

CHAPTER 5: LEFT-HANDEDNESS AND EPILEPSY

"Should ... (the) ... routes for the passage of phlegm from the brain be blocked, the discharge enters the blood-vessels ... This causes loss of voice, choking, foaming at the mouth, clenching of the teeth and convulsive movements of the hands; the eyes are fixed, the patient becomes unconscious ...

The discharge of phlegm takes place more often on the right side of the body than on the left because the blood-vessels on that side are more numerous and of greater calibre than on the left".

Hippocrates, The Sacred Disease,
10; 13.

5:1 Introduction

Left-handedness is commonly claimed, usually in passing, to be more common amongst epileptics (e.g. Hicks and Barton, 1975; Bakan, 1978; Bradshaw, 1978 and Hicks and Kinsbourne, 1978). In this chapter I will present evidence from the large-scale NCDS study which does not support the popular view, at least as far as the less severe forms of epilepsy are concerned.

Hecaen 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 both increased sinistrality and an increased familial sinistrality in epileptics. Hordijk (1952) claimed an increased incidence of epilepsy in sinistral families. Bodin (1953) suggested 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 ($\text{Chi-squared} = 7.87, 3\text{df}, p = 0.048$).

Several studies have examined the incidence of left-handedness in chronic severe epileptics undergoing neuro-

surgical operations (e.g. Penfield and Roberts (1959) and Milner et al (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.

5:2 Method

In 1958 the Perinatal Mortality Study collected data from every child born in Britain during the first week of March. These children were later followed up at the ages of seven and eleven as a part of the National Child Development Survey (for further details see Butler and Bonham, 1963; Butler and Alberman, 1969; 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 earlier in Chapter 3:3, the main finding being that it is relatively simple to divide the children into two distinct categories, right- and left-handers. These same categories will be used in the present Chapter.

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.

5:3 Results

Table 5.1 shows, for both sexes separately, and for the two sexes combined, the incidence of left-handedness as a function of various items which are or could be associated with epilepsy. Only singletons have been included in the present analysis. Almost none of the Chi-squared values are statistically significant. Table 5.2 shows the NCDS's own summary classification of the individuals' epileptic status at the age of 11. Two of the statistical tests approach significance. 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 5.1 and 5.2 there is no evidence to suggest that left-handedness is more common amongst epileptics. Table 5.3 shows data from a question in NCDS II, in which mothers were asked to

classify any attacks 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 5.3 also shows the mean age of starting attacks, and also 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 5.3 and the trend in the results is actually in the opposite direction.

5:4 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 sample), but to establish that would involve partialling out any effects due to mental sub-normality or cerebral palsy, both of which are probably associated with left-handedness.

TABLE 5.1 Shows the proportions of left-handers in those who gave particular answers on NCDS items connected with epilepsy. The analysis is for males, and females separately. Only singletons have been included.

| <u>Variable</u> | <u>NCDS No.</u> | <u>Survey</u> | <u>Person</u> |
|---|---------------------|---------------|----------------|
| Neonatal convulsion (or cyanosis) | 1831 | PMS | Doctor-midwife |
| Fit or convulsion in first year of life | 274 | I | Mother |
| Fit or convulsion after the first year of life | 275 | I | Mother |
| One fit only before five years of age | 1817 | I | NCDS Summary |
| More than one fit before five years of age | 1817 | I | NCDS Summary |
| Fits after five years of age | 1817 | I | NCDS Summary |
| Doubtful fits before seven years of age | 1817 | I | NCDS Summary |
| Petit mal or blank spells | 276 | I | Mother |
| Fits before age of seven | 1502 | II | Doctor |
| Doctors summary of abnormal conditions present= 'Epilepsy' (groups 2,3,4, & 5) | 415 | I | Doctor |
| Fits after the age of seven | 1502 | II | Doctor |
| Absent from school for more than one week during last year due to convulsions, fits, or turns | 1321 | II | Mother |
| Parent, brother or sister has had a fit or a convulsion | 290 | I | Mother |

| Males | | | | | | Females | | | | | |
|------------------|------|-------------------|------|-------|-------|------------------|-----|-------------------|-------|-------|-------|
| Condition absent | | Condition present | | Chi2 | p | Condition absent | | Condition present | | Chi2 | 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 | 14.28 | 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 | 0.931 |
| 6235 | 12.6 | 38 | 10.5 | 0.146 | 0.704 | 5979 | 9.5 | 24 | 8.3 | 0.038 | 0.841 |
| 68 | 12.7 | 11 | 27.2 | 0.998 | 0.317 | 5597 | 9.4 | 17 | 23.52 | 2.432 | 0.11 |
| 5485 | 12.9 | 491 | 13.6 | 0.166 | 0.683 | 5271 | 9.5 | 439 | 8.0 | 0.993 | 0.31 |

Table 5.2 Shows the proportion of left-handers in each of the NCDS's summary of epilepsy categories (variable 1842), by the subject's sex.

| <u>Disease group</u> | <u>Males</u> | | <u>Females</u> | |
|------------------------------------|-------------------------------------|-----------|-------------------------------------|-----------|
| | <u>N</u> | <u>%L</u> | <u>N</u> | <u>%L</u> |
| 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 | 21 | 4.8 |
| 6. Suspect diagnosis | 3 | 0.0 | 0 | - |
| 7. ?Febrile epilepsy | 15 | 0.0 | 8 | 12.5 |
| 8. Definite febrile. ?epileptic | 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-squared=22.63 12df, p=0.0310 | | Chi-squared=11.57 12df, p=0.3961 | |

TABLE 5.3 Shows, for the mothers description of their child's attacks at the age of 11, the proportion of left-handers in each group, the mean age of onset of attacks in right and left handers, and an analysis of variance of age on onset by attack type and handedness

| Mother's description | Males | | | | Females | | | |
|--------------------------|----------|-----------|-------------------|-------------------|----------|-----------|-------------------|-------------------|
| | <u>N</u> | <u>%L</u> | <u>Mean AGE R</u> | <u>Mean AGE L</u> | <u>N</u> | <u>%L</u> | <u>Mean AGE R</u> | <u>Mean AGE L</u> |
| 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 | 5.4 | - | - |

Chi-squared = 2.66
5df, p=0.7521

Chi-squared = 10.64
5df, p=0.0591

Analysis of variance
of age at first attack by
epilepsy type and handedness

| <u>Main effects</u> | <u>df</u> | <u>p</u> | <u>df</u> | <u>p</u> |
|---------------------|-----------|----------|-----------|----------|
| Convulsion type | 4 | < 0.001 | 4 | < 0.001 |
| Handedness | 1 | 0.811 | 1 | 0.261 |
| <u>Interaction</u> | 4 | 0.797 | 4 | 0.567 |
| Residual | 313 | | 323 | |