Section of Psychiatry

President—W. MAYER-GROSS, M.D., F.R.C.P.

[*May* 10, 1955]

PSYCHOLOGICAL FACTORS IN EDUCATIONAL DISABILITY

Dr. D. Russell Davis and Dr. Norma Kent[1] (Psychological Laboratory, University of Cambridge):

Intellectual Development in School-children, with Special Reference to Family Background

[Abridged]

The most satisfactory evidence on the effects of different kinds of home on intellectual development would be found in the comparison of monozygotic twins brought up in different environments. Since their genetical constitutions are identical, any differences in their mental development could be attributed to environmental factors. But the number of pairs of identical twins available for study is small, especially cases in which the two members of a pair have been brought up in environments differing in an easily defined way. So far therefore the evidence from this source is scanty.

The study of children removed from their natural parents at various ages and put into foster homes has been a more profitable source of evidence. In researches of this kind the effects due to inheritance can be estimated independently of those due to environment, at least to some degree, for correlations with the natural parents can be taken as measures of the effects of inheritance, and the correlations with the foster parents as measures of the effects of environment. The rate of intellectual development has been shown in this way to depend upon various qualities of the foster home. Thus intellectual development is favoured when the foster parents are of superior intelligence, education or occupation. But the correlation coefficients between the children's IQs and these factors tend to be relatively low; coefficients of the order of 0·3 have usually been reported when the children have been fostered within the first few months of life. Several attempts have been made to identify factors of similar or greater importance. Skodak (1939), notably, has had some success in this. She prepared a "Home Inventory", which was designed to assess what may be called the *stimulation value* of the home. This inventory is a curious mixture of items, for it includes, amongst other things, ratings of the availability of toys, and their stimulation value, the provision of space for play, the participation of parents in the children's play, the frequency of play with other children and the quality of the conversation and of the reading matter in the home. The assessments of the foster homes on this inventory correlated more highly with the children's IQs than did the IQs or the educational or occupational levels of the foster parents, the coefficients in some samples being as high as 0·49 at the older pre-school ages. Studies of fostered children, however, have not yet been pushed far along these lines. One reason for this has been the lack of adequate methods of assessing other than limited aspects of the home. The aspects which are the most easily defined and measured are not necessarily the most influential. This methodological problem besets all kinds of research in this field.

A further point of interest arises from studies of fostered children. The correlations between the children and their natural parents, and between the children and their foster parents, vary in closeness according to the age at which the children have been moved from one home to the other. The coefficients for the correlations with the natural parents are hardly above zero if the children have been moved within the first few months of life. The later they have been moved, the larger are the coefficients for correlations with natural parents, and the smaller remain those for correlations with the foster parents. From these and other similar findings one may argue that the rate of intellectual development is set

[1]In receipt of a personal grant from the Medical Research Council.

not at birth but only gradually during the first few years of life. The results of some recent investigations on the growth of intelligence in children living in their natural homes point to a similar conclusion. The coefficients of correlation between tests and retests vary in size according to the age at which the children are tested and the interval between test and retest. The trend of the variations is interesting. The coefficients tend to be relatively high during the school years; that is to say, IQs tend to be relatively constant during these years. They are much less constant at younger ages. The major part of the increase in constancy occurs between 2 and 5 years old (Honzig *et al.*, 1948). It is, therefore, especially among the children's circumstances during these years and earlier that one should look for some of the factors which determine IQs subsequently.

What are the responsible factors? Bowlby (1951) has drawn attention to the importance of the mother-child relationship, and to the effects of disturbances of the mother-child relationship in producing intellectual retardation as well as mental ill-health. Many American investigations on fostered children have concentrated on the stimulation value of the home. Levy (1933, 1943), on the other hand, has studied the effects of what he calls "maternal overprotection" on progress in various school subjects as well as on personality, and has found that overprotected children tend to read well, but to do less well in arithmetic. The effects of position in the sibship are also relevant, and in researches which involve the comparison of the intelligence or attainment of children occupying different positions in order of birth, many of the genetical factors are controlled. Only children and children first and last in order of birth seem to occupy a favourable position. However, it is debatable what advantages these positions give, to which the children owe their intellectual prowess.

