AN ANALYTICAL STUDY OF READING DIFFICULTIES
IN CHILDREN

JENNY A. COSFORD
Work of a Specific Developmental Dyslexic Boy, Aged 10+ Years and with an Intelligence Quotient of 121 (M.I.S.C.).

They loaded their bicycles with the customers' things and set off. John rode in front of Peter. They had not gone far when John skidded and fell. Peter could not stop and crashed into him.

Version as written (the 'x' mark is the manner in which he has been taught to delete incorrect words).

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Correct Version.

They loaded their bicycles with the customers' things and set off. John rode in front of Peter. They had not gone far when John skidded and fell. Peter could not stop and crashed into him.
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ABSTRACT

This study of reading difficulties is ordered in the manner of a series of models, derived from a consideration of the reading process. They lead to a model of abilities and conditions that, when absent or not optimum, will inhibit reading. Examples are lack of motivation, perceptual handicap or emotional problems. However, the models do not predict the cause of specific developmental dyslexia — and hence this is examined in detail. It is conceived of as a syndrome in which the major symptom is difficulty in reading, and this is accompanied by minor symptoms such as speech retardation or defect, motor disorders, perceptual disorders, abnormal lateral preferences, spatial and temporal disorientation. Other factors unusually frequent in the background of specific developmental dyslexias are — adoption, multiple birth, a history of difficult pregnancy or difficult birth or severe illness in early childhood. An hereditary factor is involved in some cases.

The cause of specific developmental dyslexia has been ascribed to many malfunctions. Some are inadequate in explaining the facts known about the syndrome — for example, direct emotional causation. The minimal brain damage and the maturational lag hypotheses are retained. It is possible that the two causes are interrelated, in that brain damage causes an inhibition of maturation. A genetic factor could be envisaged to act in either case, in the former being represented as a malformation (e.g. vascular).

It is considered of great importance to institute a screening programme at age five to predict potential reading failure cases and thus give them help from the start of reading. A format for such a programme is suggested. Given maximum opportunity, severe reading problems can be overcome. Given less than this, delinquency often is a result.
CHAPTER 1

INTRODUCTION

Reading is a subject that has, up to recently, been seriously neglected in any consideration of early education. It was usually taken to be something acquired naturally, just as a child acquires the ability to speak, crawl, stand and walk. It was forgotten that today not all men can read - and that reading is an ability that developed over millions of years, starting from the presence of a number of skills that in suitable combinations, allowed the potential. Reading is only acquired by learning to manipulate the codes built up over centuries of culture.

If something is thus assumed to be acquired naturally, then those who fail to achieve are assumed to be too stupid, or too lazy. This was applied to non-readers and in many cases such assumptions are still made. These children were considered 'dunces', or exceptionally lazy, needing punitive 'encouragements'. Suffering under such insults, any child will hate the object of apparent cause, the institution wherein it all occurs and the inflictors who appear so harsh and cruel. Emotional reaction will then set in, and the child will become obstinate, unruly, and miserable, factors that can but worsen the situation. The chances of ever achieving normal reading become blocked and a disenchanted, illiterate adult is the tragic result. This picture is, perhaps, an extreme, but shows the general path that a misunderstood failing reader may unconsciously be forced along.

A failing reader may not necessarily be dull or lazy and many are
in the class of superior intellect and are highly motivated to read. Observation of the reading process and the sensory systems involved in its operation, suggests that the main causes of reading problems are in environment, education and emotion (in the assumption that the child is neurologically intact, with adequate sensory apparatus and adequate intelligence). Following this approach, however, appears to neglect a certain group of children who are not able to read in a manner consistent with their mental age. These children, commonly called dyslexics, are not always accepted to be different from those in whom environmental, educational and emotional problems are the cause of the disability.

The principal investigation of this thesis is the following:

Are these children, called dyslexics, a group separable from those with problems of environmental, educational or emotional causation, and if so, what is the cause of their problem?

Many have posed this question similarly, and they have attempted to solve it from a standpoint of datum relating only to reading difficulties. This predetermines an answer based on a very narrow range of evidence. For example, when an individual has a common cold, diagnosis is based on the manner by which the individual deviates from normal. To make the diagnosis as easily and frequently as it is made, it is assumed and known that there is a full awareness of the situation of normality. Is this the case with reading? Certainly little is known of the state of normal reading. This topic is discussed in the second chapter in the form of a brief consideration of the process of reading under normal conditions. Until recently there has not been
much research on this subject, and therefore the exposition is perhaps
a little biased towards the findings of one large project in America.
It is to be hoped that in the future, a consideration of the reading
process might be achieved using data from wider sources.

From the description of the reading process, a deduction is made
concerning the abilities and conditions which are concerned in the reading
process. Again, the presence of such a chapter in a thesis on reading
pathology may be explained by the common cold example - to observe the
signs, symptoms and conditions under which a cold develops, it is com-
pared with the norm. Thus, to see how and under what circumstances a
reading problem normally occurs, it is compared with the normal abilities
and conditions under which successful reading occurs. As a result of
consideration of the reading process and under what circumstances it normally
occurs, a model is derived. This suggests what should be present and
hence, by implication, the absence of what may be a cause of a reading
difficulty.

The fourth chapter is entitled 'Anatomical Aspects of Reading'.
This gives a neurological/anatomical background both to the sensory systems
discussed in chapter three and also to the subject of other factors dis-
cussed later. The chapter on 'The Teaching of Reading' also furnishes
a background to later discussion, since the practical methods of implanting
knowledge of 'how to read' are certainly of considerable relevance.

Having completed the background to the consideration of reading, and
when and whence the difficulties might arise, there is a comparison of
the model in chapter three and the classifications and models constructed
by other workers. These indicate the fact that the current model is
incomplete - in omitting reference to dyslexia. Further comparison of
the other models suggests a lack of agreement in the definition of the
term, and thus set definitions for the purposes of this thesis are
clarified in the following chapter. For reasons explained, the term
'specific developmental dyslexia' is adopted (to be abbreviated to
S. D. dyslexia).

The remainder of the work is an examination of the syndrome of
specific developmental dyslexia. Integrated with the discussion of the
various aspects, are relevant theories and suggestions as to the cause
of the syndrome. The inquiry is designed such that each chapter raises
questions as to whether the aspect is real or an artifact of research,
and then how it is integrated into the whole syndrome of specific develop-
mental dyslexia. It is considered thus as an aspect of the syndrome that
any theory as to cause must explain. This approach, apart from attaching
order to amorphous subject matter, also prevents the tendering of some-
what superficial or incomplete hypotheses. In addition, it is possible
to examine the more useful hypotheses in relation to the more important
aspects of the syndrome. The general conclusion is favorable to the
existence of specific developmental dyslexia and the implications of
this are then given consideration - whether it is possible to predict
a potential reading problem, what the future is like for such individuals
who have persistent reading problems, and the implications that arise out
of the discussion for teaching specific developmental dyslexics.
CHAPTER 2

THE READING PROCESS

While the fundamental factor in any research into difficulties in reading must be the process of reading itself, there is little discussion of it in any textbook or article. It might be assumed from this that reading itself is either too simple and inherent a process as not to require elucidation, or that it is so complex and unfathomable a process as to be incomprehensible. It is neither, however. Reading is a further refinement of the language capability — that is, a unique feature of humanity, and, in its requirements of visual, auditory, motor and higher cortical skills, can certainly never be dismissed on the grounds of simplicity. Despite the complexity, it is possible to theorize and explore the involvement of skills in the reading process. Few authors have attempted this, but notable exceptions are Crosby and Liston (1969) and, to a lesser degree, Smith and Dechert (1961).

Perhaps a major reason for the paucity of such discussion is that since the '20s there has been relatively little research on the reading process itself, but a tendency to concentrate on the individual reader and the experiences and environment that influence his success in the reading exercise. This, as an excuse, can hold no longer. Since 1959 there has been a program of research undertaken at Cornell University on reading, and reports originating from the project show that great progress is being made ('A Basic Research Project on Reading'). The work is principally being carried out under Eleanor Gibson. A forerunner of this work, who would appear to predict the way in which reading has been unravelled by Gibson, is Langman (1960).
Work which mentions difficulty, reading teaching, or almost any relevant area, and yet skates over the fundamental reading process without mention, is not complete, and it is suggested that the reason for the volumes of research on reading difficulty unmatched by the corresponding rise in knowledge lies to a degree in this failure.

The reading process can be broken down in an hypothetical manner by a consideration of the activities involved in reading, especially in the earliest stages. On encountering a page of script, the reader first uses his eyes to take in the symbols. Some aspect of the visual image corresponds with the 'meaning', and the relationship between image and meaning is usually present in the brain of an experienced reader. If the word is new the reader translates the visual image to a sound image by reading the letters or the syllables as sounds. He can thereby determine if a corresponding 'meaning' can be found in his knowledge of the spoken word. If, thus, a meaning for the written word is discovered, on a future occasion the mediation of the sound may not be required, although it appears that the average person always uses subvocalization in word identification - i.e. not only when he comes to the incomprehensible word. This, nevertheless, serves as a useful model from which to abstract the essential activities of the reading process. The model is shown in Fig. 2.1.
Fig. 241 A Model Incorporating the Main Elements Involved in the Reading Process. (See text.)
A number of other workers have used models to demonstrate various aspects of reading. One presented by Johnson and Nyklebust (1967) shows clearly the mediation of the auditory senses in learning to read. (Fig. 2.2). This model, however, considers the objects of reading and does not involve the 'process' to any degree.

Fig. 2.2 A Model Used to Illustrate the Mediation of the Auditory Processes in Learning to Read. (from Johnson & Nyklebust, 1967)

Crosby and Liston (1969) start from this point and build a series of models, which appear to clarify the reading process, while not ultimately analysing it.

Thus, starting at a pre-reading stage, listening and speech are represented. (Fig. 2.3 - circles depict non-localised function, boxes depict localised function.)
Fig. 2.1  Model Representing Listening and Speech at a Pre-reading Stage. — From Crusby and Liden (1969).
(Circles represent non-localised functions; boxes = localised functions.)

Listening

Speaking

Listening and speech, in early reading are linked to each other, and to a developing skill - visual discrimination. Skill at determining meaningfulness directly from the visual image is not yet, however, developed. In many cases it never does develop, (Buswell 1947), and therefore the child uses the two already established paths - listening and speaking.
These are established also as linked functions, as when speech is monitored by the speaker in learning pronounciability, etc.

Crosby and Liston describe the stages of reading, and then summarise in the following diagram:

Fig 34: Model Representing the Stages of Reading - A Summary
from Crosby and Liston (1967).
(Circles represent non-localised functions; boxes - localised functions.)
In Fig 2.4 -

Stage (1) represents the earliest attempts at reading, where each word is read aloud (oral reading).

Stage (2) represents a later stage where silent reading occurs and speech is present as subvocalization and detected by the sensory speech area. 'Listening' as such is not involved. Most adults read at this level of efficiency.

Stage (3) is attained by relatively few. These individuals do not need any longer to use the vocal or auditory system at all, and can comprehend the word directly on seeing it.

It would appear that correct training would help many more to read like this. Buswell says:-

"...the possible advantages of superior methods of perception are defeated by the crystallisation of the habits of subvocalisation, resulting from the early introduction of oral reading."

He therefore advocates the teaching of mainly silent reading in the earlier stages.

An anomaly has now arisen between Fig 2.1 and Fig 2.4. These define the term 'reading' in different ways and since 'reading' is the word of primary importance in this discussion, it requires some stable definition.

In Fig 2.1 reading is used to mean the process of vision, mental reasoning, and comprehension. Crosby and Liston, however, consider that reading means little more than the visual perception of the printed symbol and possibly recognition that it has meaning. At the third stage 'reading' is bypassed. Is their definition of reading really any different from that of visual perception? There is a value in this definition
of reading, in so far as it allows a representation of a form of defective reading - that with oral 'reading' but no comprehension, and that in which words are copied into writing, without comprehension.

There seems to be no general agreement on a definition of reading.

Elkonin (1963) suggests that:

"..... reading is the reconstruction of the sound forms of a word on the basis of its graphic representation."

This is along the lines of Crosby and Liston.

De Hirsh (1963) says:

"..... reading is the successful response to the visual form of language (the understanding of graphically fixed language units)."

Others give more general suggestions of the nature of reading.

One such in Horn (1937) -

"The author ..... does not really convey ideas to the reader; he merely stimulates him to construct them out of his own experience."

and then Deehant and Smith (1961) say:

"..... psychology of reading must be the nature of the reader."
Having now considered various views of the nature of reading, and also having considered various models which attempt to elucidate the stages in the process of reading, it is possible to look at deeper aspects of the activity. Such work, as previously mentioned, has notably been performed by Eleanor Gibson and a team working at Cornell University. The work is discussed and results given in a series of papers published since 1960, a particularly good summarizing account being that of 1965.

Gibson (1970) suggests that the ontogenic origins of reading are in speech and the tendency of children to scribble. She reports of several investigations in which young children were required to distinguish writing (and sometimes scribbling) from pictures. Results varied from institution to institution (nursery schools and kindergartens) but most children of three could distinguish writing or scribbling from pictures, and at age four some could distinguish writing from scribble. Considering that none of these children were near reading, the results were surprising.

When they reach the stage of reading, children must be able to discriminate one letter from another. Gibson, Pick and Gerson (1962) devised a series of artificial but letter-like forms, and from the observations of the differences between the letters of the alphabet, constructed variants, transformed from the original by degrees of rotation, perspective, transition from line to curve and topology. All of these transformations, except perspective, were considered essential for discrimination of letters (e.g. 'V' and 'U' or 'O' and 'C'). The subjects (4-6 year old children) were given a form and required to select an identical one from a series of alternatives. This was compared on the five-year-olds with the same transformation applied to real letters. The correlation was +.67 - very high. Thus, in addition to finding a trend in improvement with all transformations (though slower with perspective) from age four to eight, the period over which the learning of
such forms is important, they were able to suggest that the effect of a
given transformation is generalised and not specific to any particular
form.

In a further experiment (Gibson, Oscar, Schiff and Smith, 1965) a
chart was drawn up to determine which letters were most frequently con-
fused, and the features of such letters, for example curve, oblique,
intersection, etc. On the whole, the results showed that confusion was
most likely between similar letters (i.e. those with the greatest number
of common features), and that curve-straight and obliqueness variables
"may have priority in the discrimination process, and perhaps develop-
mentally".

A further experiment by Pick (?1965) was designed to determine how
a child learns a letter. There were two hypotheses - the first that the
child builds a model or memory image by repeated experience of visual
presentation (the 'Schema' or 'Prototype' hypothesis) - and the second,
that learning occurs as a result of picking out features of difference.
The second hypothesis was upheld, it being suggested that "while children
probably do learn prototypes of letter shapes, the prototypes themselves
are not the original basis of observation".

The next step is that of decoding the letters into sounds. It is
assumed that, at this stage the child can differentiate to a degree
between the letters. It is then necessary to consider the size and the
nature of the basic unit of reading.

There are several factors that can be enumerated to point to the
elimination of letters as the unit involved in this structure. For
example, evidence from tachistoscopy suggests that "even first graders can
read three letter words exposed for only 40 milliseconds, too short a
time for sequential movements to occur". Newman (1966) and Kelers (1966)
demonstrated that letters, shown sequentially on a screen, for periods of 100 milliseconds each, making short, familiar words, were read with very uncertain accuracy (e.g. six-letter words - 20% accuracy). This gives about two seconds per word. If letters were perceived as the perceptual units, these words would be easily read. Gibson suggests that the units are 'spelling patterns'. She says (1965):—

"By a spelling pattern, I mean a cluster of graphemes in a given environment, which has an invariant pronunciation according to the rules of English. These rules are the regularities which appear when, for instance, any vowel or consonant or cluster is shown to correspond with a given pronunciation in an initial, medial or final position in the spelling of a word."

and —

"The relevant graphic unit is a functional unit of one or more letters in a given position within the word, which is in correspondence with a specified pronunciation."

e.g. - 'SH' may be pronounced 'F' at the end of a word, but never at the beginning.

If such spelling patterns are the units of reading, it must be assumed that the skilled reader has assimilated them - and the rules inherent in the scheme must be automatically exercised. If this is so, then letters grouped in accordance with the rules should be more easily perceived than those without such accord. Thus in 1962 Gibson, Pick,
Gaser, and Hammond tested this by presentation (technoscopie) of a series of nonsense words. One list was pronounceable, the other was constructed out of matched letters in an order such that they were unpronounceable – e.g. pronounceable "CIVIL", and "CIVISI" (unpronounceable). The pronounceable words were perceived more accurately than the latter. Gibson et al concluded (1963):–

"..... that skilled readers more easily perceive as a unit pseudo words which follow the rules of English spelling-to-sound correspondence ....."

and –

"..... that spelling patterns which have invariant relations to sound patterns function as a unit, thus facilitating the decoding process ....."

In a further experiment, Gibson, Gaser, and Pick (1963) questioned the manner in which a child begins to learn to use spelling patterns as perceptual units. There seemed to be two possibilities. First, that words are learned by rote, thence gradually associated with words as spoken (with the help of phonics). The second possibility was that the concept of correspondence may originate from the similar ways in which grammar originates, since at most developmental stages, grammatical constructions are utilised. To determine the correctness of the possibilities young children were technoscopically presented with short words, pronounceable pseudo-words and unpronounceable pseudo-words (e.g. RAI; NAR; RMA). They were asked firstly to read the word and then spell it. It was concluded from the percentage of words read correctly that a child, even in the early stages of reading, was able to read a pronounceable word more efficiently than an unpronounceable word. Children thus appeared
(as the second possibility above) to be in command of the 'rules' of spelling patterns, generalised from grammatical structure constants.

The concept of meaningfulness has long been linked with the rapid perception of letters. Gibson, Bishop and Smith in 1964, showed that the pronounceability of a word (i.e. apparently the presence of 'spelling patterns') superseded this in importance. Initials with general meaning, but no pronounceability were used in this experiment. An example is I.B.M. (meaning only), B.I.M. (pronounceability only) and B.I.X. (neither meaningful nor pronounceable) - a control.

The findings of this experiment suggest, that the order for perceptual threshold (taken as an "indicator of relative unitariness") was - pronounceable - meaningful - control. In recall, the order was - meaningful - pronounceable - control. This can be explained on the lines that, for memory preceding recall, the brain must use a coding system, and 'meaning' is obviously a preferable category to pronounceability for this function.

Pronounceability has been utilised as a concept related to reading throughout most of the experiments; however, in a paper published in 1970 Gibson demonstrated a degree of indecision as to its value. She remarked that she had replicated the finding of pronounceability as a major factor in reading "many times", but that "several people suggested to me that the pronounceable words merely had a higher sequential possibility of the letters, calculated by summed bigram or trigram frequency". In order to retest the validity of this concept, as opposed to pronounceability, another experiment was set up (Gibson, Shurcliff and Teresa, 1970). Deaf subjects were compared with hearing subjects on the ability to read pronounceable and unpronounceable combinations of letters. Results were similar, and it seemed therefore that the term 'pronounceable' was at least misleading.
"I believe the difference between the two types of words can be accounted for by the rules of orthography, that is, spelling patterns. I do not mean simply statistical structure, like transitional probability, but real rules, such as what consonant combinations can begin a word."

A further experiment (by Gibson, Farber and Shep1a 1967) suggested that children form a learning set to look for spelling structure. This they found to develop in success, with age and schooling. They tried the same experiment with colour pattern (rather than 'letter pattern') and found an ability to transfer the set; that is, a child could transfer the ability to search out a letter pattern to the task of searching out a colour pattern with a similar structure. Similarly Loomis (1969) showed first-grade children to be able to sort out 'mail' (letter cards) on the basis of the presence or absence of a constant cluster of two letters.

