1.

Pupils were divided into three groups according to the teachers' judgment (group 1 = good school achievement; group 2 = adequate school achievement; group 3 = poor school achievement). All children underwent psychometric investigation by the Wechsler Intelligence Scale for Children and the visual-motor Bender test, evaluated according to Zazzo.<sup>13</sup> Italian teachers have to judge their pupils by means of a written report that includes assessment of behaviour, attention, motivation, maturity, and socialisation. We therefore examined these reports to obtain a comprehensive picture of school behaviour.

Table 2 School achievement, IQ, and Bender test results in group 1 (good school achievement), group 2 (adequate school achievement), and group 3 (poor school achievement)

Case No	Age (years)	IQ			Bender test (mental age)
		Verbal	Performance	Total	
<i>Group 1 (mean IQ 108.8)</i>					
6	8.2	113	111	113	8
10	8.1	120	118	121	8
12	6.2	92	92	91	6
18	7.7	126	111	121	7
21	8.3	94	117	105	8
22	10.0	105	94	100	10
24	7.6	113	100	107	7
25	10.5	110	103	107	10
27	9.9	106	117	112	9
28	8.1	103	97	100	7
31	10.6	104	110	108	10
32	7.6	116	103	111	8
36	6.4	103	107	105	6
38	7.8	106	110	109	7
40	6.8	129	122	128	7
41	8.2	105	100	103	8
<i>Group 2 (mean IQ 105.5)</i>					
7	8.7	96	94	95	6
8	6.9	96	100	98	6
9	6.6	105	101	104	<6
13	8.5	97	103	100	<6
14	10.0	115	121	120	10.6
16	6.0	113	117	116	6
17	9.9	89	86	86	<6
19	9.2	114	117	117	10
20	9.6	103	105	105	9.6
23	9.4	115	103	110	9
30	9.0	105	100	103	7
33	7.3	116	117	112	<6
39	10.0	100	110	105	10
<i>Group 3 (mean IQ 94.6)</i>					
1*	7.9	91	96	93	<6
2	9.0	96	91	93	6.6
3*	8.7	99	96	97	<6
4*	8.1	97	86	91	<6
5*	8.0	106	83	95	<6
11	7.8	92	92	91	<6
15	10.0	99	106	102	6
26*	10.0	92	93	92	7.6
29	10.9	110	103	110	8.6
34	10.5	87	106	96	7.5
35	7.9	89	85	85	6
37*	10.0	90	93	91	7

\*Educational support programme.

To get objective multidimensional information about the children's personality and behaviour, an Italian version<sup>14</sup> of the Personality Inventory for Children was administered to the mothers. Responses to this questionnaire provided scores for the general adjustment scale, three validation scales (lie, frequency, and defensiveness scales), and 12 clinical scales measuring the child's ability, behaviour, affect, and family status: achievement, intellectual screening, development, somatic concern, depression, family relations, delinquency, withdrawal, anxiety, psychosis, hyperactivity, and social skills. The Personality Inventory for Children was also administered to a control group of mothers of healthy children, matched according to sex, age and family background, to assess which responses were significantly different in the children with epilepsy.

Sex, social background, age of onset, seizure type, duration of illness, EEG features, treatment, IQ, Bender test results, teachers' reports, and scores on Personality Inventory for Children were examined group by group. Problems identified were considered for their possible influence on school achievement.

Statistical analysis was performed by means of one way analysis of variance.

## Results

(1) EPILEPSY RELATED AND SOCIAL VARIABLES  
Statistical analysis showed no relation between school achievement and sex, social background, age of onset, seizure type, duration of illness, EEG features, and treatment.

### (2) SCHOOL ACHIEVEMENT, IQ LEVEL, AND BENDER TEST RESULTS

Sixteen children (39%) showed good school achievement and were included in group 1. In this group, mean IQ was 108.8. In one case (number 21), a marked difference was observed between verbal IQ and performance IQ; total IQ, however, was rather good (105). Only one patient (number 28) showed a mental age on the Bender test greater than one year below her chronological age. Table 2 shows the IQ values and Bender test results of these patients.

Thirteen children (32%) showed adequate school achievement and were included in group 2. In this group the mean IQ was 105.5; five children (numbers 7, 13, 17, 30, and 33) showed a mental age on the Bender test greater than two years below their chronological age (see table 2).