Our approach is largely from the standpoint of theories of learning (Davis, 1954*a*, *b*). Hence arises our interest in what we call the management and discipline of the home. The term discipline, which we use in a broad sense, means the methods of training adopted by the parents, both father and mother, and especially their use of reward and punishment, the frequency, consistency and generosity of rewards, the degree of stimulation, the degree of interest taken in the child's progress and the standards of achievement expected. Variables of these kinds are not easily assessed reliably, but they are meaningful aspects of the circumstances in which the children are brought up. We depend for their assessment on leisurely and often lengthy interviewing usually of the mother or mother substitute. The interviews are retrospective and are designed to discover the kind of discipline adopted by the parents in bringing up the particular child under consideration. Our preference of interviews to questionnaires is deliberate.

For the purposes of our researches each child is put, on the basis of the information elicited at the interview with his mother, into one of four arbitrarily defined classes according to the kind of discipline to which he has been mainly subjected. These classes we call: *demanding*, *overanxious*, *unconcerned* and *normal* (Kent, 1954). We look then for relationships between the classes of discipline and the results of intelligence and other tests. That is to say, we look for relationships between external conditions and behaviour variables, and in this way we devote ourselves to finding answers to the traditional question of experimental psychology: under what external conditions does a given activity or phenomenon occur? (Bartlett, 1932). In the same tradition we regard the class of discipline as the independent variable, and the test results as dependent variables. This feature of our work is in contrast to many of the psychological researches carried out recently in this country, for instance, at the National and Maudsley Hospitals, which have been concerned, without reference to external circumstances, with correlations between two or more tests made on the same individuals. Researches of this kind have certain advantages in method and convenience, but, because they neglect external variables, the interpretation of their results has, in our opinion, tended to attach undue importance to organic and constitutional factors.

Our subjects have been samples of 8-year-old children drawn from primary schools in Cambridge. We have had to forgo the methodological advantage of direct control of genetical factors, because sufficient examples of identical twins or of children fostered early in life have not been available to us. We have had to enquire, therefore, whether our results might be due to the disguised effects of physical inheritance rather than to the effects of environment on mental development, and to test this alternative hypothesis whenever possible. However, we have concluded in every case that the environmental hypothesis is the more reasonable, although we cannot definitely exclude the genetical hypothesis.

The choice of 8-year-old children as subjects is a compromise. It would be easier to obtain information from the mothers of younger children about the discipline during the important years, but on the other hand IQs are fairly constant at this age. Also we are especially interested in the effects of the various disciplines on the development of verbal and academic abilities; at a mental age of 8 and above the Binet Scale provides measures of

these abilities mainly. For the measurement of practical abilities we have relied on the "performance" sub-tests of the Wechsler Intelligence Scale for Children.

We shall now report summarily the results of an investigation on 118 school children. Three tests were applied: the Revised Stanford Binet (Form M), the "performance" sub-tests of the WISC and Schonell's Graded Word Vocabulary test.

Let us first consider the characteristics of the children from *demanding* homes by comparing their test results with those of the children from *normal* homes. Typically, *demanding* parents set high standards for their child, and they reward ungenerously. They provide opportunities for him to learn, but expect him to conform to an inflexible model of what they think he should be. In particular, they expect him to do well at school. *Normal* parents are more tolerant, and their standards, although positive, are reasonably related to the child's needs, abilities, and spontaneous interests.

The mean IQ of the children from *demanding* homes on the Binet Scale was much higher (124 compared with 110 normal). Their mean IQ on the WISC sub-tests was only slightly and not significantly higher. They did rather better, although not significantly better on the reading test. These results show that verbal abilities tend to be well developed in children from *demanding* homes relative both to practical abilities and to the verbal abilities of children from normal homes. 12 of the 118 children in the sample had IQs of 140 and above on the Binet Scale; 9 of these had been subjected to a *demanding* discipline. These children pay a certain price for their intellectual prowess.

There were several children in the *demanding* class whose Binet IQs were above average, but whose reading age was three or more years less than their mental age. This is the association of scores which has excited so much comment from neurologists. These children had met difficulties in their reading at the age of 5 or 6 years, the main sources of which, it seemed to us, lay in such things as faulty methods of teaching (especially in small private schools), irregular attendance at school, because of illness, or several changes of school, or a combination of these factors. These difficulties being aggravated by excessive demands by their parents, reading had acquired an exaggerated importance, failures had been magnified, and unfavourable attitudes towards reading induced.