These experiments have led to Gibson's use of a concept of reading as "the discovery of a structure". Such a concept has wide implications for future research. What structure, for example, is that employed in learning to read? This question is fundamental to the argument of whether 'Look and Say', or phonics teaching is most efficient in early reading.

Carol Bishop (1964) attempted to determine this by simulating 'learning to read' processes in children, by teaching Arabic to American subjects. The Arabic characters selected had a 1 : 1 letter-to-sound correspondence, and thus were easier to learn than many English letters and sounds. The subjects were divided into three groups, and the experiment was performed
in three stages. In stage one all groups of subjects were involved in the same task. They listened to a native speaker pronouncing a set of words in Arabic (the words being made up of combinations of the twelve characters). At the second stage one group (phonetic) was taught the sound and corresponding graphic symbol of the twelve letters. Another ('look and say') was taught similarly, eight words (not letters), and the control group was set an unrelated task for the same time period. At stage three, all subjects were taught to read the set of words that they had heard in stage one, responding to the presentation of the word on a card by pronouncing it. Subsequent to this stage, all were tested on their ability to give the correct letter-sound on the showing of each printed letter. Learning took place in fewest trials with the 'phonetic' group; the second in rate of learning was the 'look and say' group, and slowest were the controls.

Thus letter training appeared to be, on the whole, more effective than the method of word training for learning to read... It was found, however, that some of the 'look and say' group had analysed the component relationships of letter-to-sound in the word, and hence achieved efficiency in transfer to new words. It is an important consideration that Bishop used only letters that had a one to one letter to sound relationship. The child beginning to read English is immediately confronted with spelling and phonetic irregularities; perhaps early reading should be concentrated on the regularities that exist? Levin has shown that third-grade children, only taught characters with a one-to-one correspondence, are less efficient that a group taught characters with an inconstant correspondence. It has been suggested from this that - "initiating the class with a variable list created an expectation of learning set and facilitated learning it", and further that - "A 'set for diversity' may, therefore, facilitate transfer to learning of new letter-sound correspondences, which contain variable relationships."
It appears, therefore, that children should be taught to read with methods using some phonetics, but not necessarily compensating for the ‘irregularity’ of English.

Another theory of reading was developed by Brown (1966) (quoted in Langman 1960). He suggested that any letter is strictly limited in the range of immediately subsequent letters. The letter that follows is calculable in terms of probability - e.g. 't' is unlikely to be followed (in English) by 'p', 'b', 'f', 'v', 'n', 'n', and is most likely to be followed by 'h'. 'h' itself, however, being preceded by 't', has, in addition to its own limitations, (many consonants), a further limitation imposed by the combination 'th'. Brown says that, in spoken language, context enables the correct sound to be perceived. He suggests that the discrimination of one individual sound is rarely required (e.g., as might be necessary in the discrimination of the lists: kid, hid, hod, etc.) Also, he suggests (as Gibson) that the sequence of probability of finding any phoneme in a given place is often strictly limited. For example, 'ce-op' almost perfectly predicts an 'r', but the word skeleton 't-a' may predict 'a', 'i', 'a', 'o', or 'u-e', 'o-e', 'oa'. Brown summarises the process of learning to read as the creation of a "behavioral disposition" in a person "by his acquaintance with the combinational probability structure of his native language".

Kolers disagrees with much of the work of Gibson, and for similar reasons that of Brown, since, he says, the task of unravelling the reading process "...cannot be performed inductively by studying the most primitive aspects of the reader's performance and working up, because there is no principle to guide the induction". He further suggests that "the primitive behaviour can only be comprehended as a part of the more sophisticated behaviour." Kolers' apparent condemnation of the area of the reading
process on which Gibson concentrates is unnecessary, since both are complementary to each other. Gibson elucidates the perceptual activities involved in reading, and Kolers, various aspects which are mainly applicable to the skilled reader, although some of his work is directly applicable to the general framework laid down by Gibson. In one experiment, (Kolers and Katzman, 1966), letters were shown sequentially on a screen. It was found that letters must be presented for more than a quarter of a second each for correct identification to be made. When letters were presented for 125 milliseconds each however, the word that they made up was more easily identified. Kolers et al concluded from this that "the recognition of words has only a limited dependence on the recognition or 'discriminability' of the individual letters".

During a similar experiment to that described above, it was noted that the subjects on some occasions were able to report all of the letters, but in the wrong order. Such incorrect seriation did not occur at longer durations of showing, and the observation lead Kolers and Katzman to identify two elements in the perception of sequence, item identification and item order, the latter process taking a shorter time than the former. They explained the apparent anomaly by the conception of three stages, scanning the serial display to form a schema, then the ordering of the elements, and then only, the identification of the elements ("filling in").

Another point that Kolers makes is the importance of the role of grammar in reading. He studied errors made in reading a passage that had been transformed geometrically (e.g. mirror transformation, and various degrees of rotation, etc.) He found that errors, on the whole, maintained the sense of the passage, both semantically and syntactically, and suggested thereby that:
any theory that attempts to account for reading in terms of translating graphemes into phonemes, in terms of the discrimination of individual letters, or in terms of a sensitivity to the morphemic structure of single words, is hopelessly insensitive to even the simplest kinds of linguistic processing the reader engages in. I have shown this by illustrating the potent role grammar plays in reading — and grammar, by its very nature, involves sequences of words rather than single words."

At this point it would seem very valuable to co-ordinate the work of Gibson and Koleva, in order to demonstrate the development of the skilled reader who is able to make full use of the grammatical structure of language, and the child who has not absorbed such knowledge. It might well be valuable to conceive of a continuum of the process of reading — starting from the earliest letter-by-letter reading, to a word-by-word method whence can begin the use of grammatical context, to the stage of full use of grammar, in the skilled reader.

A further aspect of reading that Koleva has elucidated, is the nature of the perception of a word to a skilled reader. Does he 'see' the word as a sequence of letters, or does he 'see' the concept or meaning of the word? The determination of this point involved the presentation of words in two languages to bilingual individuals. Some of the words were duplicated in one language, others were presented once in both languages, and some were single. The assumption was that on recall the duplicated words would be remembered more efficiently than those presented only once. Those represented in both languages would be recalled more efficiently
only if the meaning was perceived rather than the sequence of letters. 
(In the letter case, the same word in two languages would be recalled at 
the same rate as singly represented words.) It was found that meaning 
was perceived rather than a sequence of letters. Thus Kolers concluded 
that -

"..... for a person who knows them, words are 
perceived and remembered preferentially in terms 
of their meanings and not in terms of their 
appearances or sounds."

Again, it would be interesting to investigate the evolution of the 
ability to read meanings rather than the letter sequences. This expe-
iment may also cast doubts on the direct inference of the nature of 
reading in children from experiments that involve adults (as some of the 
work of Gibson has tended to do).

There are several other workers who have, with varying degrees of 
completeness, endeavoured to show how reading occurs. These studies 
have largely been concerned with the identity of the dominant visual cues 
utilised in word recognition. This approach in itself appears to con-
tradict that of Gibson, in nominating words as the units, compared with 
Gibson's letter cluster.

Filsbury, in 1897, used tachioegy to distinguish cues for word 
recognition (quoted in Diak, 1960). These were:-

(1) Form of the whole word - length, projections, 
and location of prominent letters.

(2) Clearly seen letters themselves (away from 
the point of fixation.)

(3) Context.
Zeitler (1900) mentioned the importance of high, low and capital letters and Schumann, thence Wagner, found that when a row of unlinked letters were exposed tachioscopically, the letters reported seemed to be taken from the initial, medial and final positions in the string(of fifteen letters). It would be interesting to determine exactly what these letters were, as the results might then foreshadow the work of Gibson.

In another experiment of Dias (1960), the length of exposure time of a tachioscopically presented word was gradually increased. The image perceived by the observer was found to change from a grey elongated blur to a stage where beginning and ending letters, and other familiar letters or letter groups were discriminated - to the stage where the whole word could be identified.

It must be thus assumed that the perception of the whole word (i.e. all of the letters) is of lesser importance in reading than that of certain key letters - possibly to be equated with Gibson's spelling patterns.

The research described above and much of that of Gibson et al employs as a research tool the tachioscope in order to record a perceptual process. It is necessary to consider the possibility that this is producing artifacts among the results. For example, is the reading of a word presented tachioscopically the same process of reading as that performed in reading a whole line of script? In reading a sentence there are eye fixations at a number of positions, depending on the skill of the reader. In showing a card with a word written on it, there must be a fixation on the card. This may mean that different letters are seen than would be seen if the word were in a sentence (and were read at the normal rate of the reader). Hebb (1965) reported an experiment by Meron, which produced support for the tachioscope in work on the reading process. Letters were projected on a screen around a central fixation point, as shown in Fig 2.5.
He found that there was an eighty per cent correct response rate on the top left letter and this lowered on the other letters to forty per cent with the bottom right letter. This is an interesting result, particularly when compared with the work of Orbach, who found that Jewish subjects gave reversed results on a similar experiment (Hebrew reading from right to left.)

Another line of research into the reading process, is that influenced and modelled on the ideas of the Gestalt school. The term Gestalt had its origins around 1870, and thence development of the concept has paralleled the development of ideas about reading. It is therefore hardly surprising that the two studies have become linked in some theories. Northeimer, in 1912, defined a Gestalt as "a whole, the behavior of which, is not determined by that of its individual elements, but where the part processes are themselves determined by the intrinsic nature of the whole". This definition has been applied to words by de Hirsch (1963), who suggested that a word is a Gestalt and that a letter is a 'partial' Gestalt. She said:-

"Both word and letter configurations are probably grasped on the basis of their determining features. Certain readers may tend to the apperception of larger Gestalten, but even if they grasp them more or less as a whole, they must be able to quickly and reliably
"analyze them into their elements. Reading, in other words, requires both integrative and differentiating function".

In discussing the concept of a Gestalt applied to a word, she pointed out that where letters were spread out on a page, or separate syllables printed apart, reading took 66% longer, because the Gestalt was not maintained. Perhaps, however, this was because of the larger space over which the eye must travel, or the fact that the normal 'rhythm' of fixation was disturbed.

Many others have been influenced by the Gestalt concept in their consideration of reading. Schonell (1939) suggested that, since children tend to perceive the general shape of a letter, the sentence frequently used in early reading - "The cat sat on the mat" - should be adapted to - "The cat sat in the frying pan" - in order that a greater variety of general configuration might be involved. No doubt the shape is used in some cases as a cue (especially as a cue in longer words), but how often is this a guess at an unknown word?

Gestalt psychology much influenced the teaching of reading, and was a primary factor in the development of the 'whole word' or 'look and say' method, which superseded the phonetic method in the twenties and thirties. However, Gestalt theory is declining, in favour of more concrete investigations of physical manifestation in the cerebral cortex of the brain.

In 1957 M. D. Vernon said:-

"...... continued study by (some) psychologists inspired by the Gestalt school, ......... seems to have produced a mass of detailed results leading to conflicting conclusions, or to no conclusions at all. The apparently
"clear outlines originally drawn by the Gestalt psychologists have become blurred and dimmed. And it has seemed, perhaps, that their experimental results and their theories ....... indicate .......... rather a one-sided exaggeration of certain features, by no means the most important, in perceiving, as we ordinarily experience it."

It seems that Gestalt Psychology had a tendency to blanket many aspects of reading and, in dealing with 'wholes', prevented work being done on internal structure, especially in the field of perception. The Gestalt is a 'nice' concept, when applied to words - but the analytic approach of Gibson has been invaluable in attempting to break through it.

There are a number of areas of research which, while not directly concerned with reading, do throw light on aspects of the process. One such area is that related to Piaget's theories of decentration. Briefly this theory states that perception is a dynamic factor that has a developmental history in each individual. The young child's perception is 'centered' - it is held by the dominant aspects of the visual field, these being determined by Gestalt-like principles. Subsequently the perception becomes freed - 'decentered'. This is brought about by the development of a higher order perceptual organisation. The child, then only, can manipulate structures internally - e.g. unscramble a word from mixed component letters. Elkind et al have investigated this in a series of experiments (1962, 1962a, 1964, 1965, 1965a, 1965b). The paper published in 1965a deals directly with reading ability and decentration, and employed figure-ground tests as a tool to elucidate the relationship. They concluded:-
"These findings are thus in general agreement with the hypothesis that reading involves the activity to decenter perception, and that the more decentered a child’s perception, the better his reading ability."

They suggest that kindergarten children might be given decentration practice, on figure-ground tests. However, these findings must be tempered with earlier conclusions that the ability to correctly perceive such figures increases with I.Q. (at constant age), a factor that is likely to explain some of the results concerning reading. It would seem that the essential variable is one of saturation, one that is much linked with some forms of reading failure.

There is another field that only relatively recently became, to any degree, involved in reading. This is the field of computer science. In the early development of computer systems, data to be put in the machine was required to be in the form of a very specific code. Later the code became less complex and data processing became correspondingly less arduous. Recently, there has been development of computer terminals, separate from the main computer, a move that has forced the rapid acquisition of a 'language', that is possible to learn in a short period; one that can be used entirely by the layman (and even school children). The next step is to enable the computer to read a language, as it is written and spoken daily. This step is occurring now, and has already prompted much thought about linguistic principles. Such are largely in the realm of syntactic structures, since meaning can be built into the computer as a dictionary, where the symbols forming a word correspond to those in a store, with an attached 'meaning'. Nevertheless, it would seem impossible to consider the development of a 'reading' computer without also bearing in mind a reading human, and at least, new ideas about the process must inevitably emerge.
In addition to reading, computers are being taught to act on spoken command. This requires work on the phonetic components of language, a subject area again linked with the reading process. Gibson (1965) reports of work on English graphic mono-syllables, showing regularities of spelling pattern to pronunciation (Hockett 1963), which was developed into a computer programme for obtaining the regularities of English spelling to sound correspondence. The data enables one to look up any vowel or consonant cluster of up to five letters, and thence to find the pronunciation in the initial, medial or final position in a word. (Venezky 1962).

In this chapter, several approaches to reading have been demonstrated, beginning with that of building models, which summarize ideas on how reading occurs, and thence project ideas of where investigation might be most fruitful. They also suggest areas in the brain that might be implicated in the process, and prevent the blanket concepts of a 'reading centre' and such like. Similarly, because no one worker considers reading in the same manner, the development of different models clarifies the areas of dispute. An example of this is given - where the term 'reading' itself is used to encompass two widths of definition in two models. Several suggestions of how reading should be defined are discussed. These vary greatly, the complexity, perhaps, being determined by how far each writer has considered the reading process.

Gibson, who is currently in the fore of this research, defines reading in terms of discovery of a constant structure. She has arrived at this after at least ten years work. The experiments have covered letter discrimination, the perception of whole words, and the manner in which words are read.

Kolar at al have added to the work of Gibson, and have valuably demonstrated some areas in which it is deficient.
Other research on reading is mentioned, most of which is concerned with the identity of the dominant visual cues of a word. Since much of this work (and that of Gibson) is performed by use of the tachistoscope as a research tool, the validity and usefulness of this is questioned.

Research on reading that was influenced by the Gestalt school is considered, and it appears that there was a tendency for this concept to blanket any real analysis of the process.

In conclusion, every aspect of the reading process is relevant to the study of reading difficulties, and hence the findings now appearing must be increasingly involved in future research of this nature.
CHAPTER 3

ABILITIES AND CONDITIONS TO BE CONSIDERED IN THE READING PROCESS

This chapter will be considered in the manner of a derivation of ideas from the chapter 'The Reading Process'. This approach will demonstrate how useful hypothetical models may be in directing investigation, and organizing results. It will also provide a firm link between research that now begins to demonstrate how reading occurs, and that on the neurology, the teaching, the background abilities and conditions necessary for successful reading.

The organization of this chapter will follow that of the model depicted in Fig 2.1. In considering each ability and those external conditions that might have a lessening or ameliorating effect, introduction will be made to the topic of reading problems, particularly those directly attributable to low ability in a particular sphere, or where learning conditions are not optimal. An important concept in such discussion is the meaning of 'a normal child'. This is well introduced by C. W. Valentime in "The Normal Child" (1956).

Thus from Fig 2.1 the visual processes will be first considered. Pure vision involves the ability to transmit a clear, undistorted image from the eyes into the brain. The image should have certain fundamental properties such as colour and contrast, and these depend on the functioning of the retinal cells at the back of the eyeball. Vitamin deficiencies or general malnutrition will affect the performance of these cells, and also that of the optic nerve, transmitting nerve impulses from the eye to the brain. (see Fig 3.1) The vitamins particularly relevant here are A and B complex.
There has been much controversy about the degree of disturbance of vision that begins to have an effect on the reading performance. This was particularly so around the '30s and '40s when possible causes for reading difficulties were being first investigated. (see Eames 1932, 1934, 1938, 1944, 1946, 1955). On the whole however most reports suggest that optical imperfection has to be fairly high before there is a serious effect on reading.

On this subject de Hirsch (1966) quotes Rodman Irvine (1941), speaking on the Ophthalmological Section of Los Angeles County Medical Association in 1940:

"If the visual acuity is reduced 50% or more, the child will have difficulty in interpreting symbols, as he cannot see well......

"Except in far-sightedness, and astigmatism of a marked degree, the child's power of focusing is sufficient to give an adequate, though not perfect, degree of focusing, and a small amount of myopia may be an advantage rather than a disadvantage in reading. The presence of a crossed eye with normal vision in one eye has little or no effect on reading ability......

"Compensated muscle imbalance, such as phoros of a marked degree, does not affect interpretation of symbols......

"So-called faulty eye movements, such as so-called regressions depend primarily on poor visual understanding of visual material, and not on inco-ordinated eye muscles...... Not the eyes, but the brain, learns to read."

Goldberg (1970) has investigated the eye movements of children with
learning disabilities by using an electromyostatograph. His conclusion was that bad eye movements were caused by poor comprehension -

"...it is the degree of comprehension that produces the type of ocular movement and not ocular motility that determines the degree of comprehension."

At the level of the brain, visual perception occurs. This may be considered, anatomically and functionally, as a bridging process between vision mechanisms and full comprehension. Rabinovitch (1967) says:-

"Visual perception is the ability to recognise and use visual stimuli, and to interpret these stimuli by relating them to previous experiences."

Two functions that this definition implicates are those of correct implantation and maintenance of the visual image in the brain - visual discrimination and visual memory.

Gibson describes how individual letters are learned. She suggests that this is by means of the differences between letter forms. To distinguish this difference, a comparison must be made - one image against the other within the brain - and this is a feat requiring considerable visual memory capabilities. Similarly a child must therefore be able to discriminate, on the basis of his learning, the differences of the letter he is seeing from any other and which features will define it.

Visual perception is one of the most important functions in the reading process, and for this reason it is frequently tested as a diagnostic factor in reading assessment.
An example of the form such a test might take is shown in Fig 3.1 below:

In these items, the instructions might be to underline the figure which is the same as that given at the beginning.
Longman (1960) has enumerated a list of visual perceptual skills in reading. Some of these are quoted below.

In learning to read, a child must be able to perceive:

1. - The word as a pattern unit.
2. - The word as a figure/ground constant (i.e., always see the lettering rather than background, as significant).
3. - The word as a pattern unit with an internal design as well as an outline.
4. - Words as differing patterns.
5. - Words as including simpler constants (letters) horizontally.

The child must also be able to recognize:

6. - 26 letter patterns.
7. - Upper and lower case correspondences.
8. - Word identity in upper or lower case letters - or first letter only in upper or lower case letter.