Twelve children (29%) showed poor school achievement, and were included in group 3. In this group the mean IQ was 94.6. In two cases (numbers 5 and 34) a marked difference was observed between verbal IQ and performance IQ; their total IQ were, respectively, 95 and 96. All children in this group showed a mental age on the Bender test greater than two years below their chronological age (see table 2).

### (3) SCHOOL ACHIEVEMENT AND TEACHERS' REMARKS

Group 1: in seven cases in this group (numbers 12, 21, 22, 24, 31, 32, and 36) mild attention and behaviour problems had been observed, as shown in table 2. Group 2: most children presented one or more behavioural problem (hyperactivity, inattention, poor motivation, etc), and some pupils were described as slow, solitary, or immature. Various learning prob-

Table 3 Results of the Personality Inventory for Children questionnaire in group 1 (good school achievement); scales with pathological scores are indicated

Case No	Teachers' remarks on behaviour and prevailing learning difficulties	Personality Inventory for Children
6	-	Family relations
10	-	-
12	Immature	Family relations
18	-	-
21	Irritable	-
22	Poorly motivated, dependent, inattentive	-
24	Insecure	Family relations
25	-	-
27	-	-
28	-	-
31	Hyperactive	-
32	Hyperactive, insecure, anxious	Somatic concern, depression, anxiety
36	Inattentive	-
38	-	-
40	-	Depression, psychosis
41	-	Intellectual screening

lems were observed by the teachers (table 2). Group 3: all patients in this group presented with several behavioural problems (especially poor self esteem and motivation) and the majority of them were described as solitary, slow, and/or immature. Six of these pupils (numbers 1, 3, 4, 5, 26, and 37) had undergone or were undergoing an educational support programme. In most cases teachers remarked that school achievement had been insufficient in all fields (see table 2).

### (4) RESULTS OF THE PERSONALITY INVENTORY FOR CHILDREN QUESTIONNAIRE

Tables 3-5 indicate the scales showing pathological scores. In group 1 (table 3) six children (numbers 6, 12, 24, 32, 40, and 41) showed one or more altered scale. In group 2 (table 4) altered scales were found in eight children (numbers 7, 8, 9, 13, 19, 20, 23, and 33). All but one child in group 3 (table 5; number 15) had altered scales.

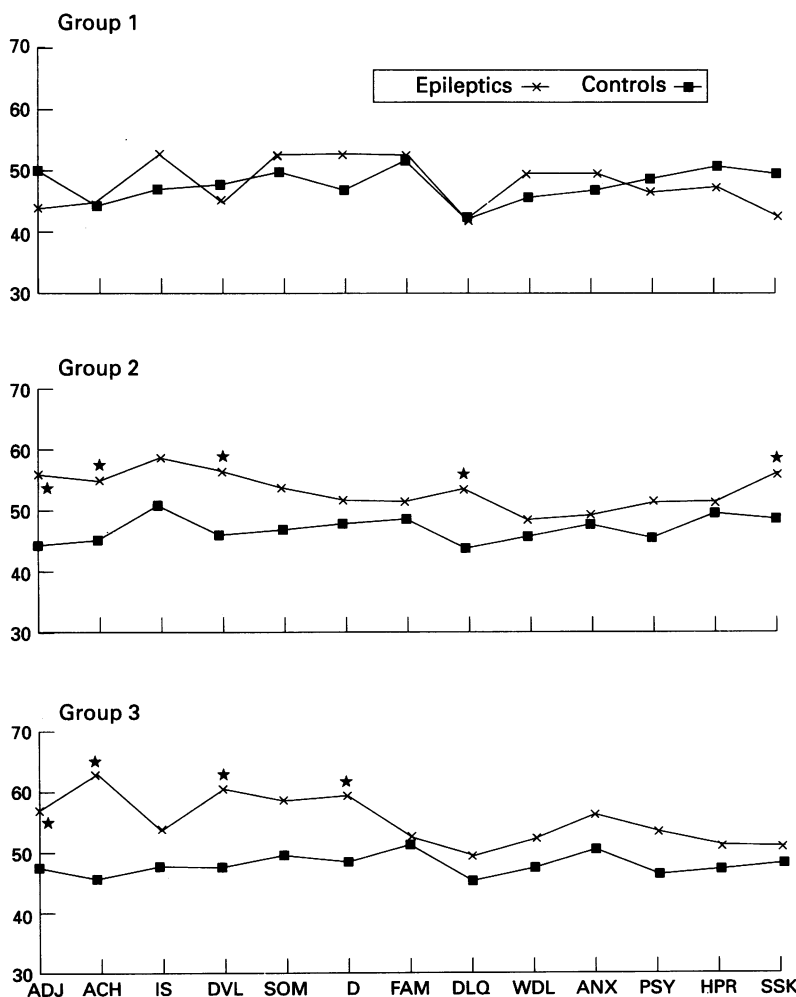
Only three pupils in the whole control group showed altered scales. Mean Personality Inventory for Children scores in the three groups of children with epilepsy, when compared with mean scores of the matched peers, showed no difference in group 1. In group 2, however, statistically significant differences were found in five scales: adjustment, achievement, development, delinquency, and social skills. In group 3 statistically significant differences were found in four scales: adjustment, achievement, development, and depression (figure).