The salient feature of the children from *overanxious* homes was their poor score on the "performance" tests, in which their mean IQ was significantly lower than the mean IQ in the normal class (101 compared with 110). On the Binet Scale and on the reading test, their means did not differ from those in the normal class.

Their parents have sapped their confidence and restricted their activities for fear of what might happen to them. *Overanxious* parents are ceaselessly anxious lest their child should fall short of what they expect, and what they feel others, such as relatives, expect, and their model is inconstant, although it may be emphatic.

The number of children in the *unconcerned* class was too small to be able to draw definite conclusions. *Unconcerned* parents tend to be indifferent to their child's successes and failures, and their interest in him is weak and negative. Their discipline tends to be inadequate, haphazard and inconsistent. The children of *unconcerned* parents did poorly on all three tests, and especially so on the Binet Scale and on the reading test, on which their reading age was significantly lower than that for the normal class (6·4 compared with 8·4). In the *unconcerned* class, verbal abilities were on the whole less well developed than were practical abilities.

These results seem to show that intellectual development as measured by standard intelligence tests is influenced to a substantial degree by the discipline provided in the home. They are in keeping with the general trend of contemporary opinion on the importance of environmental factors in determining IQs, and in combination with the results of other investigations, they suggest that the traditional views which attach overriding importance to genetical factors should be revised. It seems reasonable to hope that further study of the effects of various unfavourable disciplines, with attention to the age of the child at the time of their impact, will throw new light on the ætiology of the mental defects.

REFERENCES

BARTLETT, F. C. (1932) Remembering. Cambridge; p. 11.

BOWLBY, J. (1951) Maternal Care and Mental Health (WHO Monograph. Series No. 2). Geneva.

DAVIS, D. R. (1954*a*) In: Recent Advances in Pædiatrics. Editor: D. Gairdner. London; p. 445.

—— (1954*b*) *Bull. Camb. Inst. Educ.*, **1**, No. 4, 1.

HONZIG, M. P., MCFARLANE, J. W., and ALLEN, L. (1948) *J. exp. Educ.*, **17**, 309.

KENT, N. S. (1954) Unpublished Ph.D. thesis.

LEVY, D. M. (1933) *Amer. J. Orthopsychiat.*, **3**, 26.

—— (1943) Maternal Overprotection. New York.

SKODAK, M. (1939) *Univ. Ia Stud. Child Welf.*, **16**, 1.

Mr. R. Lynn (Psychological Laboratory, University of Cambridge):

Personality Factors in Reading Achievement

In this paper I wish to present the results of an investigation into the effects of anxiety upon the reading achievement of school children. Because of its intimate association with neurosis, anxiety is sometimes assumed by clinicians to be necessarily incapacitating and inimical to worldly achievement. It is probably fair to say that most educational psychologists have adopted this view. Thus Schonell (1942) advises the educational psychologist investigating causes of backwardness to look for anxieties and conflicts. Kanner (1935) states that

"There are children so anxious for success that their very anxiety has an inhibiting effect on learning."

On the other hand, a smaller number of writers have held the opposite opinion that anxiety may actually contribute to academic attainment. Among those who have taken this view are such distinguished writers as Sir Cyril Burt and Mrs. Melanie Klein. Speaking of anxieties in children, Burt (1937) writes:

"These, however, are less likely to retard school progress; on the contrary, they often prove a source of extra effort and even overwork."

And in her own very different field and language, Melanie Klein (1952) maintains a similar position in her description of intellectual development as a defence against anxiety. The present research was undertaken to see whether any support could be found for these views by an examination of normal school children.

The Tests and the Subjects

80 children attending a junior school in Cambridge were selected by the headmaster as being good, poor or average readers. Their ages ranged from 7·5 to 11 years; there were 42 boys and 38 girls. The children were tested and interviewed individually for some three hours over four sessions of about three-quarters of an hour each, and were given a wide variety of intelligence, scholastic and personality tests.

Their reading age was assessed by Schonell's Graded Reading test (using the norms as modified by Vernon (1950)), and each child was given a score of reading attainment by subtracting the chronological age from the reading age. Thus a child of 10 years with a reading age of 11, was given a reading attainment score of +12 months.