He must also:

9. - Realize that where letter shape remains constant, but orientation differs, he must consider the letter value as changed.
10. - Be able to perceive the word identity despite variations in line thickness, etc.
11. - Be able to recognize the change in meaning where the first letter is upper or lower case.
12. - Make full use of visual cues - e.g., length, occurrence, location of round or slim letters.
13. - Be able to perceive directional aspects of a word - right or left.
14. - Be able to recognize that written speech corresponds in arrangement with spoken speech.
15. - Know the layout system of a book - front to back, top of the page to bottom, etc.
From this list it becomes obvious that the ability to perceive accurately, and to hold the image in mind, is a very essential part of reading. Some of the ways in which Langman uses the term visual perception here are perhaps a little wide, and would be better described as comprehension. (e.g. No. 15). However, such an analytic regard of a brain function, applied to a physical ability is likely to be fertile in its implications for future investigation.

An aspect of visual perception that is not often stressed sufficiently in its importance in reading is the ability to retain the sequential ordering of the incoming stimuli. In reading, the letters in a word must be received both from left to right and also in the order in which they appear on the page. These criteria are more stringent than is usual for any other stimulus. For example, a pencil, a table, a chair and so on, are constant, and retain the same 'meaning' whether scanned from left to right or in whichever order the components are observed. Most children at the beginning-to-read stage, make errors of a nature that suggests that their ability to take in the letters in a word in the order portrayed is not fully developed. Piaget has demonstrated the acquisition of the concept of seriation, and suggests that below the age of six, the child is incapable of directing attention systematically, and hence is unable to carry out the comparisons required for ordered input to the brain. This view is opposite to that of Callaway (1970) who suggests that a sensitive period for acquisition of linguistic skills and form discrimination exists between the ages of two and four and reading should therefore be taught during this period. (see chapter 5).

By reference to Fig 2.2, the importance of speech in at least the earliest stages of reading can be seen. This, at a more advanced reading stage, is usually present but not oral (subvocalisation).
Johnson and Nyklebust (1962, 1967), in addition to the approach demonstrated in the diagram (Fig 2.2 mentioned above), consider speech in terms of input/output. Thus, prior to real speech the child must hear, learn, and comprehend each word. This may require no conscious effort in the case of such abstracts as 'it', 'this', 'the', 'a', etc. - or may be a more definite connection between sound and object - e.g. 'cat', 'table', etc. If a child, for some reason, has a misleading input, the output - speech - will be correspondingly inaccurate. The misleading input may be poor audition, a fault in learning, or a poor comprehension. (This is assuming, of course, that the initial input is correct linguistically). The child subsequently will use the word incorrectly. He will monitor the sound of the word by his acoustic sensory mechanisms, and this will act as reinforcement - unless he is corrected. However, there is another consideration. The child may have difficulties with articulation. He may have heard the word correctly, but be unable to repeat it. The difficulty is most likely to be in the motor system of the brain - or in the speech mechanism, common faults being in 'th', 'f' and 's'.

De Hirsch (1970) suggests that a five-year-old should produce 88% correct sounds. The child, therefore, with fair audition, but a fault in delivery of speech, will monitor what he says, and achieve a reinforcement on that - unless, as already mentioned, he is corrected. A parallel can be drawn here with an adult, learning a French 'r' or any other alien pronunciation - correct utterance will only be achieved when a correct model is present for imitation.

Where a child has a poor background, a correct model may not be present, because the model, for example the speech of the mother, is indistinct or of bad pronunciation, or because she is simply not available for sufficient periods of time to speak with the child.
McCarthy (1953) suggests that the consistently better linguistic performance of girls is partly due to the greater time that girls spend with their mothers, boys being 'sent out to play', where speech activity is less - and unlikely to receive correction. If girls are not in the company of their mothers, they play with dolls, or other toys of high conversation value. The latter statement might however be criticised, since self-conversation receives no external correction if this is necessary.


Also of interest are Artley (1953), Smith (1935), Kasten & Fowler (1959), Ingram (1963), - and more generally, Von Bonin (1963) describes the evolution of language.

Following on the sequence in Fig 2.1, and having now discussed vision and speech, audition will now be considered. This has been mentioned above in its relationship to speech processes, particularly where it is involved in the feedback system - the self-monitoring of verbal output.

The auditory system can, like vision, be analysed into component faculties. Firstly there is that of hearing, the mechanical reception of sound. Johnson and Nyklebust suggest that a loss of 35-40 db. will significantly interfere with communication. (This means that a tone must
be intensified by 35-40 db. above a standard of 0 decibels—hearing of
a normal young person—before it is heard.)

When the sound reaches the brain in itself a diffuse process of auditory
perception occurs. This, like visual perception, might be considered to
be a bridging process between the mechanical receptive stage and that of
full comprehension. Auditory perception may also be analysed, and here
the components will be considered as:- Auditory memory, auditory localiza-
tion, auditory discrimination, auditory fusing (or blending). Some of
these component skills are critically concerned in reading. If it is
assumed that the sound is reaching the brain intact, and with characteris-
tics sufficiently similar to those of the original to be recognisable to
the average individual, then the effect of each perceptual process can be
considered (see Fig 4.4).

Firstly the impulses arrive at the cortex by way of the auditory
nerve (and other brain tracts). If they originate from sound waves
caused by another person saying the word 'spin', they must be interpretable
as this word in the brain. The ability involved in such interpreta-
tion is that of auditory discrimination. Langman (1960) describes the
ways in which auditory discrimination contributes in the reading process:-

1. Discrimination of small vowel differences.
2. Discrimination of short rhythm patterns.
3. Discrimination of identity of word parts in rhyme.
4. Ability to discriminate simple oral directions in a
group situation.
5. Ability to form a set to listen to an adult talking
or reading aloud.

The last two points mentioned involve attention focus as a condition
prior to auditory discrimination.
There are many tests to measure auditory discrimination. Smith and Carrigan (1959) describe one such. The subject is shown a number of sets of three pictures, and identifies them. He then sits with his back to the examiner, and the examiner reads out the identity of one picture in each respective series. The subject points to the picture corresponding to the word that he has heard. An example of the word series is shown below. The underlined word is that to be stated by the examiner:

2. Coat, Boat, Coat.

and harder:

3. Poster, Toaster, Roaster.

In hearing any word sound, the child will associate it with a previous situation when that sound was connected with an object, state of feeling, etc. In addition to discriminating a word clearly, therefore, the sound must be held in the brain while the association is sought. This is the auditory memory factor. A poor auditory memory may mean that the child is unable to recall a word sound which may be related to an object or situation familiar to him, or that he cannot hold a word in mind long enough to write or spell it out. For example, a child told to write or spell the word 'spin', might produce 'spit', or 'spill'. Auditory memory, therefore, is of great significance in the reading process.

Similarly, if the word s-p-i-n is spelt out, the child should be able to fuse the separate letter sounds into the complete word. Chall, Roswell, and Beumenthal (1965) studied this ability. They say:
"We became interested in auditory blending ability after noting that children with severe reading difficulty also had extreme difficulty in learning phonics, particularly in blending and synthesising words. Auditory blending involves the ability to reproduce a word by synthesising its component sounds."

They found that the ability was not related to an intelligence test score, but that auditory blending in Grade One was related to silent reading in Grade Three. They also report that Hussett (1961) found similar results.

A test, somewhat similar to that of Chall et al, was used by D. J. Bruce (1964). He investigated the analysis of word sounds (i.e., the opposite to word blending - but probably requiring somewhat similar skills.) The requirement of his test was to listen to a word, then say what word would be left if a particular letter sound were to be removed. He found that the mean scores were affected by mental age (chronological ages were 5.1 to 7.6), and that word analysis was also affected by the position of the letter to be removed in the word. This would appear to tie up with some of Gibson's findings reported in the second chapter of this thesis, that the position of a letter in a word has influence on the ease of the reading of the word.

Thus, in learning to read, abilities of auditory blending and analysis (which may or may not itself be a skill related to blending), are of great importance, particularly where a phonic teaching method is employed.

Auditory localisation is, perhaps, not so important as the previous three abilities; nevertheless, a child unable to efficiently locate where a sound originates, will not be able to orientate his head in order to allow reception of maximum amplitude. He may, therefore, 'loose' some less distinct speech.
Further literature on auditory abilities related to reading is:-
Flower (1965); Wolfe (1941); Morris (1966); Birch (1966); Doehring (1968);
Sister Harrington and Durrell (1955); Goetzinger et al (1960); Betts -
(page 422 in Dechant and Smith 1961); Lauderville (1958); Moe (1957); -
(the latter two references are studies of "a listening test" and "auding"
respectively, as predictors of performance in early grades at school).

have investigated bimodal abilities in children. Their tests have involved
reception of a visual stimulus for an auditory response, or motor response,
etc. The results suggest that poor readers are slower at the modality
shift than better readers. Sterritt and Rudnick (1966) were also interested
in the shift of modality, and they used auditory and visual rhythms. They
justify this:-

"Learning to read ordinarily consists of learning
to translate (an) auditory temporal code into one
that is visually and spatially organized."

They found that ability to shift from visual to auditory rhythms and
vice versa alone accounted for 25% of variance in reading ability. When
combined with mental age (46% of variance accounted for), it was a useful
predictor of reading ability.

The ability to shift from one modality to another seems, therefore,
both from the literature, and from its obvious place in the reading process,
to be a necessary skill in the child learning to read.

Referring again to Fig 2.1 (chapter 2), it is now assumed that the
written word has been processed to a point where it has 'auditory meaning'
or 'visual meaning'. This term is used to represent a hypothetical stage
in the reading process, when a sound or visual image of a word has been
assimilated by that sensory modality to the stage where it is associated with a previous reception of the same word. The word is therefore familiar, and the child is able to read it. Another word, however, may be unfamiliar. It will be processed to the stage of visual and auditory perception, but the child will not be able to link it with meaning. A number of factors govern the likelihood of the child linking the perceived word with meaning (i.e. being able to read the word). He must have a wide range of experience – abstract and concrete. A child living in a city may never see farms or fields, and he can have no conception of what these words really represent, and therefore will not 'read' the words in the context intended.

From this simple example it can be generalized that, prior to learning to read, a child should have had as much experience of the outside world as possible. This should include not only visual experience but linguistic, 'thought-provoking' experience also. The interminable questions 'why?', 'why?' should be answered.

Socio-economic class is a variable that frequently is an index of the degree and nature of the 'experiences' that the child is likely to have encountered at the pre-school stage. Goodacre (1957) classified Infant schools into 'social areas' and found that, while aspects of teaching did not vary, the standards of reading were related to the social class of the area. Similarly Morris (1966) in a large survey in Kent, found that the better readers came from families in social class I (Hall and Jones Scale, 1950), and the poor readers were from the lower class homes – (as shown in the following figures).
Smith in 1935 was concerned with Social Class and its relation to sentence length in children. This use of sentence length is here measured by spoken language. In that capacity it bears a strong relationship to reading. In this research the higher social class children spoke in significantly longer sentences - and with more correct speech. The closeness of the correlation between correct speech and social class was greater in the later stages than the earlier stages.

Lowell and Woolsey, in 1964, studied non-verbal reasoning and social class in relation to reading. They suggested from their data that low social class has a 'down pulling' effect on school performance generally but is not the actual cause of problems.

Burt, in 1937, considered that 'poverty' was a major factor in backwardness in 8.6% of cases, and represented a minor predisposing factor in 50% of cases. The date of this study would, perhaps suggest that the figures would be somewhat improved on this now.

Other measures of background, akin to the concept of poverty, were used by McLaren in 1950 and Fleming in 1943, (references quoted by Vernon (195

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and these were (respectively): % children per school receiving public assistance (an area measure), and number of rooms in the house. Results in both studies favoured the more privileged children.

Other studies concerned with reading and social class are:- Kemp (1955); Ladd (1933); Nensak (1940); Wiseman (1964). Ravenette (1968) is a relatively general reference – as are Malmquist (a Danish study, 1960) and Kellner Pringle (1965).

Socio-economic class (or other very similar measures), is not a real entity; it is merely a convenient measure that reflects certain probabilities of aspects of home — cultural, educational and aspirational attitudes, etc. The lower class home is likely to be smaller, more crowded, more noisy; the children may have less to eat and may be less healthy, and the attitude towards schooling is likely to be less encouraging, since, by sheer definition of socio-economic class, the fathers have jobs requiring less education. A child from a higher socio-economic class is likely to have had more contact with parents (mentioned previously in relation to speech); more experiences about which he can talk, and read, and more conversation. His parents are likely to try to help him with school subjects (although this may not always be beneficial) — and they will probably desire the fullest education possible for him. With education, or merely interest, in mind, the middle classes are likely to have more books around the house, and a child brought up to consider ownership of books a normal occurrence, will feel more familiar with the school situation.

From this brief survey of the significance of socio-economic class differences, it is obvious that, to attain any state of learning, the lower class child has many more problems to overcome — greatest, perhaps being the generally negative attitude towards education. This attitude may tend to pervade everything the child does. For example, Milner (1951) studied
the relationship between Grade One performance in reading, and patterns of
parent-child interaction. The study involved conversation with children and
parents, and Milner implies a relationship between social class and the
responses made by the children. The high scoring reader expressed signifi-
cantly frequently that they would like to own pets, to have toys, and things
to play with; that they possessed books, and that they were read to fre-
quently by parents; they expressed pleasure at being taken out by parents,
etc. The children scoring low on reading expressed significantly frequently
that they could not think of a wish they would like to make; they were
unable to recall real happiness - and were unable to describe the state; they
were negative about physical punishment from parents, and possessed only
funny or school books. These responses are obviously not directly comparable,
but in essence the former - the higher scorers - had a positive attitude to-
wards educational type activities, whereas the latter gave in general very
negative and non-educationally influenced responses, differences between
high- and low-scorers, which are probably largely attributable to social
class characteristics.

There are a number of methods of combating the effects of poor home
environments. In Britain there are nursery schools and playgroups and in
the United States there are 'Enrichment Programs', and other similarly
functioning arrangements that are designed to 'fill in' some of the missing
experiences of the child. Another method is the use of the medium of tele-
vision. The value of this approach is currently being hotly debated in
Britain - with particular reference to 'Sesame Street'. This is a programme
devised and used with apparent success in the United States.

Several of the larger surveys have investigated the role of the school
as an environment that might influence the child's acquisition of reading
skills. Goodeare (1967) has studied the methods of reading teaching used
in a sample of infant schools, what materials were used, and how the children's
interest aroused (e.g. by wall stories, news sessions, etc.) - widening vocabulary and experience by sharing it. She mentions two very interesting findings - firstly that working class school attainment is in actual fact little different from that of middle classes, unless, however, measurement is by teachers' assessment, when there is a difference. The second point is that many reading books, such as 'Janet and John', are written by middle class people, for middle class children, the range of language being different. These factors are a further problem that the working class child must overcome in order to be motivated to acquire meaning from symbols.

Morris (1966) also investigated the presence of materials designed to arouse interest in the child, as well as preferences for methods of teaching reading, and what types of facilities for the cultivation of interest in books were available to the children (e.g. class-room libraries content, condition of books, etc.). Using these types of criteria she found that the better readers came from the schools optimal in such respects.

Gardner, in comparing progressive and traditional education in primary schools also discusses the best environment for teaching reading at optimal efficiency. In a further book in 1956 he mentions that in a more formal environment where learning to read is begun very positively, the child may have difficulty if he is not completely ready. Cane and Smithers (1971) found, however, that formal teaching was more characteristic of the middle class, and better working class schools where children, on the whole, entered school in a more prepared state for beginning to read. The children also tended to achieve higher reading levels in the more formal environment. (This was a study of a small number of infant schools only).

There are several investigations that have lead to implications concerning teachers themselves. Kemp in 1955 found that the morale of the Head and his staff - and their attitudes - was a determinant of general attainment in the first grade. More specifically, Malmquist (1958)
found a significant relationship between the teachers' age and years of service, and the pupils' attainment in reading in the first grade of elementary school. If these results are considered in parallel with a conclusion arrived at by Gann (1945) - that "according to pupils' opinion, teachers appear to be less friendly towards retarded readers than towards successful readers" - the mixture of cause and effect relationships becomes obvious. Is it because there is a large percentage of poor readers that morale drops - or vice versa - because of poor staff morale, there is a high percentage of poor readers? Does the percentage of poor readers in the school affect the age range of the staff - or vice versa?

There are two sequential points discernible here. First, a child is unlikely to work hard on learning to read if he is disliked by the teacher and the teacher will like him even less if he is not working hard. This is, therefore, a vicious circle.

Thus, to summarize the ways in which a poor school environment might act on a child to lower the motivation required inherently by the reading process - lack of adequate materials; lack of stimulus by the school environment; teaching not compatible with stage of maturity of the child; materials used in reading instruction incompatible with the child's past experiences; teachers' biases against pupils, etc.

At this point, all of the aspects of the model depicted in Fig 2.1 have been considered. There are, however, some more general factors that are not directly predictable from that model, factors that are not specified, in effect, to reading.

Firstly, a child beginning to learn to read must have an adequate intellectual capacity. There is much controversy about the downward level of intelligence quotient (I.Q.) that will first begin to impair
seriously the ability to learn to read. This is probably around 70 to
80 I.Q. score – and an I.Q. of 80 is very frequently the score used to
differentiate the children who are retarded in reading owing, most likely,
to dullness, and those in whom it is felt necessary to look for a further
cause. There is much dispute as to precisely what I.Q. scales are
measuring. In the context of reading and reading problems, the scales
are frequently used in a diagnostic manner and the sub-scores achieved
on each section are of more importance than the overall score. The
Wechsler Intelligence Scale for Children (WISC) is used very frequently
for diagnosis of the deep problems underlying reading difficulties (e.g.
whether there are visual perceptual, visual discriminatory, etc. problems).
This scale also allows a distinction between a performance or a verbal I.Q.,
an obvious advantage in the case of poor readers of average or above
intelligence. The sub-score organization of WISC has enabled profiles
to be developed for certain suspected disorders in learning. For example,
a profile has been attempted for retarded readers by Kallo, Grabow and
Guarno (1961) and Altus (1956). With strictly limited numbers they were
able to show some common patterns. These are unlikely to remain constant
over all types of reading difficulties. It is often found that the observ­
vations of the behaviour of the child, while he is doing one of the longer
tests, is sufficient for the administrator to suspect the presence of
brain damage or an obvious immaturity. Brain damage can cause a wide
range of defects in reading, in a child of normal or above normal I.Q.
It may, for example, cause a reading problem indirectly, in the effect of
deficient concentration and hyperactivity. Brain damage, immaturity and
I.Q. will be mentioned again, in a more positive and detailed manner, in
the context of reading difficulties. This also applies to anxiety.
A series of papers in the late 1950s argued for and against the necessity of some 'anxiety' in a child before he can learn to read. This originated in a paper in 1957 (a) written by Lynn. He questioned children between 7.5 and 11 years on personal and impersonal anxieties. He found a positive correlation of reading personal anxieties of +0.33 and with impersonal anxieties, -0.24, each being significant at the 5% level of probability. He says:-

"It may be ..... that too little anxiety is just as undesirable as too much."

(a quote very vague in its implication of degree of anxiety.)

In 1957 (a) he restated his point:--

"It is possible that some children do not learn because they are not anxious enough."