### Discussion

In the present study almost two thirds of children with idiopathic epilepsy showed less academic progress than expected by their IQ level, and in one third academic achievement was severely impaired. This high rate of school underachievement could be explained if a bias had influenced the characteristics of our sample as it is well known that a specialised department is often frequented by the more problematic patients.

Various factors underlying academic performance of epileptic children have been suggested, including: epilepsy onset,<sup>15</sup> seizure frequency and type,<sup>16-21</sup> laterality of epileptic foci,<sup>7</sup> side effects of anticonvulsant drugs,<sup>22</sup> sex,<sup>7, 21</sup> associated behavioural problems,<sup>23</sup> and parental attitudes.<sup>24</sup>

In our cases, however, there was no significant relationship between isolated epilepsy related or social factors and specific problems in academic performance. A more general epileptogenic factor could be hypothesised, as first suggested by Halstead,<sup>25</sup> who observed that epilepsy may have a general impact on learning, regardless of its specific features. A general and indirect relationship between epilepsy and cognitive disorders was also stressed by Aldenkamp.<sup>9</sup> Stores suggested that epilepsy particularly affects alertness, regardless of type of epilepsy or treatment.<sup>26</sup> In fact, among neuropsychological deficits shown in our patients, attention deficit and slowness



Mean Personality Inventory for Children scores in children with epilepsy and controls in groups 1-3; \* = statistically significant difference. ADJ = adjustment, ACH = achievement, IS = intellectual screening, DVL = development, SOM = somatic concern, D = depression, FAM = family relations, DLQ = delinquency, WDL = withdrawal, ANX = anxiety, PSY = psychosis, HPR = hyperactivity, and SSK = social skills.

Table 4 Results of the Personality Inventory for Children questionnaire in group 2 (adequate school achievement); scales with pathological scores are indicated

Case No	Teachers' remarks on behaviour and prevailing learning difficulties	Personality Inventory for Children
7	Immature, inattentive, poorly motivated, writing-reading difficulties	Family relations
8	Slow, inattentive, immature, general learning difficulties	Hyperactivity
9	Poorly motivated, inattentive, difficulties in arithmetic	Somatic concerns
13	Slow, inattentive, writing-reading difficulties	Intellectual screening
14	Inattentive, difficulties in arithmetic, memory problems	-
16	Hyperactive, inattentive, general learning difficulties	-
17	Slow, solitary, introverted, writing-reading difficulties, memory problems	-
19	Inattentive, insecure, dependent, general learning difficulties	Intellectual screening
20	Slow, lazy, poorly motivated, inattentive, memory problems	Intellectual screening
23	Inattentive, reading difficulties, memory problems	Family relations
30	Solitary, introverted, inattentive, difficulties in making words	-
33	Hyperactive, poorly motivated, general learning difficulties	Adjustment, intellectual screening, hyperactivity, social skills
39	Inattentive, difficulties in making words and arithmetic, memory problems	-

Table 5 Results of the Personality Inventory for Children questionnaire in group 3 (poor school achievement); scales with pathological scores are indicated

Case No	Teachers' remarks on behaviour and prevailing learning difficulties	Personality Inventory for Children
1	Immature, poorly motivated, writing-reading difficulties, memory problems	Hyperactivity
2	Inattentive, slow, poorly motivated, writing-reading difficulties, memory problems	Achievement
3	Slow, solitary, poor self esteem, inattentive, difficulties in arithmetic	Intellectual screening
4	Solitary, immature, inattentive, poorly motivated, difficulties in arithmetic	Achievement
5	Solitary, slow, inattentive, poorly motivated, difficulties in arithmetic	Achievement
11	Slow, inattentive, poorly motivated, inconstant, difficulties in arithmetic	Intellectual screening, development
15	Solitary, slow, poorly motivated, difficulties in arithmetic and writing	-
26	Poorly motivated, inattentive, difficulties in arithmetic and writing	Intellectual screening, somatic concerns
29	Immature, inattentive, difficulties in arithmetic and writing, memory problems	Achievement
34	Solitary, poor self esteem, worried, poorly motivated, inattentive, slow, general learning difficulties	Somatic concerns, depression, family relations, anxiety
35	Solitary, aggressive, writing-reading difficulties	Achievement, depression
37	Slow, poorly motivated, writing-reading difficulties, memory problems	Somatic concerns, withdrawal