Of the many methods psychologists have evolved for assessing anxiety, this paper is concerned only with the results of direct questions, although the findings have been, in general, confirmed by several objective and projective tests. The term anxiety is used in the sense described by Freud (1936) in his later discussions, i.e. as a feeling of apprehension following upon the loss, or the threat of loss, of the presence of the mother, of her love and approval, and of the approval of society. There was no attempt to measure castration anxieties. Anxiety was assessed by asking the children the following six questions, one mark being scored for each affirmation, or half a mark where the answer was equivocal.

(1) Have you ever been frightened by the thought that your mother might die?
(2) Are you upset if your mother goes out in the evenings?
(3) If you have been away from your mother at any time, have you felt unhappy?
(4) When you are reading or making things in the evening, do you dislike being alone?
(5) Does scolding make you feel upset?
(6) Are your feelings easily hurt?

These questions were asked towards the end of the interview, when a friendly relationship had been established between the child and the writer. They were asked informally, as if they had arisen by chance in the course of conversation. This method was chosen because it allowed an objective and quantitative method of scoring such as would not have been possible if the children had been assessed clinically. The questions were put informally because it was felt that the children would be more likely to answer them sincerely than if they had been presented as a formal questionnaire. Further, all the testing was carried out in the school, where the surroundings and the tester were already familiar. These circumstances probably encouraged the children to give frank answers to the questions; on the whole, they showed surprisingly little embarrassment, and gave every appearance of answering the questions truthfully.

As a control for these personal anxieties, the following series of questions concerning impersonal anxieties was also given:

(1) Are you afraid of any sort of animal?
(2) Are you afraid of thunder?
(3) Do you often feel nervous?
(4) Do you often have frightening nightmares?
(5) Are you afraid of the dark?
(6) Do you ever feel worried when there is nothing to do?

Results

On the whole the scores on both tests of anxiety were low; the mean score of personal anxieties was 1·26; of impersonal anxieties, 1·56. When these scores were correlated with those of the reading test, there appeared a positive correlation of +0·33 between reading attainment and the personal anxieties, and a correlation of +0·24 between the reading attainment and the impersonal anxieties. Both these correlations are significantly different from zero at the 5% level, although they are not significantly different from each other.

In general, these results confirmed the writer's clinical impression. A brief description of one girl will perhaps illustrate some of the features of the anxious good reader. This girl was exceptionally good academically; she was 10·4 years old at the time of testing, and achieved a reading age of 16·4. She was the youngest girl in the top class and had received special permission to take the grammar school selection examination a year early. Her Binet IQ was 146, although her Wechsler (WISC) performance IQ was only 115. On the personal anxieties she scored 4, and on the impersonal anxieties 3. A visit to her home revealed that it was substantially broken; the father worked in a town 15 miles away, and only came home once a month. The mother was a very timid woman, rather typical of the overprotective anxious mothers of nervous children described in the psychiatric literature (Levy, 1943). She described how the girl had a "mania" for tidiness—an interesting example of the compulsive features often associated with gifted children and adults—and how she spent all her evenings either reading or playing lexicon patience, a word-spelling game. It is not surprising that she does so well at school.

The association of anxiety and reading ability admitted one or two exceptions, children with some anxiety who were poor at reading. There are not enough of these to have any statistical significance and they may be due to chance factors. Taking the evidence of the intelligence tests into account, however, the writer believes that the present sample provides some cases which support the common belief that anxieties may prove inhibiting to school work, although these cases seem to be a minority.

Discussion

The investigation shows that reading achievement is associated with anxieties in general, and especially with anxieties about the mother's presence and approval, and the approval of society. The finding that anxieties and attainments are related might perhaps be explained by the supposition that there is a common factor underlying both; and such a common factor is not difficult to find, for anxieties and reading are both *learned*, and their association might simply be due to the fact that some children learn more easily than others. A child with an efficient nervous system might be expected to learn both to read and to fear with equal facility.

Alternatively, there may be some common environmental circumstance which would account for the relationship between reading and anxiety. It seems likely that such an environmental factor may be present in the types of mother which Dr. Russell Davis and Dr. Kent (1955) have called "demanding" and "overanxious"; they have shown that these mothers tend to have children who are good readers, and it is well known that anxious children also frequently have mothers of this type (e.g. Banister and Ravden, 1944).

