

## LEFT-HANDEDNESS AND EPILEPSY

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### INTRODUCTION

Left-handedness is commonly claimed, usually in passing, to be more common amongst epileptics (e.g. Hicks and Barton, 1977; Bakan, 1978; Bradshaw, 1978; and Hicks and Kinsbourne, 1978). In this paper I will present evidence from a large-scale study which does not support the popular view, at least as far as the less severe forms of epilepsy are concerned.

The association of laterality with epilepsy has a long history. Hippocrates, in his treatise on *The Sacred Disease*, describes how epilepsy is due to the blocking of passages in the brain through which the phlegm is discharged, and that these vessels become blocked more often on the left side of the brain since there they are smaller and less numerous (Lloyd, 1978, pp. 243-245).

Hécaen and de Ajuriaguerra (1964) reviewed several studies which had examined the incidence of left-handedness in epileptics, usually without an adequate control group. Redlich (1908) claimed an increased sinistrality in epileptics, although he also suggested that there was no increased familial sinistrality. Stier (1911) claimed that epileptics showed both an increased sinistrality and an increased familial sinistrality. Hordijk (1952) claimed that there was an increased incidence of epilepsy in sinistral families. Bodin (1953) suggested that there was an increased incidence of left-handedness in epileptics as compared with schizophrenics and oligophrenics; he however used no normal control group, and his results are only just statistically significant ( $\chi^2 = 7.87$ ; d.f. = 3;  $p = 0.048$ ).

Several studies have examined the incidence of left-handedness in chronic severe epileptics undergoing neurosurgical operations (e.g. Penfield and Roberts, 1959, and Milner, Branch and Rasmussen, 1964). Whilst these studies appear to show increased sinistrality, there is neither an appropriate control group, nor any evidence to negate the possibility of a selection bias in favour of operating on left-handed patients (due for instance to a diminished risk of post-operative aphasia).

A recent study by Brittain (1978) compared a group of epileptic patients ( $n = 157$ ), with a group of matched controls ( $n = 80$ ); there was no evidence of increased sinistrality amongst the epileptics.

### MATERIALS AND METHOD

In 1958 the Perinatal Mortality Survey (PMS) collected data from every

child born in Britain during the first week of March (approximately 17,000, a 98% response rate). These children were later followed up at the ages of seven (I) and eleven (II) as a part of the National Child Development Survey (NCDS) (National Child Development Study, 1966; 1972). Handedness was assessed in a large proportion of the study population, and the detailed structure of these responses has been discussed elsewhere (McManus, 1979), the main finding being that it is relatively simple to divide the children into two distinct categories, right and left-handers on the basis of a single response, the mother's reply to a question, "Which hand does your child write with? Right/Left." This same division will be used in the present paper.

At birth evidence was collected of the presence of neonatal convulsions (this was, regrettably, coded with neonatal cyanosis, and thus the two are indistinguishable). At ages 7 and 11 detailed information was collected from the parents (interviewed by a trained interviewer) and also from doctors, as to the presence of epileptic symptoms during the child's life. An overall summary of the child's epileptic status was also constructed by the NCDS.

## RESULTS

Tables I show, for the two sexes considered separately, the incidence of left-handedness as a function of various items which are or could be associated with

TABLE I.

*Proportion of left Handers (%L) in those with and without a History of the conditions shown in Table I. (The sexes have been analysed separately since there are differences in incidence both of handedness and epilepsy between the sexes). The Table continues on page 489 (Table I<sub>b</sub>).*

Variable	NCDS No	Age	Survey	Source of information
Neonatal convulsion (or cyanosis)	1831	0	PMS	Doctor-midwife
Fit or convulsion in first year of life	274	7	I	Mother
Fit or convulsion after the first year of life	275	7	I	Mother
One fit only before five years of age	1817	7	I	NCDS summary
More than one fit before five years of age	1817	7	I	NCDS summary
Fits after five years of age	1817	7	I	NCDS summary
Doubtful fits before seven years of age	1817	7	I	NCDS summary
Petit mal or blank spells	276	7	I	Mother
Fits before age of seven	1502	11	II	Doctor
Doctor's summary of abnormal conditions present; "Epilepsy" (groups 2, 3, 4 and 5)	415	7	I	Doctor
Fits after the age of seven	1502	11	II	Doctor
Absent from school for more than one week during last year due to convulsions, fits or turns	1321	11	II	Mother
Parents, brother or sister has had a fit or a convulsion	290	7	I	Mother

epilepsy. Only singletons have been included in the present analysis. None of the  $\chi^2$  values are statistically significant. Table II shows the NCDS's own summary classification of the individuals' epileptic status at the age of 11. One of the statistical tests is significant at the 0.05 level. Nevertheless, scrutiny of the sub-groups of the table shows that, if anything, the incidence of left-handedness in the true epileptic groups (i.e. groups 5, 7, 8, and 10) is *lower* than in the other groups. In Tables I and II there is no evidence to suggest that left-handedness is more common amongst epileptics. Table III shows data from a question in NCDS 11, in which mothers were asked to classify any attack that their child had had (it is accepted that this classification may well be suspect). There are no differences in incidence of left-handedness between the groups. Of more interest is that the mothers were also asked to state the age at which the child first started having the attacks. Table III also shows the mean age of starting attacks, and Table IV an analysis of variance of age and attack type, by handedness. If one were to propose that, say, birth stress caused both childhood epilepsy and handedness (e.g. Bakan, 1971), then one would predict that the age of onset of epilepsy might well be lower in left-handers than right-handers. There is no evidence of such a process in Table III, and the trend in the results is actually in the opposite direction.