were rather common; visuomotor impairment and memory problems have also been frequently observed.

Concerning the type of learning disabilities in epileptic children, most reports have been focused on reading achievement.<sup>7 27 28</sup> In contrast, some studies suggested that arithmetic is the most impaired academic skill in epileptic pupils<sup>9 23 29-31</sup>; Jennekens-Schinkel *et al* mentioned difficulties in spelling and writing skills.<sup>32</sup> In our cases school failure, when it occurred, was due to poor performance in almost all academic fields, and was associated with higher visuomotor impairment. Children showing good school performance had a higher average IQ level, and presented with less visuomotor impairment.

When learning problems occur in children with epilepsy despite a good IQ, another factor to be considered is the interference of interictal EEG epileptiform discharges on neuropsychological functions. Aarts *et al* proposed the concept of transitory cognitive impairment, referred to as a functional neuropsychological deficit detectable by suitable tests in co-incidence with either generalised or focal EEG discharges.<sup>33</sup> In a previous study on reaction

time to simple visual stimuli,<sup>34</sup> we found an indirect effect of focal epileptiform discharges: reaction time delay appeared to be related to overall paroxysmal activity, rather than to the effect of single bursts. However, in the present study fluctuating impairment of cerebral function related to interictal paroxysmal activity could not represent a factor responsible for academic problems, as most patients did not show frequent discharges on EEG.

As regards behavioural problems evidenced by the Personality Inventory for Children in this study, we found that children with epilepsy with good academic performance did not differ from healthy peers, whereas poor school performance was associated with emotional maladjustment. Social skill impairment and, in children with more severe school difficulties, depression, were found to be particularly frequent. Teachers' remarks indicated poor motivation and low self esteem prevailing in children with poor school achievement.

Thus heavier neuropsychological and behavioural problems characterised the children showing the worst school performances. In conclusion, the three groups of children, divided according to school achievement, showed quantitative rather than qualitative difference in both neuropsychological and behavioural features.

Each of the mentioned factors is of potential importance in academic achievement, but could hardly be sufficient by itself, in the majority of cases, to explain school failure in presence of normal IQ values. It may be assumed that school problems arise in intelligent children only under particular circumstances. The general stigmatisation that follows the diagnosis of epilepsy must be considered an additional explanation for school underachievement<sup>10 24 35 36</sup>; this has been also attributed to depressive reactions caused by classmates' reactions to seizures.<sup>6</sup> Unpredictability of the seizure, loss of control, and social non-acceptance have been considered outstanding features leading to the low self esteem that seems one of the major characteristics of children with epilepsy.<sup>28 37</sup>

It is also well known that children's psychological adjustment is affected by environmental responses, and that the acceptance of teachers is one of the most important features in socialisation of epileptic pupils.<sup>38 39</sup> In a previous experience with a group of infant and junior school teachers, we found that 21.9% of them reported dramatic, unexpected, and frightening experiences during the occurrence of seizures in pupils<sup>40</sup>; moreover, teachers complained of their lack of competence with children with epilepsy, concerning socialisation and educational tasks.

Heijbel and Bohman hypothesised that early information given about the benign nature of idiopathic epilepsy and adequate medical treatment could reduce the risk of behavioural disorders in these children.<sup>5</sup> However, in previous studies, we found that low self esteem and depression belong also to benign childhood epilepsy, in spite of a good prognosis.<sup>41-43</sup> Our results suggest that the

presence of epilepsy, although benign, is associated with adaptive problems in the whole family, and the child is therefore at risk for emotional maladjustment. The importance of family counselling and meetings with teachers cannot be overemphasised,<sup>44</sup> but a deeper awareness of the child's individual problems rather than the information transfer on epileptic disease should be pursued.<sup>40</sup>

Thus, although idiopathic epilepsies are often self limiting conditions, it should not be forgotten that their global outcome does not depend only on seizure course, but also on academic, psychological, and social adjustment.