He saw the disparity of attainment in arithmetic and reading in some children as being due to different degrees of anxiety being required for the two subjects. Reed and Schonfield (1958) replied and in a further paper Lynn (1958) restated his case. The whole argument is therefore based largely on the questions asked of children on their personal and impersonal anxieties. The correlation was high - but there may have been a third external variable causing this. It might be possible that the very passive lazy child (with a glandular disorder?) is less ambitious in reading - but this correlation seems too high in a normal population sample for this to be the complete explanation. The method of investigation may yield further explanation of these seemingly convincing results. Personal anxiety level was assessed on questions such as:-
"Are you upset if your mother goes out in the evening?"
"Does scolding make you upset?"
"Are your feelings easily upset?"

and impersonal anxiety:-

"Do you often feel nervous?"
"Do you ever feel worried when there is nothing to do?"

These questions are very abstract for the age group to whom they were administered, and it would seem that a third variable that would explain the correlation between anxiety and reading, is likely to be intelligence or maturity, both of which would need to be advanced to respond to the abstract concepts posed.

Many of the 'abilities' and 'conditions' necessary for success in reading are summed up in the concept of Reading Readiness. The idea originated in 1896 when C. T. W. Patrick questioned the readiness of children to read on entry to primary school. The term 'Reading Readiness' was first used in the 1920s (see Sanderson 1963). It is a very much favoured concept in the United States where reading readiness programs may be run in conjunction with 'Enrichment' programs mentioned earlier. In Britain, Lynn (1963) reports the concept to be held by 73% of Head Teachers.

There is a certain amount of confusion on the term 'reading readiness'. What form of 'reading' and what type and degree of 'readiness' does the concept refer to? Reading can be taken to mean - the learning by rote of the child's name and two or three words from the cornflakes packet - or a systematic knowledge of word attack, allowing the tasking of an easy new word. 'Readiness' was taken by Bradley (1956) to include such factors as:-
Perception of relationships.

Ability to make auditory and visual discriminations.

Memory span of ideas.

General background of information.

Lovell suggests that readiness for reading occurs when:

- a child shows an increased desire to have stories read, and to look at pictures.
- a child holds up books and pretends to read.
- a child realises that the printed word will help him to understand pictures.

All of the criteria of Lovell, and the last of Bradley’s, are totally orientated to the middle class child, who has come from an actively literate home. This is not a suitable criterion for the child who has not seen anyone reading before he enters school.

Piagetian theory links the beginning of reading with the development of concept formation (Wepman 1962) and, along these lines, Artley (1955) says:

"A child can read no better than he can organize his ideas and express them."

Thus, while a general level of maturation is assumed by all of these ideas of reading readiness, there is some argument about which specific capabilities it refers to. Bradley lists physical skills, Lovell puts over more abstract mental 'skills', and a criticism of incompleteness could be levelled at either. However, if they were combined, a relatively
clear picture of 'Reading Readiness' might be achieved.

Cane and Smithers (1971) used a formal test to indicate readiness or lack of readiness to read in children from deprived areas. They used the Harrison-Stroud Reading Readiness Profile. This consists of five tests -

- Using symbols.
- Visual discrimination (two forms of the test).
- Using the context.
- Auditory discrimination.
- Using the context + auditory clues.

The results of these tests were correlated with a reading attainment test, and an assessment of book level. The correlations were all in the range +0.4 to +0.6. On further analysis it was found that:

"..... the best predictor was a combination of auditory and visual tests concerned with words and sounds themselves rather than the more general symbolic skills concerned with understanding stories and pictures."

Cane and Smithers also noted the characteristics of children ready and unready (on the Harrison-Stroud test) for reading.
Features of Ready Children

- Good speech
- Good manners
- Self confident
- Interest in the tasks and reading generally
- Pleasant personality
- Co-operativeness
- Good concentration

N = 47

Features of Unready Children

- Shyness, withdrawal or indifference
- Anxiety
- Poor speech
- Poor concentration
- Lack of interest in test, reading generally, refusal of part of test
- Fidgety behavior
- Poor health or nervous habits
- Difficult family circumstances.

N = 63

These features are very similar to those which normally separate middle class and working class children in achievement. It is of note that they are factors that discriminate with apparent validity, even at the level of lower working class children in deprived areas, where overall achievement is below average. The implication is that these factors should never be used as fixed variables, but as sliding variables relative to the situation in which they are applied.

An attempt to discover a more measurable variable for Reading Readiness was made by Karlin in 1957. He compared skeletal growth and development, height, weight, etc. with scores on reading achievement and reading readiness tests. He concluded - on the one relationship showing a significant correlation:-
"While the relationship between skeletal development is definite and may be considered a factor in Reading Readiness, it is too small to overcome the influence of chance when predictions are attempted."

The usefulness of a concept that is interpreted in so many different ways is dubious. This is especially the case when some of the emerging arguments that reading is best started at two years, are considered (see chapter 5 – Callaway 1970). It would appear, therefore, that the term 'reading readiness' is too much a blanket concept and in its usual interpretation is probably little more informative than is a measure of social class. If the concept is held, it is essential that it is fully defined by each user.

If a child's ability to learn to spell is any different from that of reading, then a concept of spelling readiness is equally possible as that of reading readiness. It too would require precise definition by the user. Peters (1967) argues that the skills involved in spelling are different from those of reading, and suggests that spelling should be taught.

She says:—

"The coding system (spelling) consists of the most probable combination of letters in words that tend to go together. The good speller, then, has learnt the probable sequences of letters in words in his own language, and these he has learned visually. But the child without such experience of the look of words has a long way to go before he can unhesitatingly select the correct sequence from the various alternative letter sequences."
Peters suggests that the extent of learning during reading is only about 4% (Nisbet 1941). She says that the most important skill in spelling is that of visual retention (memory) and this is upheld by the observation that deaf children can often spell better than hearing children, in being forced to concentrate on the visual pattern (Gates and Chase, 1926; Templin 1954).

It appears, therefore, that 'the spelling process' is not identical to the reading process, being more dependent on visual skills than auditory skills. It can, however, be considered analogous for many aspects discussed in this thesis.

In order to summarize the complex implications of this chapter, the model at Fig 2.1 will be elaborated to indicate what conditions and abilities are involved in the reading process. The value of models is thereby further demonstrated. The first model of the elements involved in reading is not complex and it merely suggests a hypothetical train of events. By organizing the events however, it provides a suitable framework from which to derive an analysis of the capabilities involved in reading. It can then be considered at which points the absence or lowering of an ability might give rise to difficulties in reading.

The simplification of the approach must not, however, prevent the conception of the enormity of the reading process and its overriding variables.

Ravenette sums this up (1968):-

"Learning to read represents the intersection of many dimensions - the child and the family; the family and the culture pattern; the child and the school; the school and the family; the child and the teacher; the child and his peers; that which the child has to learn and the resources which he has for learning."
"But primarily reading represents one aspect of the engagement of the child with the life into which he is moving. His success in this venture will be crucial in defining the possibilities which are open to him in later life and in defining his own identity amongst his peers, his parents and his teachers."
This chapter will endeavour to form a simplified neurological/anatomical basis for the discussion of reading and associated reading problems.

Reading is a very highly developed skill - an elaboration of Man's language capacity that has made possible the dispersion of knowledge in a permanent form. Language is a faculty, present in no other animal but man and hence to study it, Man must rely on his own species. This constitutes a great problem, since it implies that few opportunities are available for research involving the anatomical location of language formation - i.e. in the brain. Situations in which the brain can be studied in depth are largely limited to those of a sporadic nature, where an accidental lesion has been produced, or where a vascular obstruction, for example, occurs. Under these circumstances, if it is possible to locate the position precisely, the produced effects can be roughly equated. This process, while having yielded a large body of relatively crude information, is liable to mislead. For example, where a lesion is produced in a tract of nerve fibres, the manifest symptoms may be those effected by the isolation of a brain area, at a distance from the actual lesion. This form of research obviously suffers from being unsystematic.

Another method is that of administration of drugs. If there is prior knowledge of drug effect from animal experiments, the effects of change of concentration or method of administration may lead the way to new findings.
The Wada test, for example, involves the injection of a substance which inhibits one hemisphere of the brain. This enables the laterality of brain function to be observed. The significance of this will become apparent later. Further such tests of inhibition may yield promising results concerning areas of the brain involved in some way in the reading process. This method of research is not widely used, and it would appear that it functions primarily as a means of hypothesis development or a guide of what to look for in subjects with known brain lesions.

A further method of researching on brain functions in Man is that of stimulation (electrical). Here an electrode is placed in the brain, or on the skull, and small electrical pulses given. These may produce sensations - pleasant or unpleasant - or perhaps movement of a particular part of the body. Sensations, being a subjective phenomenon, must be described by the patient - i.e., the patient should be unanaesthetized; however, movement, visible externally, may be produced in an anaesthetized or comatose subject. Obviously the type of patient response is predetermined approximately by the area of stimulation. This research method, like the first described, may give misleading results if the electrode is implanted in a nerve tract.

The experimental or research methods to investigate brain function in Man, discussed above, have a common disadvantage in that they involve real or imagined discomfort to the subject and they therefore require willing volunteers, who may not be forthcoming. Brain damaged patients are not always prepared to undergo any more examination than is necessary for the specific treatment. Whether or not additional examination is performed is a function of medical ethics.

A means of investigating the brain that does not involve discomfort to the subject, and is therefore free from ethical considerations, is that
of electroencephalography. This technique is usually applied to cases of reading difficulty (as opposed to normal reading) and here experiments tend to be small and uncontrolled. Little work has been done on the E.E.G.s of the brain during normal reading, an essential if E.E.G.s are to be used on children with reading difficulties. Electroencephalography is used in some clinics where diagnosis of reading problems is made. In these cases it is used to determine whether the cause is likely to be the presence of a brain lesion, or whether this possibility can tentatively be discounted.

It was noted in chapter two that the two input pathways employed primarily in the reading process, are those of vision and hearing. A third pathway, kinaesthetic, may be important in some aspects of the process, and it is a significant part of some methods of reading teaching (particularly of a remedial nature).

The pathways of vision and hearing will be described diagrammatically in order to give a foundation to the previous chapter and to the discussion of reading problems in later chapters.

Fig 4.1 shows how visual images reach the eye.
Parallel rays are focused at the cornea and lens. The lens in adjustable to focus rays from differing distances. The image, as a pattern, is converted to nerve impulses on the retina. The impulses are conveyed to the optic nerve, and thence into the brain.

Images are focused on the retina at the back of the eyeball. Nerve impulses are produced in response to the light/dark and colour pattern. These are conveyed by way of the optic nerve to the optic chiasma in the arrangement shown in Fig 4.2. Some of the nerve fibres cross over, such that the right hemisphere receives nerve fibres from the right side of each retinal field and vice versa.
Fig. 4.2 Paths of Visual Images (in the form of nerve impulses) in the Brain.

Fig. 4.3 Position of the Visual Cortex in the Brain.
The impulses reach the occipital lobe and the visual cortex at the back of the brain where they can be mapped out spatially, corresponding to points on the retina.

The primary visual perception area, the visual cortex, is surrounded by a secondary, and thence a tertiary area for visual reception. The latter two are ‘association areas’, and are activated in turn by impulses radiating from the visual cortex. The secondary area is concerned with visual memory patterns for visual recognition, and destruction of it causes visual agnosia. This is a condition in which letters are recognisable, but the individual is unable to name them. The tertiary area is concerned with the elaboration of visual symbols. The destruction of this area causes varying effects, possibly the recall of language, objects and possibly people. It is unlikely to affect the reading ability as such.

The auditory organ is proximal to the semi-circular canals which monitor balance. The two organs are functionally separate.
Sounds enter the ear and impinge on the tympanum. They are translated into vibrations and are thus transmitted mechanically into the inner ear, where they are carried in a fluid medium into the cochlea. Fine hairs detect the motion of the liquid and thence stimulate cochlear nerves which pass impulses to the auditory nerve.

The cochlea, receiving sound waves, discriminates between those of high and low frequency. The former are eliminated at the base and the latter travel to the apex.
Like the visual tracts to the visual cortex, some of the auditory tracts cross over the mid-line of the brain. They appear to carry a sound pattern in the form of nerve impulses, some fibres carrying impulses originating from a high frequency note, and others, from a low frequency note. There is some evidence of a map of frequencies on the auditory cortex, which corresponds to that in the nerve fibres, and that in the cochlea.

The position of the auditory cortex is shown in Fig 4.5.

**Fig 4.5** Position of the Auditory Cortex in the Brain.
It was demonstrated in Fig 2.1 that speech is a very important aspect of early reading (if not most reading). Fig 4.6 shows the situation of the motor speech area in the frontal lobe of the brain.

**Fig 4.6** The Position of the Motor Speech Area of the Brain.

The reception of sensory speech impulses is located in the parietal lobe.
Reading, as it has been shown, is a skill that involves multiple input and output - sensory and motor. There must, inevitably, be a high degree of co-operation in the brain, and this appears to be organised principally in the association areas. Such areas are difficult to investigate, as many nerve fibres enter, many leave, and search for a real function is liable to be misleading. The association area of the brain that seems to be primarily involved in the reading process is the angular gyrus. This is in the inferior posterior parietal region - as shown in Fig 4.7.

**Fig 4.7** Position of the Angular Gyrus in the Brain.

From the diagram, it can be seen that the angular gyrus is situated in a relatively central position to the auditory, visual and speech sensory cortices, and because of this position and the function, Geschwind has termed it "the association cortex of association cortices". It appears to be one of the last regions to myelate, and does not mature in cellular structure until the age of three or four years. The late maturation of
that area may be relatively basic to the age of development of the ability
to read. A child can walk, talk and perform most other functions in the
manner of adults, if less skillfully, by the age of three. Few children
are able (or are taught - see chapter 5) to read at three or even four.
Since some theories of reading difficulty involve the concept of matura-
tional lag in a specific part of the brain, the late development of the
angular gyrus is very relevant.

The central position of the angular gyrus seems also to be relevant
to reading on the grounds of the variety of skills that contribute to the
reading process. Generalization can be made about the state of these
skills, and their cross-modal functions, when lesions of this area occur.
Geschwind (1964) reports that large lesions cause aphasia, while smaller
lesions may prevent the ability to read and draw (alexia and agraphia),
or just the ability to read. In the case of smaller lesions, the speech
faculty remains intact. Speech involves, particularly, tactile and
visual experiences, whereas reading involves largely visual-vocal-auditory,
and perhaps later just visual-auditory experiences. If, in destruction
of the angular gyrus, these connectives are cut, a patient may still be
able to copy words, while not actually being able to read them. This
can be partly explained by the motor functions and kinaesthetic reception,
inherent in writing. These are skills whose connections are supposedly
 unaffected by the lesion. In a similar way, Geschwind suggests, number
reading is frequently preserved in such cases, because this has a reinforce-
ment from counting on fingers. However, music reading and colour naming
are more likely to be lost, because their connections are more purely
auditory and visual, and they have no tactile associations.

A number of remedial methods are based on the concept of levels of
integration of the skills involved in reading. Tansey describes the
levels and co-ordinates them with a programme of diagnostic and
corrective exercises (1967). The concept of different levels of integration would seem both promising and constructive for the purpose of remedial treatment, if not all reading teaching. The principal advantage is that it embodies the idea that all children differ in their mastery of component skills of reading at any one stage. This is allied also to the work of Deutsch (1967) who was concerned with the ability to transfer efficiently from the use of one sensory input to the use of another.

Tansley was emphatic in stressing the involvement of kinaesthetic and haptic (tactile) senses in the reading process. This is by no means a new idea, although it has never become very widespread. Delacato (1963) has recently tended to put the idea in disrepute, since he has taken the idea to the extreme. He suggests that the brain of a child with reading difficulties can be effectively trained by the manipulation of the limbs, the bandaging of one eye, and the tying of the child in one position during sleep. His methods are based on the assertion that the brain of such children is not developed to its full potential, and that the treatment described above will 'educate the brain'. (Further information on this method, and criticisms of it, are - Delacato (1959), (1966), publications of the Human Potential Institute, and articles by Freeman (1967) in the Journal of the American Medical Association. Myers and Hamill (1969) appraise the method in comparison with many others.)

Both Fernald (1921, 1936, and 1943) and Gillingham (in collaboration with Orton) have developed remedial methods which are based on the concept of maximizing the input through the sensory channels. These make full use of the kinaesthetic input.

The neurologist's concept of sensory pathways linking and integrating in the brain in order to produce the elaborate ability of reading seems to co-ordinate well with the teachers' concepts of input and levels of integration.
Several factors complicate the neuro-anatomical 'picture' of the reading process that has been presented in this chapter. In 1936 Lyman, Kwan and Chao, writing in the Chinese Medical Journal, mentioned the case of a brain tumour patient. This man was previously fluent in English and Chinese, but after the removal of an occipito-parietal tumour, he was able to read English slowly, but could recognize only one Chinese word (symbol). He was also confused about spatial and temporal factors. After a while, his condition improved, and it was noticed that, whereas he would spell out English, he would trace, with his fingers, the Chinese word symbols. He was more fluent in writing Chinese than English. Lyman et al commented:

"..... the difference in ability to use two languages clearly depends upon the structure of the language as well as the site of the lesion."

Perhaps the hypothesis that best describes this case is that English and Chinese, in some respect utilize different levels of integration, and that the lesion was spatially placed affecting one level more than the other.

An interesting parallel to this paper is one written in 1961 by Kurokawa and Okada. They were describing a child with developmental dyslexia, who found it easier to read word symbols, (Japanese), than words made up of letters. This case will be discussed in more detail when consideration of the dyslexia syndrome has been made.

In addition to the more specific instances of brain damage being a causal factor in reading problems, there are a number of reports of 'head injury', infectious disease in early years, prematurity, difficult labour, pregnancy abnormalities, etc. as preceding factors. It is to be assumed that these cases may speculatively be placed in the category of brain damaged children, though the possibility of a congenital defect should not
be neglected. Brain damage is a generalization, used often because there is a state of ignorance as to precisely which area is affected and to what extent. Symptoms exhibited vary with a number of factors, for example the age of the individual, but a usual picture of the behavior of a brain damaged child includes hyperkinesis, impulsiveness, lack of concentration, spatial disorientation and imprecise learning difficulties. (These children are often behind their peers at school, particularly in the first few grades.) Laufer and Denhoff (1957) give a general picture of a brain damaged child. Semmes, Weinstein, Ghent and Teuber (1953) discuss cases of brain injury where the predominant symptom was spatial disorientation. Such patients were found to exhibit parietal lobe damage. Luria (1966) also attempts to suggest the relation between brain area affected and manifest signs in the patient. He discusses this largely with reference to the reading process; for example, where the patient appears to be unable to perceive the whole word, but must progress letter by letter, the lesion is postulated to exist in the parieto-occipital region. This, perhaps, links with the work of Lyman (ibid), whose patient was better able to cope with words made up of letters, where he could systematically follow from letter to letter, than Chinese word symbols with no partial cues.

A further factor complicates the picture of the links between manifest signs and symptoms and brain injury or damage. This is the issue of laterality and handedness. While on the surface it would appear that such is irrelevant to reading, the briefest perusal of the literature on reading disability and dyslexia in particular would demonstrate that it is not, and that the possibly higher proportion of sinistrals or ambilaterals among these children is argued widely.

The handedness of an individual was originally thought to be inversely related to the dominant cerebral hemisphere - thus in a right handed person (about 90% - 95% of the population), the dominant hemisphere was that on the
left side, and in left-handed individuals, who form about 5% - 10% of the population, the dominant hemisphere was considered to be that on the right side. This view was confused by two factors. Firstly, what of those who were ambidextrous, or those who were right-handed but left-footed? The second factor was more definite. While brain injury in right-handed individuals on the left side affected the right side of the body, no such firm rules could be laid down for people who used the left hand normally.