It looks as if only some explanation in terms of a common factor can explain the association of impersonal anxieties and reading achievement, since it is difficult to see how either could have any direct effect on the other, for example, how being frightened of an animal could directly affect a child's reading ability. That this is not the only explanation, however, is suggested by the higher correlation between reading and anxieties about personal relationships. Here it is more plausible that anxiety could have a direct effect on the reading achievement. This may be described in psychoanalytic terms as the building up of a defence mechanism against anxiety, or in learning theory terms as a high degree of reinforcement due to anxiety reduction.

It may be, therefore, that too little anxiety is just as undesirable as too much. This view is supported by Bowlby's (1951) account of the affectionless character, who has so little concern about the opinion of society that the usual deterrents of disapproval mean nothing to him. If this view is correct we should think more in terms of redirecting anxiety than of trying to eliminate it altogether.

Acknowledgments

I am indebted to Dr. D. Russell Davis and Professor O. L. Zangwill for their advice and encouragement, and to the Pinsent-Darwin fund and King's College, Cambridge, for their financial support.

REFERENCES

BANISTER, H., and RAVDEN, M. (1944) *Brit. J. Psychol.*, **34**, 60.
BOWLBY, J. (1951) Maternal Care and Mental Health (WHO Monograph Series No. 2). Geneva.
BURT, C. (1937) The Backward Child. London; p. 551.
DAVIS, D. R., and KENT, N. (1955) *Proc. R. Soc. Med.*, **48**, 993.
FREUD, S. (1936) Inhibitions, Symptoms and Anxiety. London; chapter 8.
KANNER, L. (1935) Child Psychiatry. London; p. 545.
KLEIN, M. (1952) In: Developments in Psychoanalysis. Editor: J. Riviere. London; p. 222.
LEVY, D. M. (1943) Maternal Overprotection. New York.
SCHONELL, F. J. (1942) Backwardness in the Basic Subjects. Edinburgh and London; p. 120.
VERNON, P. E. (1950) In: Reading Ability. London, H.M.S.O.

Mr. G. Ettlinger and Mr. C. V. Jackson (Psychological Department, The National Hospital, London):

Organic Factors in Developmental Dyslexia [Abridged]

The incidence of certain physical factors in cases of the reading disability commonly designated as *specific* or *developmental dyslexia* is noticeably greater than in a randomly selected group of individuals. These factors include anomalies of lateral preference, in particular left-handedness and "crossed" eye-hand preference (Orton, 1937; MacMeeken, 1939); anomalies in the visual perception of apparent movement, considered by some authors to indicate failure to establish normal hemisphere dominance (McFie, 1952); minor EEG abnormalities, occasionally associated with a history of brain injury or even frank epilepsy (Spiel, 1953; Faust, 1954); anomalies of intellectual maturation, especially with regard to spatial and temporal analysis (Ajuriaguerra, 1951); and last, but not least, indications of a specific genetical background (Hallgren, 1950). This paper reviews some recent studies of dyslexia in which organic factors have been outstanding and presents a small group of cases we have recently studied at the National Hospital, Queen Square.

Our studies have their origin in McFie's work on developmental dyslexia employing the Jasper-Raney test of cerebral dominance. In this test, the two half-fields of vision are compared for sensibility to apparent visual movement and the hemisphere implicated as dominant is normally found to be the same as that predicted on the basis of handedness. McFie compared the findings on this test in a group of 12 cases of developmental dyslexia and a group of 12 normal subjects without reading disability. The results suggested that dyslexic subjects perceive apparent movement poorly and often show no clear-cut directional predominances. McFie was therefore led to conclude that in these cases "the neurophysiological organization corresponding to dominance has not been normally established in either hemisphere".

Spiel (1953) investigated a family in which the father, his three brothers and his two sons had selective difficulties in reading. Neurological examination of the two boys proved negative. However, both their EEG records showed poor development of the parieto-occipital alpha rhythm, but without evidence of focal lesion.

These findings of McFie and Spiel are complementary in so far as both indicate some maturational defect in the posterior regions of the brain. It is noteworthy that unusual or "borderline" features were reported also in the EEG records of 4 out of 6 of McFie's cases. A combination of neurological defects with specific reading disability has also been reported by Bach (1949) and Faust (1954) and the whole matter has been discussed by Hoff *et al.* (1954).