### CONCLUSIONS

There is no evidence, in a large population sample, of an association between left-handedness and epilepsy. It is of course possible that there may be such an association in severe epileptics (of whom there are relatively few in the present

TABLE 1b

Males						Females					
Condition absent		Condition present		chi <sup>2</sup>	p	Condition absent		Condition present		chi <sup>2</sup>	p
N	%L	N	%L			N	%L	N	%L		
6782	12.7	41	19.5	1.160	0.281	6473	9.4	18	22.2	2.091	0.148
5903	12.9	125	12.0	0.027	0.868	5661	9.4	95	10.5	0.034	0.853
5870	12.9	171	11.7	0.115	0.733	5635	9.5	134	8.2	0.115	0.734
6717	12.7	107	13.1	0.141	0.708	6395	9.5	96	9.4	0.001	0.971
6724	12.7	100	11.0	0.266	0.612	6416	9.5	75	8.0	0.192	0.665
6784	12.7	40	7.5	0.982	0.321	6459	9.5	32	9.4	0.001	0.982
6787	12.7	37	19.3	0.413	0.527	6470	9.5	21	14.3	0.568	0.451
6009	12.8	36	11.1	0.003	0.952	5734	9.5	37	5.4	0.314	0.575
6072	12.6	201	11.9	0.765	0.381	5792	9.5	191	8.4	0.286	0.599
5849	12.8	37	8.1	0.723	0.395	5573	9.5	33	9.1	0.006	0.932
6235	12.6	38	10.5	0.146	0.704	5979	9.5	24	8.3	0.038	0.840
6813	12.7	11	27.2	0.998	0.317	5597	9.4	17	23.5	2.432	0.118
5485	12.9	491	13.6	0.166	0.683	5271	9.5	439	8.0	0.993	0.319

TABLE II

*Proportion of Left-Handers (%L) in Each of the NCDS's  
Summary of Epilepsy Categories (variable 1842)*

Disease group	Males		Females	
	N	%L	N	%L
1. No disease	4	25.0	2	50.0
2. Indefinite	63	22.2	67	6.0
3. Faints	84	11.9	141	14.2
4. Hysterical	36	8.3	25	8.0
5. Consensus epilepsy	27	0.0	20	4.8
6. Suspect diagnosis	3	0.0	0	—
7. ? Febrile epilepsy	15	0.0	8	12.5
8. Definite febrile. ? Epeliptic	15	0.0	8	12.5
9. Not diagnosed	53	9.4	39	15.4
10. Febrile convulsion	113	11.5	92	9.8
11. Breath-holding	42	9.5	30	6.7
12. Non-epileptic blank spells	3	33.3	3	0.0
13. Epilepsy never suspected	6375	12.8	6061	9.4
	chi <sup>2</sup> = 22.63; d. f. = 12		chi <sup>2</sup> = 11.57; d. f. = 11	
	p = 0.0310		p = 0.3961	

sample), but to establish that would involve partialling out any effects due to mental subnormality or cerebral palsy, both of which are probably associated with left-handedness.

TABLE III

*For the Mothers' Description of Their Child's Attacks at the Age of 11, the Proportion of Left-Handers in Each Group, and the Mean Age of Onset of Attacks in Right and Left Handers.*

Mother's description	Males				Females			
	N	%L	Mean age R	Mean age L	N	%L	Mean age R	Mean age L
Grand mal	58	8.6	4.50	5.25	26	11.5	1.61	2.50
Petit mal	81	13.6	3.36	2.09	88	2.3	1.64	1.00
Other, or mixed epilepsy	8	25.0	6.20	3.00	11	18.2	1.00	5.50
Fainting or blackouts	103	10.7	8.43	9.36	124	14.5	7.70	8.52
Other attacks or turns	98	11.2	4.68	5.40	104	11.5	4.45	4.41
No attacks at all	6386	12.8	—	—	6064	9.4	—	—
	chi <sup>2</sup> = 2.66; d. f. = 5				chi <sup>2</sup> = 10.64; d. f. = 5			
	p = 0.7521				p = 0.0591			

TABLE IV

*Analysis of Variance of Age at First Attack by Epilepsy Type and Handedness*

Main effects	Males		Females	
	d. f.	p	d. f.	p
Convulsion type	4	< 0.001	4	< 0.001
Handedness	1	0.811	1	0.261
Interaction	4	0.797	4	0.567
Residual	313		323	

## ABSTRACT

Analysis of a large prospective study of 12,00 children shows no relationship between left-handedness and epilepsy.

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