Critchley (1966) does not consider sinistrality to be such a unified characteristic as dextrality, and he breaks it down into five groups. These include pure sinistrality (with left hand, eye and foot and right hemisphere dominant); cases where a left-handed individual by birth has been forced to use his right hand through convention; those in which right handedness is natural, but early on the right arm has become diseased, etc. It would appear, therefore, on the grounds of this theoretical breakdown of sinistrality, and the accumulation of clinical and pathological data, that —

"..... in sinistrality, there does not necessarily occur a mere mirror reversal of cerebral dominance. The right hemisphere may not constitute simply the left hemisphere in reverse, in regard to its functional significance."

Beyond the direct effect of damage to one hemisphere on one side of the body, other faculties have become associated with one particular hemisphere, though again this is considerably less definite in sinistrals. The current knowledge on this subject is summarized by Critchley in his book, 'The Parietal Lobes' :-
"In the ordinary educated adult person, the left hemisphere .......... has a greater importance in symbolic thinking and expression than the right. This unilateral predominance is not an exclusivism, however, and can be modified if necessary, the two hemispheres being flexible in this respect. In so far as it is an aspect of mentation, the faculty of language cannot logically be localized to any part of the brain or even strictly lateralised to one hemisphere or the other. This must be so, even though chemical evidence at present teaches us that one hemisphere (Critchley is referring to the left here), when diseased, is ordinarily more liable to be followed by speech disorders than the other. However, of the more vulnerable hemisphere, the middle third, which includes the parietal lobe, is more likely to be followed, when diseased, by disorders of language. Also, within this significant middle third of the cerebrum, there seems to be a certain specialisation, in that lesions in the hinder part were apt to be followed by difficulties in the understanding of verbal symbols presented visually. Beyond this, it would be unwise to elaborate the role of the left parietal lobe in the domain of speech."

Because of the controversy that surrounds the concept of laterality, there has been much work published on a wide range of related aspects. One investigation, that appears to be representative of the foregoing
account, was described by Humphrey and Zangwill in 1952. Ten naturally left-handed intelligent cases, each with a unilateral brain lesion, were observed. These were selected such that five had lesions on the left side and five on the right side. Dysphasia was reported to be present in all left hemispheric cases, and all but one of the right hemispheric lesion cases. Symptoms appeared to be more severe in the former group, though calculations were affected in the latter. This investigation, while disputing the traditional ideas of language function of the time, appear to be in accord with what Critchley believes still 14 years later.

A further report in Rebb (1965) suggests that a severe stroke in a right-handed, right-eyed, and right-footed person in the left hemisphere, leads to loss of speech in 95% of cases, (and in all cases a paralysis of the right side). However, a stroke in left-handed, footed and eyed persons in the right hemisphere, leads to only 50% loss of speech.

The results of the investigations described above do not agree entirely. This is probably attributable to the small, and differing sample sizes.

Further work involving the concept of laterality, has been done by Zangwill (1960, 1962); Humphrey (1951); Ettinger, Jackson and Zangwill (1955); Ettinger, Warrington and Jackson (1957); Mfie and Zangwill (1960); Gerhardt (1959); Goodglass and Quadfasel (1954); Roberts (1955); and Naesen et al (1954, 1956).

The discussion of laterality has not been elaborated in the direction of reading difficulties as such, since this will be covered in a later chapter. However, the background to the controversy of laterality and its cerebral correlates, discussed above will demonstrate why the uncertainties exist, and must be seen to exist with respect to reading difficulties and laterality.
In this chapter an endeavour has been made to establish a background of neurological and anatomical information in order that a discussion of some aspects of reading disability might be adequately founded in the later stages of the thesis.

The means of investigation of the human brain are very limited, and to a large extent, the findings must be considered relative to the method. For example, some of the data that is procured from EEGs is likely to be an artifact of the technique. The four methods of investigation mentioned are:

1. Observation of individuals with specific brain damage.
2. Observation of individuals to whom known drugs have been administered.
3. Observation of individuals who are undergoing electrical stimulation at known areas in the brain.
4. Use of electroencephalography.

Consideration is given to the anatomy and functioning of the sensory organs principally involved in the reading process. These are hearing and sight. Speech output and sensation is also mentioned, as Fig 2.1 demonstrates. Stimuli entering the brain impinge on specific areas of the cerebral cortex (sensory cortex). Near each of these specific areas is an association cortex. This receives impulses from the sensory cortex and is concerned with such functions as short term memory of the particular sensation. Approximately central to the sensory cortex areas is the angular gyrus, so called 'association cortex of association cortices'. This appears to be of great significance in the reading process.

Integration of skills is an essential, perhaps the essential, factor in reading, and this is discussed with reference to several papers.
LATERALITY IS A VERY CONTROVERSIAL TOPIC IN NEUROLOGY AND READING, AND PERHAPS IT MIGHT BE ARGUED THAT STUDY OF LATERALITY AND READING IS FUTILE, IF NEUROLOGISTS ARE NOT CLEAR ABOUT IT. THERE ARE SEVERAL SPECIFIC PROBLEMS THAT REQUIRE ANSWERS. FIRSTLY, HOW IS HANDEDNESS RELATED TO THE DOMINANT HEMISPHERE OF THE BRAIN, IF A DOMINANT HEMISPHERE CAN, INDEED, BE SHOWN TO INVARIABLY EXIST? SECONDLY, TO WHAT EXTENT CAN IT BE PREDICTED THAT A FACULTY (FOR EXAMPLE, SPEECH) IS POSITIVELY RELATED TO HANDEDNESS AND FOOTTEDNESS. CRITCHLEY SUMMARIZED THE TOPIC IN 1966 IN AN UNDECIDED MANNER. WITH NO MORE POSITIVE RESULTS RECENTLY, THERE IS NO JUSTIFICATION FOR THE DRAWING OF FIRM RELATIONSHIPS BETWEEN ASPECTS OF READING AND ASPECTS OF CEREBRAL DOMINANCE.

REFERENCES OF GENERAL RELEVANCE TO THIS CHAPTER ARE TO BE FOUND IN — LURIA (1965, 1966); HEBB (1965); JOHNSON AND MYKLEBUST (1967); SMITH AND CARRIGAN (1959); DOEHRING (1968); GESCHWIND (1963, 1965, 1967) AND DECHANT AND SMITH (1961).
CHAPTER 5

THE TEACHING OF READING

The human ability to read is a topic which lends itself to wide theoretical reasoning. Any of the reasoning that is to be more than academic exercise must be applied through the teachers of reading. This chapter, therefore, gives a background to the teaching of reading, past and present.

The theoretical concept of 'reading readiness' has already been discussed, but in practice a child in a class must begin to learn the elements of reading with his classmates. There is much controversy about this, some saying that reading should be taught only at a later stage, for example, age 6½ - 7, or even 8 years, because only then will a child be able to pick it up quickly and easily. This was the view of Bradley (1956) who gave tests to children in grades 1 - 4. Those, too, who follow the maturation theory, believe that (Lynn 1963):

"a child is unable to perceive words or letters before a mental age of six, seven or even eight."

Lynn says further:

"According to Stanford Binet, a child needs a mental age of seven to be able to copy a diamond accurately."

He suggests that these ideas are somewhat mistaken, the first being partially explicable on the grounds of the tendency for a child to see wholes. He uses a number of examples to support his view that reading
should be taught before the age of six. For some of his examples, the use of the word 'read' is probably inaccurate - 'perception of letters' being a more apt description. Lynn mentions that Davidson in 1931 taught 3-4 year olds to progress after four months of 10 - 15 minutes daily. A child named Viola Olerich is reputed to have learned to read at seventeen months, and was fluent by her third birthday. Robert Wiener learned all the letters in two days at the age of eighteen months. Lynn reports that, according to maturation theory, these children had I.Q.'s of 500. One explanation for this excessively high I.Q. is that these children are geniuses, although 500 is well beyond a conceivable range, even for a genius. The most feasible explanation, therefore, lies in the method of measurement, and the assumptions on which it is based. It is assumed, for example, that the mental age of a child develops in a linear mode, and that at given mental ages (reflected in the I.Q.) the ability to learn to read becomes possible. Callaway (1970) has assimilated evidence to oppose this notion. Fundamentally he proposes that environmental stimulation plays a very significant part in the development of intellectual ability. For various reasons (which he discusses) it is biologically necessary for the concentration of the maximum environmental effect over a specific period at a predetermined length of time after birth. This is termed a sensitive or critical period, and the existence of it is well documented in birds. Callaway is concerned primarily with the development of two abilities - form perception and linguistic ability. He suggests that these are present in the neonate as 'intrinsic competences' which require environmental stimulation - learning processes - for the "superstructures .....to arise and become operative" as the full ability to perceive form, and use language. The sensitive period for the learning of these skills
is from age two to age four, and it is in that period that reading should be introduced.

The concept of 'mental age', therefore, with regard to the optimum age to learn to read, is invalidated. The existence of a 'sensitive period' for skills related to reading also explains the apparent ease with which many under-fives who are unexceptional, learn to read.

Callaway concludes his paper with a consideration of the implications of his theory for the education of children. He suggests that the most fruitful method of implementation is by way of the parents. He says:

"Parents, for instance, will probably assume a much more significant role in the education of their children. The pressing need for educating parents to meet this responsibility becomes evident. Most parents are not aware of the tremendous impact, whether positive or negative, they inevitably have upon the intellectual development of their offspring.

With only minor additional cost, public education could help alleviate the problem of parent education. A school district, for example, that employs a hundred elementary teachers could easily add two or three more for the sole purpose of full-time work with parents of pre-school children."

Callaway goes on to suggest that the parents should be informed of the evidence that "mental development as well as physical and emotional development, requires special attention during the earliest years." In this way, he considers, most children could read before entry to elementary
school, and could thereby be advanced by three grades almost immediately.

The arguments put forward by Callaway are very convincing, and are based on sound evidence that has been accumulating during the last decade. The evidence is not restricted to any one discipline but effectively links the theoretical concepts of psychology and linguistics with the observations of geneticists and educationalists. It represents, therefore, a new and fruitful view of education.

Unfortunately theory takes much time to become practice, and it is the current educational method of learning to read that is affecting children at the present time. In England reading begins normally in the year from age five to age six, and in America, where children start school at six, reading begins in the year from six to seven. The child may, of course, have done some reading in a nursery school, or kindergarten, or home, but this is frequently unsystematic, and may cause confusion when regular instruction begins. For example, a child taught capital letters from advertisements, will be very muddled when he is confronted with lower case letters first.

Reslow, in 1940, considered that first year reading problems might be minimized if children were put in groups, according to I.Q. and reading readiness. She reports that the results of one years experiment were above the norm for the age groups. However, this prejudges a child’s ability — a child who has not come across reading, and is put in the lowest group, is unlikely to be very motivated to read — as he is a failure already.

De Hirsh (1966) suggests that for some children who, at a pre-reading stage, show signs of immaturity, an extra year in the kindergarten, prior to first grade entry (at six years) would be very beneficial. These children are predicted on an index, which shows up those who will fail in early reading. (to be discussed later).
Methods of teaching reading come and go in waves of popularity. They follow the popular psychological conceptions of the times, tending to follow, somewhat without regard for the individual children, at whom the teaching is directed.

The principal methods are:

1. **Sentence Method.**
   A short, simple sentence, based on the experience of the individual child, is given and the child takes cues from the context.

2. **Look and Say or Whole Word Method.**
   The children are shown short whole words on cards and learn to associate the configuration with the sound and experience. The words are then built into a sentence.

3. **Phonic Method.**
   Phonetic sounds of the alphabet are learned and this helps the child to tackle new words. Irregular words are usually learnt as wholes.

4. **Alphabet or Spelling Method.**
   The child learns the names of the letters (not the sounds).

Dick (1960) gives an interesting account of the history of reading teaching. He reports that before the nineteenth century, the alphabet or spelling method was widely used, and many alphabet books were published.
by small printers. The words were built up from component letters, and perhaps logically, small words were tackled first. However, such a regime lead to a sentence such as:— "If he is as I am, he is in." It appeared thus, that the word mattered — not the interest, context, even speech.

In 1849, however, Lord Lytton demonstrated that letters, as well as names, had sounds. Hence the phonic method began to enhance the alphabetic method.

The word method had early origins (Nila Bentson Smith in 1828), but, nevertheless, was not widely used until the end of the nineteenth century, when Catell (1885) showed by tachiscopio methods that whole words were perceived more quickly than the component letters could be read.

Despite this approval of the word method, it was not until there was further support from the developing school of Gestalt psychology in the 1920s, that it was widely used. From then until quite recently the word method (or look and say), has been in vogue. A primarily phonic, but perhaps more mixed method has been used largely since then. Teachers are now more aware of the value of each method, and the fact that different children may learn in different ways. Those children who, for example, have slightly defective hearing may not be able to cope with phonics, because they are unable to clearly distinguish one sound from another. Again, those at the lower I.Q. levels may find the concept too hard to grasp; therefore the straight forward word approach may be more appropriate here.

The teaching of reading has progressed in many other ways. Once, only the upper social classes were taught to read, and they endured the repetitious, uninteresting early stages in order to be able to converse in terms of this necessary accomplishment. Efforts were made at times
to create more interest in the learning process, but their success is dubious. Díazk mentions a book — "Reading Without Tears — a Pleasant Mode of Learning to Read.," written by an anonymous author, and published in 1857. This book was 566 pages in length, and included a hundred and eighteen pages of instruction before the first story!

In the last twenty years there has been a greater use of visual aid material in the classroom, such as wall charts, nature tables with items clearly labelled, books which are simply written about quite complex subjects — cars, space travel, etc. Reading is now covered by the television programme curriculum, and it would seem that soon, beneficially or otherwise, audio-visual aids will fill the classroom.

Another aid to teaching that has entered the classroom particularly over the last few years, is the standardised test. This gives the level of attainment of the child relative to his age. There are also very approximate I.Q. tests. It is to be hoped that the attitudes of teachers, now prepared to assess the capabilities of children, may become more constructive towards the problem of learning disabilities. There has been a tendency for a long time to attribute many such problems to poor environments or emotional states. Although, as has been stressed, these factors are of importance as inhibitors of learning, they must not be allowed to obscure other reasons for backwardness. A child who is backward for a reason other than a poor environment, a lack of experiences and so on must be detected early, and helped, before he is labelled, to himself and others, as a failure. The teacher can co-operate in detecting quickly the child who seems to find school work difficult. This child may improve rapidly, but he may not, and it is this eventuality that must be considered.

Another necessity for the future, is the improvement of the training of teachers of reading. The relative paucity of the training is hardly
surprising when an evaluation is made of what, up until recently, has actually been known about the reading process, the abilities concerned in reading, how a child learns to read, and so on. However, in the presence of Gibson's findings and the enlightened view of reading that is gradually appearing, teacher training must be involved and revised. Most of all, perhaps, the old concepts of early reading as a unitary process should be tackled.

Each child is endowed with a degree of skill in each of a large number of activities involved in reading. He is not, however, equally endowed, and hence, certain areas of the process are easier to him than others. The optimum method of teaching him to read should concentrate on those areas that he can cope with best, thus building his confidence and motivation. This analytical approach can only be attempted by breaking down the reading process.

Multisensory methods of teaching reading, maximise the sensory input and thus adjust automatically to the individual rather than the other way round as most reading methods. These are currently applied only at the remedial level and it is difficult to visualise how they might be adapted to use in a large class. Multisensory methods will be discussed in a later chapter, in the context of their use for specific developmental dyslexic children.

The literature on the subject of reading teaching is wide. However, the following was consulted, in addition to that mentioned in the chapter:- Schonell (1936); (1950); Goodacre (1967); (1971); Morris (1959); (1966); Artley (1953); Bond and Tinker (1957); Gardner (1949, 1956); Ablewhite (1967); Burt (1962); Peters (1967).
Up to this point, discussion has ranged over the various factors that are in the background to reading difficulties. This was necessary in order to achieve a picture of these difficulties in the widest possible perspective. This has involved considerations drawn from a number of disciplines. The inter-disciplinary nature of the study of reading difficulties has lead to a polarisation of areas of research - the medical views, the views of psychologists, and those of the educationalists. This is unfortunate from the aspect of the furthering of knowledge, and from that of the parent of the child with reading problems.

The inter-disciplinary nature of reading difficulties is brought out particularly well by Ravenette (1968) in an example of the procedure following the observation of a child with reading problems. The parent takes the child to a general practitioner, complaining that the child, despite a medium or high I.Q., appears to be unable to read. The doctor is aware that this could be an example of brain malfunction and sends the child to a brain specialist. He attempts a diagnosis, possibly attributing the cause to a brain lesion, which he describes in terms of the knowledge that he possesses. Neither the G.P. nor the brain specialist have much knowledge of the learning process, or of the influence that environment might have on learning, and thus there will be a tendency to ignore this side.

Ravenette does not describe the other situation, however, where a child, referred through the school to an Educational Psychologist, is diagnosed in terms of psychological, environmental, and other such factors.
Indeed, the educational profession in general have been very slow to acknowledge that neurological factors may be involved in learning problems.

The inter-disciplinary nature of this approach will, it is hoped, bridge some of the gaps illustrated in the example.

What is meant, therefore, by a reading difficulty? In this account the term will infer a poor ability in reading, compared with that expected when the age of the individual is taken into consideration.

Reading difficulties appear to be the result of a number of factors that can affect the pre-reading child. Many of these can be derived from the model of the reading process, that was developed in the first few chapters (Fig 3.3). Thus, following in sequence from the entry of the image to the eye:

**Fig 6.1**

<table>
<thead>
<tr>
<th>INABILITY TO SEE ADEQUATELY.</th>
</tr>
</thead>
<tbody>
<tr>
<td>POOR VISUAL DISCRIMINATION.</td>
</tr>
<tr>
<td>POOR VISUAL MEMORY.</td>
</tr>
<tr>
<td>LACK OF GOOD LANGUAGE MODEL.</td>
</tr>
<tr>
<td>INABILITY TO SPEAK CORRECTLY.</td>
</tr>
<tr>
<td>TOO EMOTIONALLY DISTURBED FOR PROPER SPEECH.</td>
</tr>
<tr>
<td>INABILITY TO HEAR.</td>
</tr>
<tr>
<td>POOR AUDITORY DISCRIMINATION.</td>
</tr>
<tr>
<td>POOR AUDITORY MEMORY.</td>
</tr>
<tr>
<td>POOR AUDITORY FUSION OR BLENDING.</td>
</tr>
<tr>
<td>WORD NOT SEEN PREVIOUSLY ) LACK OF EXPERIENCE OF WORD.</td>
</tr>
<tr>
<td>WORD NOT HEARD PREVIOUSLY )</td>
</tr>
<tr>
<td>NO MEMORY OF WORD FROM PREVIOUS EXPERIENCE.</td>
</tr>
</tbody>
</table>

(continued)
**Fig 6.1 (continued)**

**SCHOOL**

TEACHING METHOD INAPPROPRIATE.

TOO MANY CHILDREN IN CLASS FOR SUFFICIENT INDIVIDUAL ATTENTION.

READING BOOKS UNSUITABLE (too difficult; too easy; not interesting.)

SCHOOL PROVIDES LITTLE MOTIVATION FOR CHILD TO READ (i.e. poor book environment.)

STAFF ATTITUDES TO READING, THE CHILD, ETC. UNFAVORABLE.

**HOME**

CHILD HUNGRY, OR DEFICIENT NUTRITIONALLY.

CHILD TIRED, LACK OF SLEEP

HOME ENVIRONMENT NOISY, DISTURBED

LACK OF CONCENTRATION.

ASPIRATIONS OF FAMILY UNFAVORABLE TOWARDS EDUCATION.

CHILD RECEIVING NO HELP WITH HOMEWORK. (physically or by encouragement)

FEW BOOKS AT HOME, BOOKS NOT READ AT HOME, OR FELT TO BE NECESSARY.