Genetical considerations in specific dyslexia have been reviewed by Hallgren (1950) in a valuable study. Although this author was unable to differentiate between hereditary and secondary dyslexia on clinical grounds alone, he reports a high incidence (i.e. 88%) of families in which the relatives of his actual cases were similarly handicapped by dyslexia.

Some further evidence that consistent anomalies of performance occur in specific dyslexia has recently been adduced by Ajuriaguerra and his co-workers (Ajuriaguerra, 1951; Galifret-Granjon *et al.*, 1953). In particular, defects in the establishment of right-left orientation, spatial judgment and temporal organization were marked in a significant proportion of their cases. These results are of particular value in so far as they suggest that dyslexia is not an isolated deficit but one facet of a more generalized defect of intellectual maturation.

We have been able to confirm many of these organic features in a series of cases referred to the Psychological Department of the National Hospital. The histories and test results in respect of 24 patients recorded as presenting selective reading defects were reviewed. This group does not overlap with that studied by McFie (1952). It was, however, decided to exclude 16 cases on account of insufficiently pronounced dyslexia (4 cases); the presence of marked emotional or psychoneurotic features (5 cases); and incidence of frank neurological disorder which could be construed as primary to the dyslexia (7 cases). Although

the resulting group of 8 cases is far too small to permit general conclusions to be drawn, it was thought preferable to exclude all patients whose reading disability could be at all plausibly related to some associated factor, neurological or psychogenic.

The *final case material* consists of 5 boys and 3 girls, with ages varying from 7 to 12½ years at the time of our examination (Table I). In every instance mental age exceeds

TABLE I

	Chronological age		Intelligence (Terman-Merrill M.A.)		Reading age (Burt)	Visuo-constructional tests (Kohs M.A.)
	Years	Months	Years	Months	Years	Years
Case (1)	8	11	12	0	7	8
(2)	10	0	10	0 or better	5½	11
(3)	12	5	13	2 or better	8	—
(4)	10	6	11	0 or better	6½	—
(5)	11	6	11	10 or better	8½	8½
(6)	7	1	7	6	5	6½
(7)	9	1	IQ 116		7	9½
(8)	10	0	10	0	6	7½

chronological age (thus excluding general mental defect) and the average amount of selective reading retardation by comparison with each child's mental age is four years (minimum two and a half years). It was found that all 8 children were comparably backward on Burt's Oral Spelling Test but only one was selectively retarded on tests of mental arithmetic. The nature of the reading and spelling errors broadly conforms in every instance to the characteristic pattern found in selective dyslexia.

Neurological examination was negative in all cases. There was, however, a history of early head injury in one case and of meningitis following mumps in a second. One patient gave a history of infrequent epileptic attacks (2 major and 7 focal fits involving the left hand). No evidence of neurological disorder was present in the remaining 5 cases.

On *psychological examination*, 3 children (out of 6 tested) gave evidence of *selective impairment on visuo-constructive tests*. The tests used were the Kohs Blocks and the Terman-Merrill "Memory for Designs" subtest, and our criterion of selective impairment was a deviation of two years or more from the mental age established on the full Terman-Merrill scale. It was interesting to note that although 2 of the children affected on these tests were below the age of 10, the third was aged about 12 and might therefore be expected to present a lesser degree of retardation. None the less her M.A. on the Kohs full scale was three and a half years below that derived from the Terman-Merrill. Although these results are obviously insufficient to permit any conclusions to be drawn, they broadly support the findings of Ajuriaguerra and his co-workers in so far as they go.

Certain features connected with *lateral preferences* deserve especial mention (Table II).

TABLE II

	Neurol. signs	Handedness		Cross laterality	Jasper-Raney test
		Personal	Familial		
Case (1)	None	R	Father partly L-handed	None	Indefinite dominance
(2)	None	R	Father partly L-handed: and L-footed	Eye-hand	Indefinite dominance
(3)	None	R. from age 7 onwards	Not known	Eye-hand	—
(4)	None	L	Father L-handed	Foot-hand	Indefinite dominance
(5)	None	R. from age 5 onwards	Uncle L-handed. Mother not fully R-handed	Not known	—
(6)	Sl. L-hand weakness	R	All R-handed	Not known	—
(7)	None	R	Not known	None	—
(8)	None	Ambidext: R>L	Mother partly L-handed	Foot-hand	R-dominant

4 out of 8 cases were fully right-handed and one fully left-handed. Two cases although right-handed when examined had originally preferred their left hand up to a relatively

late age. One case was predominantly right-handed but partly ambidextrous and certainly left-footed. There are thus signs of left or mixed handedness in half of this small group of cases. It was also notable that one of the fully right-handed children was left-eye dominant, the partly ambidextrous child was also left-eye dominant, and that the fully left-handed child was right-footed. Indeed consistent unilateral hand, foot, and eye preferences were present in only 2 of the 6 cases for whom this information is available.