- 1 ILAE Commission on Classification and Terminology. Proposal for revisal classification of epilepsies and epileptic syndromes. *Epilepsia* 1989; **30**: 389-99.
- 2 Beaussart M, DeFaye J, Edrei C. Schooling and social integration in children with epilepsy and without associated handicaps. In: Kulig BM, Meinardi H, Stores G, eds. *Epilepsy and behavior*. Lisse: Swets and Zeitlinger, 1980: 185-93.
- 3 Loiseau P, Pestre M, Dartigues JF. Long term prognosis in two forms of childhood epilepsy: typical absence seizures and epilepsy with rolandic (centro-temporal) EEG foci. *Ann Neurol* 1983; **13**: 642-8.
- 4 Lerman P. Benign partial epilepsy with centro-temporal spikes. In: Roger J, Dravet C, Bureau M, Dreifuss FE, Wolf P, eds. *Epileptic syndromes in infancy, childhood and adolescence*. London: J Libbey, 1985: 150-8.
- 5 Heijbel J, Bohman M. Benign epilepsy of children with centrotemporal EEG foci: intelligence, behavior, and school adjustment. *Epilepsia* 1975; **16**: 679-87.
- 6 Pazzaglia P, Frank-Pazzaglia L. Record in grade school of pupils with epilepsy. *Epilepsia* 1976; **17**: 361-6.
- 7 Stores G, Hart J. Reading skills of children with generalised and focal epilepsy attending ordinary school. *Dev Med Child Neurol* 1976; **18**: 705-16.
- 8 Stedman J, van Hewmingen R, Lindsay J. Educational underachievement and epilepsy. A study of children from normal schools admitted to a special hospital for epilepsy. *Early Child Development and Care* 1982; **9**: 65-82.
- 9 Aldenkamp AP. Epilepsy and learning behaviour. In: Parsonage M, Grant RHE, Craig AG, Ward AA Jr, eds. *Advances in epileptology: the XIVth International Epilepsy Symposium*. New York: Raven Press, 1983:221-8.
- 10 Seidenberg M, Beck N, Geisser M, et al. Academic achievement of children with epilepsy. *Epilepsia* 1986; **27**: 753-9.
- 11 Farwell JR, Dodrill CB, Batzel LW. Neuropsychological abilities of children with epilepsy. *Epilepsia* 1985; **26**: 395-400.
- 12 Yule W. Educational achievement. In: Kulig BM, Meinardi H, Stores G, eds. *Epilepsy and behavior*. Lisse: Swets and Zeitlinger, 1980: 162-8.
- 13 Zazzo R. *Manuel pour l'examen psychologique de l'enfant*. Neuchâtel: Delachaux et Nestlé, 1969.
- 14 Bellaterra M, Pancheri L, Wirt RD. *Un questionario di personalità per l'età evolutiva. Il Personality Inventory for children (PIC)*. Firenze: Organizzazioni Speciali, 1981.
- 15 O'Leary DS, Seidenberg M, Berent S, Boll TJ. The effects of age of onset of tonic-clonic seizures on neuropsychological performance in children. *Epilepsia* 1981; **22**: 197-203.
- 16 Dodrill CB. A neuropsychological battery for epilepsy. *Epilepsia* 1978; **19**: 611-23.
- 17 Dodrill CB. Correlates of generalized tonic-clonic seizures with intellectual, neuropsychological, emotional and social function in patients with epilepsy. *Epilepsia* 1986; **27**: 399-411.
- 18 Klove H, Mathewes CG. Neuropsychological studies of patients with epilepsy. In: Reitan RM, Davison LA, eds. *Clinical neuropsychology*. New York: John Wiley, 1974: 237-67.
- 19 Brittain H. Epilepsy and intellectual functions. In: Kulig BM, Meinardi H, Stores G, eds. *Epilepsy and behavior*. Lisse: Swets and Zeitlinger, 1980: 2-13.
- 20 Seidenberg M, O'Leary DS, Berent S, Boll TJ. Changes in seizures frequency and test-retest scores on the Wechsler intelligence scale. *Epilepsia* 1981; **22**: 75-83.
- 21 Holdsworth L, Whitmore K. A study of children with epilepsy attending ordinary school. *Dev Med Child Neurol* 1974; **16**: 746-58.
- 22 Trimble MR. Antiepileptic drugs, cognitive function and behavior in children: evidence from recent studies. *Epilepsia* 1990; **31**: S40-4.