VOCABULARY LEVEL LOW, CHILD LIMITED IN VOCABULARY AND CONCEPTION OF MEANINGS.

**VARIABLES AFFECTING WHOLE READING PROCESS.**

CHILD EMOTIONALLY DISTURBED.

CHILD INSUFFICIENTLY MATURE TO LEARN TO READ.

CHILD SUFFERS FROM DAMAGED NERVOUS SYSTEM (particularly in the brain).

CHILD FOR SOME OTHER REASON NOT MOTIVATED TO LEARN TO READ.

CHILD NOT SUFFICIENTLY INTELLIGENT.

(No categories are mutually exclusive, and some factors may be secondary to others also listed.)
The model of reading difficulties above can now be compared with other models and classifications of reading difficulties to determine whether or not it is complete.

Approaches adopted to classifying reading difficulties vary considerably in nature. Some are highly theoretical, and are of academic rather than practical, value (Wiener and Cromer (1967)). Others are written from a medical point of view and others from a purely psychological attitude. To maintain an inter-disciplinary approach, more models than are perhaps entirely necessary for comparison with Fig 6.1 are included in this chapter.

Wiener and Cromer (1967) adopt a very theoretical approach to classifying reading difficulties (they tackle all possible difficulties). They break down the enigma with the justification:

"An analysis of the usages of the term 'reading difficulty' indicates that four different assumptions are used to account for reading difficulty and its etiology. Each of the four models implies particular kinds of remediation."

The four models are:

**Fig 6.2**

1. **The Assumption of Defect**

(Defect = "something that is not operating appropriately in the person so that he cannot benefit from his experiences.")
2. **THE ASSUMPTION OF DEFICIENCY**

(Deficiency - the "absence of some function - i.e. a particular factor or process is absent and must be added before adequate reading can occur." Wiener and Cromer continue to say that this is the concept under which most remediation occurs, and thus 'phonetic skills' are 'added' to help the child to read.

3. **THE ASSUMPTION OF DISRUPTION**

"..... that the difficulty is attributable to something which is present but is interfering with reading and must be removed before reading will occur."

They suggest that anxiety, for example, comes into the category of disruptive factors.

4. **THE ASSUMPTION OF DIFFERENCE**

"that reading difficulty is attributable to differences or mismatches between the typical mode of responding and that which is more appropriate." Thus, children may respond optimally to other teaching methods than those administered and hence are unable to make rapid progress.

This approach to reading difficulties certainly fulfils the aims quoted from Wiener and Cromer. The four types of problem do, it is obvious, imply particular forms of remediation; however, is it really useful to consider remedial treatment in this way? It would appear to be too abstract. The teacher is not likely to consider reading difficulty in the terms of these theoretical concepts, but as a manifestation of a concrete factor, about which he may hypothesise. For example, he may think that the child is not reading because he is not concentrating.
From the classification, lack of concentration might be - 'the assumption of deficiency', but concentration is not a factor that can be 'added'.

Further, why has this child no concentration? He may be a brain damaged child - defect or deficiency? He may be hungry - but is hunger disruption or deficiency? Thus the highly theoretical construct would appear to be primarily an academic exercise, with little functional value.

Another approach which seems more concrete, is that of Nyklebust (1968). This is headed 'Disruptions of Learning', (not reading alone, although it applies equally). This attempts much less than the model of Wiener and Cromer. It is simple, but encompasses the principal points.

Fig 6.3

<table>
<thead>
<tr>
<th>DISRUPTIONS OF LEARNING</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SENSORY DEPRIVATION</td>
<td>HEARING IMPAIRMENT</td>
</tr>
<tr>
<td></td>
<td>VISUAL IMPAIRMENT</td>
</tr>
<tr>
<td>EXPERIENCE DEPRIVATION</td>
<td>LACK OF OPPORTUNITY</td>
</tr>
<tr>
<td></td>
<td>CULTURAL DEPRIVATION</td>
</tr>
<tr>
<td>EMOTIONAL DISORGANIZATION</td>
<td>PSYCHOSIS, NEOBOSIS,</td>
</tr>
<tr>
<td></td>
<td>PERSONALITY DISORDER</td>
</tr>
<tr>
<td>NEUROLOGICAL DYSFUNCTION</td>
<td>SPECIFIC LEARNING DISABILITY</td>
</tr>
<tr>
<td></td>
<td>MENTAL RETARDATION</td>
</tr>
</tbody>
</table>

(Adapted from Nyklebust - 1968)
This model represents only large categories of 'disruption of learning', and for this reason does not yield much information of a useful nature. For example, it gives no indication of the meaning of the term 'specific learning disability'. Does this include cases of brain damage? Similarly, does the term 'mental retardation' include all cases of dull children - many of whom apparently do not have any neurological dysfunction?

An earlier model by Nyklebust and Johnson (1967) is in a diagrammatic format. It attempts to compare normal learning and learning disabilities by suggesting a hypothetical series of linked processes. It must be assumed from the terminology 'disability', as opposed to 'difficulty', that the writers are not including environmental factors that might give rise to learning problems.

Fig 6.4

(Adapted from Johnson and Nyklebust - 1967)
While the layout of this model appears to be of value, it suffers from the same abstract terminology as that of Wiener and Cromer, and hence, without a great deal of elaboration, it cannot be applied in a useful way, either to organise or to suggest research. What, for example, does the broken line signify? If it represents malfunction, the disabled reader, surely, cannot be expected to malfunction with respect to every neurological aspect mentioned.

The models following are concerned with specific aspects of reading difficulties. They are descriptions of the disability which, on the model of Johnson and Nyklebust (1968), might be classified under 'Neurological Dysfunction', although, on the whole, do not refer to cases of mental retardation. The term that is used for this disability is 'dyslexia'.

**Fig 6.5 (Adapted from Rabinovitch 1968)**

Rabinovitch qualifies the term 'dyslexia' in two ways:

**PRIMARY DYSLEXIA**
- A. Developmental Dyslexia.

**SECONDARY DYSLEXIA**
- A. Other encephalography (specific language impairment.
- B. Motor-concentration impairment.
- B. Emotional disturbance.
- C. Motivational or opportunity factors.
- D. Deprivation or distortion in language experience.
Keeney (1968) has classified 'the dyslexias' in a more comprehensive manner than Rabinovitch; however, their ideas would appear to be along the same lines.

**Fig 6.6**

I  **SPECIFIC (PRIMARY) DEVELOPMENTAL DYSLEXIA.**  
    (Strephosymbolia, Dysymbolia)

II  **SECONDARY DYSLEXIAS.**  (Symptomatic, Secondary Reading Retardation)

A. Secondary to organic brain pathology.

1. Brain Damage.

- (cerebral dysfunction; other encephalography; cerebral palsy; mental retardation; low I.Q.; perceptual disorders; word blindness; visual agnecies; anoma; soft neurologic stigmas.)

(a) Genetic.

(b) Post Traumatic.

   i) prenatal.
   ii) natal.
   iii) postnatal.

(c) Post inflammatory (intrauterine; extrauterine.)

   i) encephalitic.
   ii) meningitico.

(d) Asphyxie (hypoxie) (intrauterine; extrauterine.)

   i) placenta previa.
   ii) cord strangulation.
   iii) maternal circulatory collapse.
   iv) excessive maternal narcosis (drugs).
   v) circulatory collapse; cardiac arrest; cerebrovascular accidents.
(e) Prematurity.
(f) Other specific brain lesions (aneurysm, cyst, etc.)

B. Secondary to Slow Maturation (late bloomer; developmental delay)
   (associated with impaired lateralization and dominance)

C. Secondary to Emotional Disturbances.
   1. Hyperactivity.
   2. Depression.
   3. Anxiety.

D. Secondary to Uncontrolled Seizure States.

E. Secondary to Environmental Disturbances.
   1. Cultural deprivation.
   2. Poor motivation.
   3. Poor instruction.

III SLOW READERS (Handicapped without symbolic confusion)
   Bradylexia.
   A. Asthenopia; visual handicap (hyperopia, heteropia, astigmatism,
      binocular control abnormalities.)

IV ACQUIRED DYSLEXIA (Lesions of Dominant Hemisphere; Angular Gyrus,
   and Splenium.)

V. MIXED
They also give some definitions:

**DYSLEXIA** - (Gr. dys- difficult, + Gr. lexis - word)

A difficulty in reading, understandably due to a central lesion.

**BRADYLEXIA** - (Gr. brady - slow, + Gr. lexis - word)

An abnormal slowness in reading, due neither to defect in intelligence, nor ignorance of the alphabet.

**ALEXIA** - (Gr. a - negative, + Gr. lexis - word)

Word blindness, or inability to read, due to a central lesion.

(adapted from Keeney, 1968)

Bannatyne (1966) arranges his conceptions of "Causes and Types of Dyslexia" diagrammatically.
Fig. 6.7 A Classification of Causes and Types of Dyslexia (adapted from Bannatyne 1966).

Groups are not mutually exclusive.
Bannatyne's model involves an ambiguity regarding the factors of 'maladjustment' and 'primary emotional causes', the latter being included under the term 'dyslexia' and the former not.

Ingram used a model to demonstrate the symptoms of speech defect characteristic of types of dyslexia. Part of only, of the model is shown that which indicates Ingram's views on the major subdivisions of the syndrome.

Fig 6.8

The schema presented below represents an analysis of the term 'dyslexia' as used in the foregoing models. The schema includes the term 'Specific Learning Disability', as used by Myklebust, since this is implied to be equivalent to 'dyslexia'.

Myklebust (1968) defines specific learning disability only by exclusion. He considers it to be of a 'Neurological Dysfunction' causation, and that the term does not include sensory impairment, experience deprivation emotional factors - of inspecific mental retardation.
Rabinovitch (1968) defines dyslexia as inclusive of two groupings.

Primary dyslexia includes only 'Developmental Dyslexia' but excludes factors that he groups under 'Secondary Dyslexia'—brain damage, emotional factors, motivation or opportunity factors, deprivation of distortion in language experience (the latter two categories being roughly equivalent to 'environmental factors').

Keeney (1968) defines dyslexia as inclusive of two groupings, and, like Rabinovitch, he includes only 'developmental dyslexia' in the first. Under secondary dyslexia he groups—brain damage, slow maturation, emotional factors, seizure states and environmental factors. He does not include slow reading (e.g. as a result of visual handicap), or acquired dyslexia, (often termed alexia) which is subsequent to known brain damage of some nature.

Bennatyne (1966) defines dyslexia as including emotional factors, minimal neurological dysfunction, environmental factors and genetic dyslexia, and excluding aphasia, maladjustment and low I.Q. He defines genetic dyslexia away from the environmental brain damage and emotional factors. Unlike those writers above, however, he attempts to define genetic dyslexia in terms of higher sensory defects, these including auditory discrimination, auditory sequencing, auditory closure on experience, verbal or auditory conceptualizing and poor speech feedback.
Ingram (1963) defines 'congenitally determined dyslexia' as inclusive of cases with brain damage, and those in which the reading problems are assumed to be genetically determined. The term 'congenital' prevents reference to difficulties arising from environmental or emotional constraints.

Thus, appearing from these classificatory models, is a hierarchical pattern of definition of aspects of reading difficulties. A more general level includes emotional factors, environmental, brain damage, etc, and a more closely defined level is 'specific developmental dyslexia' in most cases.

There are a number of attempts in the text of the literature to define specific developmental dyslexia. Eisenberg (1962), speaking of 'dyslexia', says:-

"The adjective 'specific' calls attention both to the circumscribed nature of the disability, and to our ignorance of its cause. Operationally, specific reading disability may be defined as the failure to learn to read with normal proficiency, despite conventional instruction, a culturally adequate home, proper motivation, intact senses, normal intelligence and freedom from gross neurological defect."

Crosby and Listen (1968) introduce their book on dyslexia in the following words:-

"Human beings can read because they have the neurological
"capacity to recognise the shapes of the individual letters in their alphabet and the words they form and distinguish the sounds that those words and letters make. The burden of this book is that a significant percentage of children have an impairment of their neurological ability to perceive shapes and sounds correctly, and therefore have a reading problem. They are dyslexic."

Newton implies that dyslexia originates at higher levels of brain function than is suggested by Crosby and Liston:—

"The term dyslexia denotes a cognitive disorder manifested by difficulty in coding language forms, especially in reading, despite adequate intelligence, conventional instruction and socio-economic opportunity."

Crichtley sums up, briefly and very effectively, much of the preceding discussion of definition, in the Doyne Memorial Lecture (1961). An extract follows—

"There exists within the community of poor readers, a specific syndrome, wherein particular difficulty exists in learning the conventional meaning of symbols. Such cases are earmarked, it has been said, by their gravity and by their purity. This syndrome is of constitutional, and not of environmental origin, and is often genetically determined. It is unlikely to stem from even minor
"degrees of brain damage at, or before, birth. It is independent of the factor of intelligence, and consequently it may appear in children of normal I.Q., while standing out conspicuously in those in the above average brackets. There is also no reason why the syndrome should not, at times, occur in children of subnormal mentality, though diagnosis might then be difficult. Other symbol systems, e.g. mathematical or musical notation, may or may not be involved as well. The difficulty in learning is not due to peripheral visual defects, but represents a highest level asymbolia."

Despite these very positive pronouncements from a distinguished neurologist and others, there is much controversy still about the term. Views, like that of Park (1953) still exist:

"Dyslexia is a syndrome which follows disturbance of the emotional, physical or educational development and progress."

Park, in fact, went on in his research to say that the reversals, mirror writing, etc., which are suggested to be linked with dyslexia, are done by children to "express their emotional dissatisfaction". This type of statement is one which creates the greatest barriers to acceptance of the developmental dyslexia syndrome. Others are less definite about the absolute non-existence of the neurological entity, but are not happy about the use of the label 'dyslexia'. For example -

"The word 'dyslexia' seems to be jargon at its worst. It means bad reading, and nothing is added but its Greek form......"
A view widely held is that the label 'dyslexia' creates a resistance to attempts at remediation (Daniels), and Reid (1968) quotes that several (Wall 1961, Malmquist 1958, Morris 1966) put forward the term 'reading retardation' as being adequate for remedial purposes. The use of this term, however, is deplored by Meredith, as a "resistance to the idea of something specific". Another view which is currently widely held, is that the word 'dyslexia' has become an excuse for middle class parents of dull or lazy children. The existence of this view frequently means that teachers and psychologists endeavour to diagnose a reading problem as anything but dyslexia. This attitude may hold up proper diagnosis for years.

In this chapter the whole topic of reading difficulties has been assessed. The model of abilities and conditions required for the reading process (Fig 3.2) has been used in such a way as to suggest sources of reading difficulties. (Fig 6.1) The model of reading difficulties has been compared with a number of other classificatory models to investigate its completeness. Since it does not include reference to the term 'dyslexia', the use of this term by other workers has been considered in depth. It is concluded that dyslexia is not directly inferred in the model. (Fig 6.1). Prior to its inclusion, however, cause must be further elucidated.

Terminology has been a problem throughout this chapter, and hence the next chapter will attempt to clarify the situation.
The controversies over many studies of reading problems can be seen from the last chapter, to arise in the sphere of terminology. One study is for example of reading disability cases, another of reading difficulty cases - are they to be considered equivalent?

The word dyslexia is used principally to imply a positive reading difficulty of an unknown neurological origin ..... But to be sure of full and universal comprehension, qualification must be used, such as 'specific', or 'congenital', or 'specific developmental', or 'genetic' - or we might call the syndrome 'word blindness' or congenital word blindness' or 'strophosymbolia', or even 'alexia'. This is not the end of the list. 'Dyslexia' may also be of different types, examples being - 'linear dyslexia', 'auditory dyslexia', 'visual dyslexia', etc. For a fuller discussion of terminology, see Critchley (1970), pages 12-13, and Abrams (1969).

Further, however, there is a large vocabulary of words surrounding the wider concept of poor ability in reading - reading difficulty, disability, retardation, problems, backwardness, deficiency, or specific reading difficulty, disability, and others wider still which usually imply reading, such as developmental language disability, specific learning difficulty, learning disability, and so on. Each term tends to be the hallmark of a particular writer, and usually the meaning that he wishes his word to impart, is clear from the context. However, this personalized nomenclature complicates any cross comparison.

To sum up - there are at least ten very common ways in which to
communicate a positive reading difficulty of an unknown neurological origin! There are also eleven more terms that communicate various degrees of poor ability in reading! There are, therefore, twenty-one words that could be used virtually interchangeably during the remainder of thesis. To this point, the principal word used has been 'reading difficulties', and this can be defined as follows:—

**Reading Difficulty** = Poor ability in reading, compared with that expected when the age of the individual is taken into consideration.

In the last chapter the concept of a more narrowly defined and diagnostically qualified reading difficulty was introduced. The word 'dyslexia' should be adequate for this; however, since a recent attempt has been made to standardise the terminology, the term there defined would seem to be better. (See Vernon 1971, p.127).

**Specific Developmental Dyslexia, as defined by The Research Group on Dyslexia of the World Federation of Neurology.**

"A disorder manifested by difficulty in learning to read, despite conventional instruction, adequate intelligence, and socio-cultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin."

(1968)
There is one other term which, while it will not be used much, needs definition — that is 'alexia'. Normally this word is employed to describe a state of non-reading following cerebral damage, either from a stroke, or cerebro-vascular accident, etc. Many writers have drawn very strong implications from this, that specific developmental dyslexia is the result of damage to the brain, even when there are no records of trauma.

On this, Critchley (1961) says:

"Most neurologists .... would be reluctant to visualise in developmental dyslexia any focal brain lesion, dysplastic, traumatic or otherwise, despite the analogies of the acquired cases after cerebral damage."

On this statement is based much of the controversy described in the remainder of the thesis.
CHAPTER 8

SPECIFIC DEVELOPMENTAL DYSLEXIA - INTRODUCTION AND CASE HISTORIES

Specific Developmental Dyslexia is best viewed at present as a clustering of varying symptoms around a central fact of the relative inability of an individual to interpret a series of graphic symbols that would normally be meaningful for his age and intelligence level.

The controversy that has raged so hard, concerns largely two points:

a) The lack of a clear syndrome that may be easily and reliably identified even by a layman.
b) The fact that S.D.dyslexia, having no very clear identity in itself to the layman, is in many ways so alike to other reading problems in overt symptoms.

The lack of a clear syndrome is due mainly to the cluster of varying symptoms that may or may not be present. The list of these is still growing and each must be accommodated - in absence or presence, in any theory of causation for S. D. dyslexia. The list has apparently also been a great inhibition to the planning and operation of fruitful research.

There are many examples of case histories in the literature. A few have been selected for inclusion in this chapter, for reasons of the insight they give into specific developmental dyslexia.

One of the most lucid personal accounts of a dyslexie is that written by 'X' in 1936, who was informed of the existence of 'word blindness' (as she calls it) relatively late in life. She says of the occasion when
...and, having blurted out to him that I could not read, he unfolded what was, to me, the new and wonderful story of word blindness. I came away rejoicing.

Her father and his brother were both stammerers, but their sisters, and her own brothers and sisters (three other than herself) were normal. The children were taught initially by governesses, who considered 'X' slow and lazy, and for these supposed offences, she was punished. She says:

"I found reading was so very difficult, almost impossible; the book was a blank and conveyed nothing to me and I was so weary with trying to read. "Dunce", written in large black letters on a white cardboard, hung on my back while I had to sit alone at the side table during luncheon with my back to the room - the butler and footman, handing food, looked on. I felt very foolish and self-conscious..... I was quite sure I was an idiot or feeble-minded. And with these awful silent thoughts, I often cried in bed in the dark."