Parental handedness could be established for 6 cases. Among the 4 fully right-handed children, there was evidence of a left-handed father in 2. In the case of one of the shifted sinistrals, 2 paternal uncles were reported to be left-handed or eyed and the mother was not fully right-handed. The maternal grandfather had two left-handed brothers. The mother of the ambidextrous boy was partly left-handed and the father of the fully left-handed boy was likewise fully left-handed. There is thus some sinistral ancestry in 5 out of 6 cases in which relevant data are available.

A *familial history of dyslexia* was elicited in only one case. This was in a girl who was left-handed up to the age of 5 and then shifted to the right hand. She had sinistral antecedents on both sides of the family, and some evidence of reading-spelling disability in the maternal grandfather.

On the *Jasper-Raney test of lateral dominance*, results were obtained in 4 cases. 2 fully right-handed cases gave results of the type adduced by McFie (1952) as indicative of indefinite cerebral dominance, as did also the fully left-handed child. The ambidextrous but left-footed boy saw movement to the left, probably indicating right occipital lobe dominance.

EEG records are available in 2 cases. In one (the girl with epilepsy) the record gave evidence of a focus in the right Rolandic area. In the other—the girl with shifted handedness and dyslexic antecedents—the EEG indicated marked, though not definitely pathological, asymmetry of the alpha rhythm, which was larger and more constantly present on the right, more especially in the parietal region.

These findings, although very fragmentary, find confirmation in a number of large-scale studies. Thus the exceptionally high incidence of left-handedness in dyslexics has aroused comment on the part of many workers, of whom some (e.g. Ajuriaguerra, 1951) are inclined to link it ætiologically, at least in certain instances, with the reading disability. "Cross-laterality," again, has been adduced as a causal factor in dyslexia by a number of workers, in particular McMeeken (1939), though Hallgren (1950) has failed to substantiate her findings.

Our very limited results tend in general to confirm McFie's findings and to support his claim that, in many dyslexics at least, normal dominance has not become fully established in either hemisphere. Although acquired factors, such as early brain injury, may play a part in this, it is more probably due in the majority of cases to some hereditary factor governing cortical maturation of function and the proper establishment of cerebral dominance. At all events, reading defects of the kind presented in these cases cannot properly be attributed to environmental or psychogenic influences. The frequent incidence of anomalies in lateral preference—both personal and familial—of crossed laterality, of equivocal findings on the Jasper-Raney test, and of defects in spatial and temporal perception render it virtually certain that developmental dyslexia is of constitutional origin. On our view, it is best regarded as a selective failure of learning directly due to defective maturation of those cerebral mechanisms underlying the visual aspects of language.

We should like to acknowledge the help and advice generously given to us by Professor O. L. Zangwill.

REFERENCES

AJURIAGUERRA, J. DE (1951) *Enfance*, No. 5, 389.
BACH, W. (1949) *Allg. Z. Psychiat.*, **124**, 25.
FAUST, C. (1954) *Nervenarzt.*, **25**, 137.
GALIFRET-GRANJON, N., STAMBAK, M., and SANTUCCI, H. (1953) Les Cahiers de L'Enfance Inadaptée. Paris. No. 17, p. 11.
HALLGREN, B. (1950) *Acta psychiat., Kbh.*, Suppl. 65.
HOFF, H., GLONING, I., and GLONING, K. (1954) *Wien. Z. Nervenheilk.*, **10**, 149.
JASPER, H. H., and RANEY, E. T. (1937) *Amer. J. Psychol.*, **49**, 450.
MACMEEKEN, M. (1939) Ocular Dominance in Relation to Developmental Aphasia. London.
MCFIE, J. (1952) *J. Neurol. Psychiat.*, **15**, 194.
ORTON, S. T. (1937) Reading, Writing and Speech Problems in Children. London.
SPIEL, W. (1953) *Wien. Z. Nervenheilk.*, **7**, 20.