- 23 Bagley CR. The educational performance of children with epilepsy. *Br J Educ Psychol* 1970; **40**: 82-3.
- 24 Hartlage LC, Green JB. The relation of parental attitudes to academic and social achievement in epileptic children. *Epilepsia* 1972; **13**: 21-6.
- 25 Halstead H. Abilities and behavior in epileptic children. *Journal of Mental Science* 1975; **103**: 28-47.
- 26 Stores G. Effects on learning of 'subclinical' seizure discharge. In: Aldenkamp AP, Alpherts WCJ, Meinardi H, Stores G, eds. *Education and epilepsy*. Lisse: Swets and Zeitlinger, 1987: 14-21.
- 27 Stores G. Schoolchildren with epilepsy at risk for learning and behaviour problems. *Dev Med Child Neurol* 1978; **20**: 502-8.
- 28 Long CG, Moore JR. Parental expectations for their epileptic children. *J Child Psychol Psychiatry* 1979; **20**: 299-312.
- 29 Green JB, Hartlage LC. Comparative performance of epileptic and non-epileptic children and adolescents. *Diseases of the Nervous System* 1971; **32**: 418-21.
- 30 Ross EM, West PB. Achievement and problems of British eleven year olds with epilepsy. In: Meinardi H, Rowan AJ, eds. *Advances in epileptology psychology, pharmacotherapy and new diagnostic approaches*. Lisse: Swets and Zeitlinger, 1978: 34-7.
- 31 Aldenkamp AP, Alpherts WCJ, Dekkar MJA, Overweg J. Neuropsychological aspects of learning disabilities in epilepsy. *Epilepsia* 1990; **31**: S9-20.
- 32 Jennekens-Schinkel A, Linschooten-Duikersloot EMEM, Bouma PAD, Peters ACB, Stijnen T. Spelling errors made by children with mild epilepsy: writing-to-dictation. *Epilepsia* 1987; **28**: 555-63.
- 33 Aarts JHP, Binnie CD, Smit AM, Wilkins AJ. Selective cognitive impairment during focal and generalised epileptiform EEG activity. *Brain* 1984; **107**: 293-308.
- 34 Sturniolo MG, Giannotti F, Cortesi F, Galletti F. Partial childhood epilepsy and reaction time: the effect of interictal EEG discharges. *Neurophysiol Clin* 1992; **22**: 287-99.
- 35 Matthews WS, Barabas G, Ferrari M. Emotional concomitants of childhood epilepsy. *Epilepsia* 1982; **23**: 671-81.
- 36 Hoare P. Does illness foster dependency? A study of epileptic and diabetic children. *Dev Med Child Neurol* 1984; **26**: 20-4.
- 37 Winston E, Chilman C. Epilepsy, some social, psychological, educational, economic and legal aspects. *Psycho Reviews* 1964; **2**: 1-9.
- 38 Gallhofer B. Epilepsy and its prejudice. Teachers' knowledge and opinions: are they a response to psychopathological phenomena? *Psychopathology* 1984; **17**: 187-92.
- 39 Gutteling GM, Seydel ER, Wiegman O. Previous experiences with epilepsy and effectiveness of information to change public perception of epilepsy. *Epilepsia* 1986; **27**: 739-45.
- 40 Benedetti P, Galletti F, Mazzei C, Petrilli A. Perception of epilepsy in a group of Italian basic school teachers. In: Canger R, Loeber JN, Castellano F, eds. *Epilepsy and society: realities and prospects*. Amsterdam: Elsevier Science Publishers, 1988: 95-7.
- 41 Sturniolo MG, Petrilli A, Galletti F, Benedetti P. Childhood benign epilepsy and family psychological adjustment. *Abstracts of the 2nd European Congress Epilepsy and Society*. Dublin, 1990: 73.
- 42 Sturniolo MG, Giannotti F, Maffei S, Benedetti P. Benign epilepsy and depression in childhood and adolescence. *Epilepsia* 1991; **32**: S42.
- 43 Sturniolo MG, Maffei S, Giannotti F, Petrilli A. Poor self-esteem and maladjustment in children with epilepsy: the maternal view assessed by adjective check list. *Epilepsia* 1993; **34**: S44.
- 44 Bannon MJ, Wilding C, Jones PW. Teachers' perceptions of epilepsy. *Arch Dis Child* 1992; **67**: 1467-71.