She tells how her mother offered her ten shillings if she could finish "Black Beauty", and, despite her devotion to horses -

"I never finished the book, or, of course, received the ten shillings, and "Black Beauty" is a nightmare to me."
She remarks that she was good at other subjects, especially geography, and was able to do better in them than her sisters. At the age of about twelve years, she was sent to a school and there, in turn, each girl had to read ".....out loud, a paragraph of about two inches of rather small print." She always tried to get the girl next to her to read the passage over to her quietly, but she always ".....made a lamentable exhibition of myself." Sometimes she was forced to sit near the front of the class, and then -

"Just before my turn came, I would scratch the inside of my nose, and, having produced some blood, I was allowed to leave the room, because 'my nose was bleeding'."

Later she went to a boarding school in Paris, where some kindness was shown to her by a member of staff, who, in so doing, gave enormous encouragement.

At the time of writing the article, 'I' say that she attempts The Times daily -

"I think the shortness of the lines helps me, and I do not lose my place and my line quite so often as I do when reading a book. Constantly I have to read the lines several times to get the sense. I have to read each word by itself. I do not use my lips. Long words I have to spell out, and I generally fail to appreciate the different syllables of which the word is composed. I am still very ashamed of my inability to read. I carry this dreadful secret always; I live in fear of having to read out something. At all costs I must conceal my ignorance - a habit which dates from childhood."
"There is another thing which makes my trouble worse; if I simply have to read out something, I get so agitated from a sense of fear that the written words hop about and splutter before my eyes and after the first paragraph, all meaning is lost to me. I have an awful sensation of strain in my head."

She motions that, while being musical, she is visually unable to read the music, and that her husband says of her:

"She is a very intelligent woman, and a very badly educated one."

Her eldest brother says:

"Considering how slow she was in reading, and backward, it is wonderful to see how clever she is now."

This statement demonstrates the condescending attitude of others to 'X's disability, and suggests the enormity of the value of the label 'word blind' to her. This paper is unique in the insight it provides to the state of a specific developmental dyslexic; there is, however, value also in the more objective approach afforded by an externally observed case history.

Rutherford, for example, in 1909, reports on a little girl called Bertha Ellen S..., aged 10 years. This particular case is presented in order to substantiate his arguments of -

".....the etiological influence of germ plasm defect, and not merely of this alone, but of the effect of
"inbreeding, in giving rise to congenital word blindness, or, as it may with propriety be termed, dyslexia congenita."

Despite, however, his erroneous reasoning on inbreeding, the points that he makes about the child are interesting. She was unable, at ten years, to read the harder monosyllables, although she was able to tackle such words as 'on', 'of', 'the', 'if'. He says:-

"She cannot remember words that have been pointed out to her but the moment before, and either makes the wildest guesses or else lapses into frightened silence. She is unable to give the pronunciation of a word, the letters of which are spelled over to her, a possible indication that in her case the auditory centre shares in the defect of the visual."

Rutherford points out that she seems to be up with her age group in arithmetic, handwriting (the latter, perhaps surprising for a S. D. dyslexic), and her general intelligence. However -

"Her reading in class is absolute nonsense, as she puts into the piece all sorts of words apparently for the sake of saying something rather than standing silent."

He says that Bertha was able to copy but not cope with dictation, even when given ten minutes preparation for it, and using only twenty simple words (e.g. dream, tale, etc.).
The teacher compared Bertha to an "incorrigible dunce" - a boy whose brother was a "congenital imbecile" - and used words like 'stubborn' and 'stupid' in describing her.

Rutherford mentions a younger sister, age six, who "can read fairly well for her age." He says:

"Both these children are alike nervous and easily frightened. They have yellow hair and pale, foolish faces, but neither of them is albinoid. They are certainly not either idiotic or imbecile - such is not the reason for the illiteracy of the elder child."

He gives great detail about the family history, which he obviously considers relevant to the case, being compatible with his theory of in-breeding. There are, however, some points that are interesting. For example, it is mentioned that Bertha's grandparents were illiterate, and also all of the five children were illegitimate. The former point leads to speculations on the hereditary aspects of S. D. dyslexia. The latter implies a somewhat unstable home life, which Rutherford elaborates in the early deaths of the peers of Bertha, and the illnesses of the mother. However, Rutherford's main point is that Bertha's father was her mother's uncle - a case of inbreeding.

"(He) is a confirmed alcoholic ...... I have seen him several times and there is no doubt whatever that he is weak minded; he it is who is the father of the girl who has word blindness, and of her brothers and sisters."

Rutherford describes the other fourteen of the sibs of this father, and most are suggested to show "varying degenerative manifestations".
Thus, he says, this family is "tottering to it's fall" - and he observes it not unlikely to " 'throw' variants from the common stem now to one side, now to the other." This he considers to be the origin of Bertha's word blindness.

Another early case history of "word blindness" is written in Pritchard (1911). The child in question (T.B.) is 8 years, and while "below the normal standard for his age", is handicapped only by the fact that he cannot learn 'visual reading'. He is said to have a good memory for auditory and kinaesthetic impressions, as well as visual characters other than words. However -

"If one draws him a cup, or a hat, or a dog, no matter how badly or inaccurately, he will recognise the object at once and say "cup," "hat", or "dog". But if one writes the letters c, u, p, he will not recognise any of them, nor their significance when arranged in that order."

The child does not recognise separate letters and small groups of letters. He could give few letters by name (Pritchard thought that this was by guess-work). He has, however, a good memory -

"It is very difficult to differentiate between a parrotlike repetition of whole pages of his reading book, and intelligent reading of the same. I have casually presented a page of his book to him, and asked him to read it aloud. After a few seconds hesitation, he will begin to read, as a rule correctly, but when I have asked him to read particular words or letters out of the page which he has already repeated correctly as a whole, he has been quite unable to do so."
Pritchard suggests that this behaviour might be due to T. B. taking in the whole page "as a picture", or that he has "an exceptional memory" that is set in motion by some objective association - "such as a familiar picture on the page, or its number."

The child could 'read' Roman numerals correctly and also was quick at mental arithmetic. He could tell the time and appeared to have normal vision. Pritchard also points out that the child seemed to have difficulty in concentration, particularly in reading. However, with the problems that T. B. appears to have in this subject, such is hardly surprising.

One of the main points of this account is that T. B. appears to fluctuate in his reading performance -

".....at times he not only recognises all the letters, but can read quite intelligibly. These lucid moments occur perhaps once or twice a week."

This latter point has not been mentioned of other cases; it may be due to the lesser depth into which most recent case histories have gone - particularly with respect to the nature of the actual problem.

Another case history, reported in Ingram (1964), illustrates emphasis on the early development, rather than the immediate symptoms.

K. K. was examined at age 8½ years, because he was reported to be unable to read or write, despite 'good' intelligence. He is described as being right handed, but having a left handed sister, and also two cousins with slow speech development.

His birth, and birth weight were normal and he walked, talked, fed himself, and was toilet trained within normal time limits. He was noticed to have some difficulties in dressing (e.g. putting his corresponding shoes on right and left feet) and seemed a little clumsy. He was healthy,
and played, going to school as normal. Initially at school, K. K. seemed to be one of the brightest in the class; however, subsequently he had difficulties in recognising words, and in reproducing them. He reversed letters and small words and had never learned to spell even simple words correctly, and tended to omit parts of words and individual letters, and at times mistook even individual letters when asked to name them.

On examination K. K. was observed to move slowly and clumsily, although he was neat in manipulating toys. There were no manifest neurological abnormalities, but he had some difficulty in imitating hand posture, and in right-left discrimination.

He was found to be weak in visuo-spatial powers - and his reading age on Sechonell graded reading vocabulary test, was 7.6 years. K. K. had a tendency to misread small words, e.g. 'this', 'as', 'their', and 'for' as 'from', etc., and he would guess at words from their context. He was unable to break down long words into syllables. This was largely due to 'Look and Say' teaching methods, and he was helped by use of the phonic method, whereon his reading age rose 1½ years in four months. This was largely in the ability to tackle words that he would previously not recognise from a look and say method.

Another example of specific developmental dyslexia is one which is observed from two points of view, that of a child and his parents. This was described by Richard Garner in 1966. The dual points of view illustrate the conflicts that such a disability as S. D. dyslexia is likely to give rise to in a family, conflicts that can only worsen the chances of the child.

The child concerned here is Barry, "an alert, good-looking fourth grader, who has been frustrated for over three years in his attempt to learn to read."

Barry had been thought initially at school to be 'eager, enthusiastic,
social-minded. " However, the teachers had reported him to be slow in learning the alphabet. He had started in the top group, but, with continual confusions over 'b', 'd', and 'p', 'q', and very poor copying ability, he ended in the lowest group, where still he never mastered "the simple vocabulary of the preprimers." A vision test was administered, but, to the parents disappointment, it gave no clues to Barry's problems. In subsequent grades, he still reversed, added, substituted words and letters; could hardly tackle oral reading, and was painfully slow in reading. He was still considered by the teachers to be bright and capable, however.

The parents of Barry —

"....find it difficult to be objective and clinical about Barry. Mixed in how they see Barry now is also the image of what they hope he will be in the years ahead.

Mr. Graham (the father) is a college graduate, and has a responsible job with an engineering firm. To him college is an essential part of life and anything else but college for Barry is unthinkable. Mrs. Graham is becoming extremely sensitive about the achievements of neighbourhood children, and the comparison she automatically makes with Barry are not favourable. She is even more concerned that Barry's younger sister in second grade is reading more fluently than he is."

The father attempted to help Barry, but could not comprehend the lack of ability to read in a child apparently so intelligent. His idea was that the lack of attention, so frequently reported of his son, was the problem, and this needed great discipline; thus he threatened and lost patience, leaving Barry in tears with perhaps even less chance of eventual success.
"Mrs Graham secretly entertained the idea that Barry is really retarded, in spite of the fact that all his teachers felt that he was a bright boy."

Other factors that are mentioned about Barry are that he was a month premature, was slower to walk and talk than his sister, and still confused left and right. He was not sure which hand to use when he first entered school, and was constantly 'on the go', and unable to concentrate.

Barry, himself, talked of his great desire to read, and how he enjoyed the early days of school, until he began to be taught reading. He could not recall words like his peers, letters did not stick in his mind, and gradually the world became hostile in his eyes. He was very conscious of the way in which he was dropping behind, and an overheard conversation between his parents about a possible repetition of the first grade was a great worry to him.

He started the second grade with new confidence, but this rapidly disappeared as failure occurred once again. His friends began to laugh at his mistakes and as a reaction, he began to tease them, and annoy the teacher. His dream was to be praised by the teacher for good work. Consistent failure created anxiety and oral reading was an ordeal. He, in addition to his mother, began to wonder if he was stupid. He hated school now, though found a small compensation in his ability as a footballer. This account of Barry, himself, is concluded by Garner -

"At this point there seems to be little doubt that Barry will be added to the roll of school drop-outs in a few years, if drastic changes do not occur in his education."

Garner goes on to suggest some of the changes that should be made
to help such cases as that of Barry, although for many of them it is too
late.

This paper implies that the family origin of Barry is middle class, and it serves as good illustration to the frustration and disturbance that S. D. dyslexia may cause in a family, particularly prior to identifi-
cation (such a point was also illustrated in the account written by 'X').

The last case history to be described in this chapter, is that of I.V., aged 10½ years. This child was tutored by the writer for six months, a fact which indicates the point of view of the discussion. I.V. was in the
last year of his primary education, and had long been acknowledged to be
behind in reading by his parents, who had endeavoured to encourage the
school to send him to remedial classes. The school did not appear to consider
this necessary and they were totally negative to the suggestion by I.V.'s
mother that he might be 'dyslexic'. Eventually the child was seen at the
Child Guidance Clinic, where his parents received the clear indication that
they were, in some way, to blame for their son's difficulties. This they
resented deeply. I.V. was subsequently taken to a London Specialist and
there diagnosed. It was considered that he showed difficulties in read-
ing of a 'dyslexic nature', and that his problems were not due to environ-
mental or emotional causation. Unfortunately neither his present school,
nor his future secondary school were prepared to accept this diagnosis,
the former being more prepared to believe the results of a class I.Q. test
which indicated I.V. to be of low intelligence. The London Hospital had
found that, on W.I.S.C., I.V. scored at superior level for the performance
section, and at above average on the overall score. It was considered
that his problem originated from the fact that he was premature at birth,
although another factor that might equally well have been causal was
meningitis at the age of two.
At the age of 10½ years, I.V. had a reading age of under nine, and a spelling age of 7.8 years, the latter obviously being his most significant handicap. I.V.'s reading performance was showing signs of great improvement, and had gained about a year in the previous few months. The improvement was due, to some degree to the learning of phonic skills, since his primary school used exclusively, a 'look and say' method, which tended to exploit the areas of function in which I.V. was most weak. His most deficient areas were those of retention and sequencing; he was often able to find the correct letters in a word, but muddled their order. He was also liable to confuse some letters, particularly 'u' and 'y', and sometimes also the expression of the vowels in a word given to him to spell. He had a tendency to omit letters, because he was unable to discriminate the separate sounds in a word, although this may have been partially due to his 'look and say' training. His expression in reading was, at the beginning of the period of tuition, very inadequate. He breathed in the wrong places, he ignored totally, all punctuation marks, and always tried to read as quickly as he could, virtually regardless of what he read. This should have been corrected early by a vigilant teacher but no-one, it seemed, cared what was read, so long as it was read rapidly. This fault cleared up as soon as the pressure for speed was lifted.

Another aspect of I.V.'s disability, was a low performance on the 'Draw-a-Man' Test. The standard score on this was 44, and an example of the drawing of a man and a woman is shown below, with other examples of writing, spelling, etc.
Fig 8.1  Examples of the Work of I.V.

'of'  read as 'for'.

'so'  read as 'soon'.

'pay'  unable to read.

'tub'  pointed out that it read 'but' in reverse, but unable to read in correct orientation.

'yarn'  (a word which he knew as a key-word for the letter 'y') — spelled 'yrane'.

'bright'  spelled 'brit'.

'number'  spelled 'nummern'.

'ticket'  spelled 'tikit'.

'done'  spelled 'dun'.

'scrape'  spelled 'scasp'.

'already'  spelled 'ereded'.

'water'  read as 'wanted'.


Drawing and writing - I.V. had a book in front of him when he did this piece of work.

I.V. was told to draw a man and a woman to his best ability, and with no time limit. The first example was done five months prior to the second, and is, for some reason, a better and higher scoring effort. The second drawing demonstrates a poor use of space on the paper, which was the size shown.
Second Example of Drawing.
Further examples of the work of I.V. are to be found in Fig 11.1, and 11.2 (both free writing), and 11.3 and 11.4 (both dictation).

Many papers and books written about reading difficulties and S. D. dyslexia include case histories; however, it must be realised that the case history is a very biased account. It will include only factors that fit with the ideas of causation held by the writer. If he thinks that a child's background has held back his reading, he will fill his report with such details, perhaps excluding (by lack of enquiry - not necessarily deliberately) other factors such as lack of established cerebral dominance, that may be relevant according to the views of others. Rutherford, for example, mentions much about the family history of Bertha Ellen, but not much of her own development - was she clumsy, left-handed, directionally confused, etc? For this reason, it would not be a reliable policy to pick out various points made in these case histories in order to compile a picture of the syndrome of specific developmental dyslexia. The more reliable method is to consider the overall findings of studies of samples of cases, with numbers large as possible. In this way, each aspect of the syndrome can be examined separately, and the importance and frequency thus assessed. This approach is adopted during the remainder of the thesis.

Examples of other case histories will be found in Critchley (1970); Thompson (1954) - a generalized account; Hinogae (1927); Silverman, Fite and Mosher (1959) - "Profile of a Typical Reading Disability Child", and Rawson (1968).
CHAPTER 9

THE INCIDENCE OF SPECIFIC DEVELOPMENTAL DYSLEXIA

The problem concerning specific developmental dyslexia has now been outlined, and it is necessary to consider how frequently the syndrome occurs in various populations. There is a very wide range of estimates, and it is not possible to assume that all refer solely to specific developmental dyslexia, and many talk of 'reading difficulties', or other indefinite terms. Thus, while concentrating on specific developmental dyslexia, the details of suggested incidence cannot be discussed in isolation, and must include reference to all causation.

Very few workers have attempted to split the figure of incidence into male and female. This is surprising, since separately much data on this difference does exist, and this will be discussed in a later chapter.

The reports of incidence of reading difficulties, the terminology used, and other comments, are presented below in tabular form.
### Table Showing Reported Incidence for Specific Developmental Dyslexia and Reading Difficulties

<table>
<thead>
<tr>
<th>Writer</th>
<th>Date</th>
<th>Age</th>
<th>Incidence</th>
<th>Terminology Used</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thomas</td>
<td>1905</td>
<td>-</td>
<td>0.05%</td>
<td>Congenital word blindness.</td>
<td>Survey conducted on London elementary schools.</td>
</tr>
<tr>
<td>Wallin</td>
<td>1911</td>
<td>-</td>
<td>0.7%</td>
<td>Dyslexia.</td>
<td></td>
</tr>
<tr>
<td>Wallin</td>
<td>1921</td>
<td>-</td>
<td>4.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bachman</td>
<td>1927</td>
<td>-</td>
<td>0.02%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Orton</td>
<td>1928</td>
<td>-</td>
<td>2-4%</td>
<td>Strepsoym-bolia.</td>
<td>Survey conducted on American schools.</td>
</tr>
<tr>
<td>Preston</td>
<td>1940</td>
<td>-</td>
<td>20%</td>
<td>Non-reader</td>
<td>Drew reports this as 'congenital dyslexia'.</td>
</tr>
<tr>
<td>Orton</td>
<td>1943</td>
<td>-</td>
<td>10%</td>
<td>Strepsoym-bolia.</td>
<td>Survey conducted on American schools.</td>
</tr>
<tr>
<td>Birch</td>
<td>(1947)</td>
<td>9-10</td>
<td>23%</td>
<td>Two years behind in reading.</td>
<td>Survey conducted in Burton-on-Trent.</td>
</tr>
<tr>
<td>(1949)</td>
<td>11.</td>
<td></td>
<td>16%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bakwin and</td>
<td>1948</td>
<td>-</td>
<td>10-15%</td>
<td>Specific reading disability</td>
<td>Survey conducted in American schools.</td>
</tr>
<tr>
<td>Bakwin</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinclair</td>
<td>1948</td>
<td>-</td>
<td>10%</td>
<td>Developmental aphasia.</td>
<td></td>
</tr>
<tr>
<td>Heller</td>
<td>1949 to</td>
<td></td>
<td>2.1%</td>
<td>Word blindness</td>
<td>Reported by Heller (1963). The findings resulted from a survey of 6,000 children.</td>
</tr>
<tr>
<td></td>
<td>1958</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hallgren</td>
<td>1950</td>
<td>-</td>
<td>about 10%</td>
<td>Specific dyslexia.</td>
<td>Survey conducted on 'school children' in Scandinavia.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-10.6%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>boys, 4.3% girls</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borel -</td>
<td>1951</td>
<td>-</td>
<td>3-20%</td>
<td>Reading disability</td>
<td>Survey conducted on school children.</td>
</tr>
<tr>
<td>Malcommy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McFie</td>
<td>1952</td>
<td>-</td>
<td>about 1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>WRITER</td>
<td>DATE</td>
<td>AGE</td>
<td>INCIDENCE</td>
<td>TERMINOLOGY USED</td>
<td>COMMENT</td>
</tr>
<tr>
<td>------------------------</td>
<td>------</td>
<td>-----</td>
<td>-----------</td>
<td>------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Robinovitch</td>
<td>1954</td>
<td>-</td>
<td>10%</td>
<td>Reading retardation</td>
<td>Reading retardation = two year deficit between reading and mental age.</td>
</tr>
<tr>
<td>Bender</td>
<td>1957</td>
<td>-</td>
<td>5-15%</td>
<td>Specific reading disability</td>
<td></td>
</tr>
<tr>
<td>Child</td>
<td>1959</td>
<td>-</td>
<td>5.5-25%</td>
<td>Reading disability</td>
<td></td>
</tr>
<tr>
<td>Hermann</td>
<td>1959</td>
<td>-</td>
<td>10%</td>
<td>Reading disability</td>
<td></td>
</tr>
<tr>
<td>Silver and Hagin</td>
<td>1960</td>
<td>-</td>
<td>5-25%</td>
<td>Specific reading disability</td>
<td></td>
</tr>
<tr>
<td>Myklebust &amp; Bashas</td>
<td>1960</td>
<td>-</td>
<td>5%</td>
<td>dyslexia</td>
<td></td>
</tr>
<tr>
<td>Kucares, Matejak and Langmeier</td>
<td>1963</td>
<td>2nd class</td>
<td>4.5%</td>
<td>slow readers</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>5th class</td>
<td>1.59%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Critchley</td>
<td>1964</td>
<td>-</td>
<td>under 10%</td>
<td>developmental dyslexia</td>
<td></td>
</tr>
<tr>
<td>Morris</td>
<td>1966</td>
<td>11 years</td>
<td>0.5-05%</td>
<td>illiterate or semi-literate</td>
<td></td>
</tr>
<tr>
<td>Västil</td>
<td>1966</td>
<td>infants</td>
<td>1%</td>
<td>reading difficulties</td>
<td></td>
</tr>
<tr>
<td>Västil</td>
<td>1966</td>
<td>-</td>
<td>11.4%</td>
<td>Spelling</td>
<td>Survey of spontaneous essays. In the 11.4% spelling &quot;was at such a low level that it would deter future achievement&quot;.</td>
</tr>
<tr>
<td>Ablewhite</td>
<td>1967</td>
<td>second decade</td>
<td>10%</td>
<td></td>
<td>Criterion for reading problems was 3-yr retardation.</td>
</tr>
<tr>
<td>Robinovitch</td>
<td>1968</td>
<td>-</td>
<td>3%</td>
<td></td>
<td>Reported by Vernon 1970.</td>
</tr>
<tr>
<td>National Advisory Committee on Dyslexia</td>
<td>1969</td>
<td>-</td>
<td>15%</td>
<td>Dyslexia and reading disorders</td>
<td></td>
</tr>
<tr>
<td>Newton</td>
<td>1970</td>
<td>-</td>
<td>10%</td>
<td>dyslexia</td>
<td></td>
</tr>
<tr>
<td>Writer</td>
<td>Date</td>
<td>Age</td>
<td>Incidence</td>
<td>Terminology Used</td>
<td>Comment</td>
</tr>
<tr>
<td>------------------------</td>
<td>-------</td>
<td>-------</td>
<td>-----------</td>
<td>------------------</td>
<td>-------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Gold and Huebner</td>
<td>1970</td>
<td>&lt;10.5</td>
<td>1%</td>
<td>Developmental dyslexia</td>
<td>Survey conducted &quot;in regional school population&quot;.</td>
</tr>
<tr>
<td>Clark</td>
<td>1970</td>
<td>9 yrs</td>
<td>1.2%</td>
<td>Reading difficulties</td>
<td>Criterion for 'backward' was two years behind.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5.1%</td>
<td>reading retardation</td>
<td>Survey conducted on a Scottish population of initially 1544 children.</td>
</tr>
<tr>
<td>Butter, Tisard and Whitmore</td>
<td>1970</td>
<td>9,10</td>
<td>6.64%</td>
<td>Reading backwardness</td>
<td>Reading backwardness includes children with low IQ.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11yrs</td>
<td>3.68%</td>
<td>reading retardation</td>
<td>Reading retardation takes the child's IQ into account - hence excluding those with low IQ.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>0-10%</td>
<td>dyslexia -</td>
<td>Survey conducted on 2334 children - Isle of Wight.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1%</td>
<td>dyslexia - dyslexia</td>
<td>Reading backwardness includes children with low IQ.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>15%</td>
<td>dyslexic-backward-</td>
<td>Overall estimate</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>readers )</td>
<td>Survey in Yorkshire town.</td>
</tr>
<tr>
<td>Inner London Education Authority</td>
<td>1970</td>
<td>8 yrs</td>
<td>17%</td>
<td>'poor' readers</td>
<td>31,308 children tested. Score of less than 80 on an N.F.E.R. Sentence Completion Test = criterion for 'poor' reader.</td>
</tr>
</tbody>
</table>

(Other figures for the incidence of reading backwardness are given by Moorehead and Hill (1971). The figures are from various local Authorities in unidentified areas of the Country).

An underlying pattern to this table is demonstrated in the figures of the Ministry of Education Pamphlet 32. This survey (in Britain) from 1948-1956 shows a gradual improvement in reading ability (with no variable but age accounted for) during these post-war years. From the table, however, there appears to be a raising of the estimates of reading...
difficulties, and particularly those estimates which, in terminology, are suggestive of specific developmental dyslexia. It is unlikely that such represents a real increased incidence, but probably merely a higher consciousness of the fact that some children who ought to be able to read, cannot. In earlier years many specific developmental dyslexies have been considered educationally subnormal, as illustrated in the account of 'X' in the last chapter. If, however, specific developmental dyslexia is a neurological malfunction of some type, it is almost certain that it has always existed, possibly even before the alphabet. One of the oldest references, apparently to specific developmental dyslexia, is to be found in the writings of the Greek poets, and describes a child who was unable to read, despite all efforts of the school teacher.

It is probable that manifest variations in incidence of specific developmental dyslexia, or any reading difficulties, might be found in a comparative study of different countries. This is due to the linguistic structure of the language itself. Västi gives figures for 'reading difficulties' in Finland, as 1%, a fairly low estimate compared with those of British surveys using a similar terminology. She points out early in her paper that Finnish is a very regular language, long sounds, for example, being universally represented by a doubled letter. Again, Kuera, Matejek and Langmeier report a lower incidence of reading problems in Czech children than what they consider to be the figure in England - (1.59 and 4.5% as opposed to 12%). They say that the Czech language is fairly consistently phonetic, and this accounts for the difference in figures. Another language, Spanish, which is similarly consistent, also appears to produce fewer difficulties, for the child learning it.

Lee (1960), has investigated the role of phonetic inconsistency in English, and how much it is a root cause of reading and spelling problems. After an extensive study, he concluded that English spelling was but a minor factor in causing these difficulties. However, Downing (1962) and the other
up-holders of the use of the initial teaching alphabet, quote much evidence to the contrary.

Several countries have two types of script. Japan is an example of such, and in a paper by Kuromaru and Okada, there is the implication that a "developmental alexic" is likely to have more problems with Kana 'letters' than Kanji characters. In the former case, each letter represents a sound, several of which are built into a word - similar to English letters. Kanji script, however, is composed of idioographic configurations, each of which has meaning, and hence is equivalent to an English word. The comparative performance of a specific developmental dyslexic learning one or other of the scripts, can be of value in determining the real nature of the difficulties associated with this disability.

Despite these reports of lowered incidences of specific developmental dyslexia in some countries, there is little doubt that the difference is only apparent, unless there is a real genetic variance. Such a possibility will be discussed in a later chapter. Many mildly affected cases 'struggle' by when a phonetically consistent language is presented; however, once confronted with irregularities such as those of English, his difficulties are magnified, and his disability will become obvious. This is not necessarily an argument in favour of the initial teaching alphabet.

Another factor that may conceal or bring to light fewer or more cases of specific developmental dyslexia is that of the method of reading tuition that is used. Orton (1928) has said:-

"..... the indications of our records are that children suffering from this condition in a degree sufficiently severe to be a really significant obstacle to school progress formed at least two per cent of the total school population in every community visited, while in some this percentage
"was more than doubled. This striking difference in numbers we feel to be related directly to the teaching methods employed."

He continued to say that sight (Look and Say) methods (see chapter 5) appeared to produce the higher percentage of cases of 'strepseudobilia'. It must, however, be stressed that Orton only suggested that this is a "very serious obstacle" - not a cause.

Lastly, in this discussion of factors affecting the reporting of the incidence of reading difficulties, it is necessary to consider what proportion of specific developmental dyslexics exist in the general population of backward readers. Many poor readers are still considered to be merely of low all-round ability, and their problems are not investigated at all. An example is the child who has poor visual memory, who is continually taught by Look and Say methods, which rely heavily on the retention of visual images - this child may be a specific developmental dyslexic. Because many teachers will not concede to the term, however, it is common for them to reject the whole idea that poor reading is anything but laziness or stupidity. Hermann says:-

"...... in all probability, the great majority of children who have reading difficulties at school, must, in fact, suffer from congenital word blindness."

This point of view is held by a large number of those who have engaged in serious research in this field. To verify or reject the notion, nevertheless, would probably be too demanding of diagnostic capacity. Another important point is that a mild case of specific developmental dyslexia in a child of superior intelligence may be manifested merely as a rate of progress not consistent with the I.Q.
Many of the figures in the tables do refer directly to specific developmental dyslexia - in one or other terminology. However, the suggestions of percentage vary from 0.05 (Thomas) to about 25% (Silver and Hagin). There does nevertheless appear to be a cluster of figures around 10%, and indeed Critchley, who in 1964 believed the incidence to be well under this figure, has revised his views, and in the 1970 edition of his book, he says:

"Today I am much less confident, suspecting the percentage is much higher." (than 10%).

In the absence of any national survey of the incidence of specific developmental dyslexia, it is only possible to look for a cluster of figures in the tables of incidence. 10% would appear to be a high estimate for a condition that is treated as an abnormality. If 10% is correct, then very many specific developmental dyslexias are never noticed. If the true figure is lower, then some estimates are inaccurate, or are including cases of reading difficulty that should not be identified as specific developmental dyslexia. At a subjective evaluation of the reports of incidence, ignoring the cluster at 10%, a figure of around 5% seems more likely to represent the incidence of specific developmental dyslexia.

To summarise this chapter, therefore, the tables show the reported incidences of reading difficulty and specific developmental dyslexia over about sixty-five years. The figures vary considerably, and some possible reasons for the range of estimate (of S.D. dyslexia particularly) are given. These can be divided into reasons for variation in the same country - or at least with the same original stock and linguistic structure:-
(1) **Between Countries**

a) Linguistic structures differ, one being easier to learn to read, and hence more specific developmental dyslexics 'get by' without being identified.

b) Scripts differ, one being easier to read than the other.

c) Consciousness of specific developmental dyslexia in the countries differs - and also the terminology and diagnostic criteria used is different.

d) There is a possible genetic variation between racial types with respect to this entity.

(2) **Within Countries**

a) Differing consciousness of the problem; differing terminology used and different methods of diagnosis.

b) Variations in the methods of teaching reading.

c) The existence of different racial types within a country, who differ genetically with respect to specific developmental dyslexia.

In the conclusion to this chapter, a cluster of suggested incidences of the syndrome in English speaking countries particularly, is observed to be around 10% for specific developmental dyslexia. 10% is considered to be a high figure on subjective judgement, and an incidence of nearer 5% is deemed more likely.
CHAPTER 10

THE DIFFERENT INFLUENCE OF SPECIFIC DEVELOPMENTAL DISABILITY IN MALES AND FEMALES

It has been mentioned in the last chapter that there appear to be many more male specific developmental dyslexics than female S.D.dyslexics. Despite this, few of the figures on incidence of any type of reading problem, are divided into sexes. Probably in the papers written at the turn of the century, the numbers of children identified with S.D. dyslexia were too small to allow a judgement on this; however, in the late 1920's, figures on %-male and %-female in selected samples began to suggest that boys were more likely to be S.D. dyslexics than girls. Despite some relatively emphatic denials of this difference, on the whole a ratio of about 4 : 1 - boys to girls - is reported. The findings of a number of workers are described in Fig 10.1, and further examples of such findings are to be found in Gritchley 1970.
Table Showing the Reported Male and Female Incidence of Specific Developmental Dyslexia and Reading Difficulties.

<table>
<thead>
<tr>
<th>Author</th>
<th>Date</th>
<th>Male</th>
<th>Female</th>
<th>Sample Size</th>
<th>Terminology</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachmann</td>
<td>1927</td>
<td>70</td>
<td>30</td>
<td>-</td>
<td>-</td>
<td>(Reported by Critchley, 1970)</td>
</tr>
<tr>
<td>Orton</td>
<td>1943</td>
<td>82</td>
<td>18</td>
<td>-</td>
<td>strepho-symbolia</td>
<td>-</td>
</tr>
<tr>
<td>Eames</td>
<td>1944</td>
<td>80</td>
<td>20</td>
<td>-</td>
<td>reading failure</td>
<td>-</td>
</tr>
<tr>
<td>Rustis</td>
<td>1947</td>
<td>75</td>
<td>25</td>
<td>-</td>
<td>specific language disability</td>
<td>Quoted as 3:1 male to female ratio.</td>
</tr>
<tr>
<td>Hallgren</td>
<td>1950</td>
<td>76</td>
<td>24</td>
<td>276</td>
<td>specific dyslexia</td>
<td>-</td>
</tr>
<tr>
<td>Rabinovitch</td>
<td>1952</td>
<td>72</td>
<td>28</td>
<td>34</td>
<td>reading disability</td>
<td>Sample of children with psychological problems.</td>
</tr>
<tr>
<td>Johnson</td>
<td>1955</td>
<td>67.6</td>
<td>32.4</td>
<td>34</td>
<td>-</td>
<td>Results of study in Reading Clinic Laboratory School.</td>
</tr>
<tr>
<td>Malmquist</td>
<td>1960</td>
<td>52</td>
<td>48</td>
<td>400</td>
<td>reading disability</td>
<td>Results not significant statistically.</td>
</tr>
<tr>
<td>Hermann</td>
<td>1959</td>
<td>75</td>
<td>25</td>
<td>-</td>
<td>reading disability</td>
<td>-</td>
</tr>
<tr>
<td>Ingram</td>
<td>1964</td>
<td>83</td>
<td>17</td>
<td>-</td>
<td>specific dyslexia</td>
<td>An estimate of 5:1 ratio.</td>
</tr>
<tr>
<td>Johns</td>
<td>1964</td>
<td>70</td>
<td>30</td>
<td>1300</td>
<td>reading retardation</td>
<td>Referrals to an Educational Psychologist.</td>
</tr>
<tr>
<td>Critchley</td>
<td>1967</td>
<td>83.5</td>
<td>16.5</td>
<td>115</td>
<td>developmental dyslexia</td>
<td>-</td>
</tr>
<tr>
<td>Critchley</td>
<td>1968</td>
<td>79</td>
<td>21</td>
<td>616</td>
<td>developmental dyslexia</td>
<td>-</td>
</tr>
<tr>
<td>Gold and Huebner</td>
<td>1970</td>
<td>87.5</td>
<td>12.5</td>
<td>200</td>
<td>developmental dyslexia</td>
<td>Ratio of 8:1 - boys to girls.</td>
</tr>
</tbody>
</table>
Any theory of causation for specific developmental dyslexia must explain the sex difference, or at least account for it. Such a difference, however, is not confined only to the reading ability. Bender (1958) says:

"The number of boys affected is several times that of girls, which is true also of pre-adolescent schizophrenia and of all other disorders of childhood concerned with developmental deviation."

These wider aspects of sex differences in the earlier years will be discussed over the next few pages in order to determine whether they might apply in any degree to the difference found in specific developmental dyslexia. Bentzen (1963) gives a number of examples of developmental factors, in which boys are affected more frequently than girls. He first gives ratios at conception and at birth - 100:125-135 (female to male) and 100:100-120 (female to male) respectively. Thus, in all there are

<table>
<thead>
<tr>
<th>AUTHOR</th>
<th>DATE</th>
<th>MALE</th>
<th>FEMALE</th>
<th>SAMPLE SIZE</th>
<th>TERMINOLOGY</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingram, Mason and Blackburn</td>
<td>1970</td>
<td>80.5</td>
<td>19.5</td>
<td>82</td>
<td>reading disability</td>
<td></td>
</tr>
<tr>
<td>Butter, Tizard and Whitmore</td>
<td>1970</td>
<td>76.7</td>
<td>24.3</td>
<td>86</td>
<td>specific reading retardation</td>
<td>Figures for 'reading backwardness' - 67.1% boys, and 32.9% girls.</td>
</tr>
<tr>
<td>Inner London Education Authority</td>
<td>1970</td>
<td>20.9</td>
<td>11.8</td>
<td>31,308</td>
<td>'poor' readers</td>
<td>'poor' readers scored less than 80 on N.F.E.R. Sentence Completion Test.</td>
</tr>
</tbody>
</table>
more boys who do not achieve the stage of birth. It is found also that more boys suffer injury at birth (Strauss and Lehtinen), because of greater birth weight. This implies that more children with known brain damage are male, and such is usually substantiated. The point concerning birth weight and birth injuries is reiterated by Malmquist (1960). Although he found no statistically significant difference in reading, girls were better readers on average and were also lighter at birth, had fewer injuries, and were also less frequently premature (and prematurity is often associated with cases of low achievement in junior schools).

Malmquist also found that they had fewer defects than boys. Schuell (1947) mentions a ratio of boy to girl stutterers of 3:1 and Mills (1942), conducting a speech survey at Mt. Holyoke, Massachusetts, found that 46.1% of boys and 28.3% of girls have articulatory errors, in the first three grades.

Apart from the mechanism of speech itself, it seems relatively valid to suggest that females are on the whole more verbal than males. Barratyme (1966) in addition to mentioning the verbal ability, suggests that females "tend to operate their lives slightly more on a feeling (emotions) and submissive basis, whereas males tend more to conceptualize in terms of constructs, and to dominate their environment actively". Krabbe links this area of suggestion with "word blindness" - boys tend to "think in images", and they see nouns as images rather than words. This creates difficulty in abstract thought. Many other workers have found that young boys tend to be more concrete in thought than girls.

Another suggestion for the sex difference controversy on the emotional side is that of McCarthy (1933), who points out that the mother is the first language teacher, and the girl is at a natural advantage, since "she identifies more readily with the mother". The voice of a boy is unlike that of both parents, although that of the girl is similar to her mother's. McCarthy also says (as mentioned in chapter 3) that the boy
goes out to play more frequently, away from a "linguistic" environment.

Stroud and Lindquist (1942) sum up much literature on the achievement of boys and girls in school. Overall, girls appear superior in most aspects of early school activities, although the boys subsequently take over at the high school level. A number of suggestions for this situation are considered in this paper. The first is that of Ayres (1909), who said:

"... our schools as they now exist, are better fitted to the needs and natures of the girl, than of the boy pupils."

Ayres' paper does not specify exactly what he is referring to. It may have been discipline, and the fact that school enforces largely indoor activity, perhaps more 'suitable' for girls. Stroud and Lindquist ultimately explain their own research largely with reference to their finding that of "basic skills", language showed up the greatest sex difference. They suggested that language predominates in the lower school classes - and is less important later - thus girls appear ahead earlier, but not so in higher classes. This explanation seems plausible - and yet it does not suggest why language is more advanced in young girls.

There are, however, many figures that maintain a girl to be advanced in more than just language - in physical growth, mental maturity, and so on, also. Estimates of the overall degree of difference between boys and girls, vary with the age and the criteria on which the calculation is made; however, Bentzen (1963) mentions that a six-year-old girl is twelve months ahead in "developmental age", - and at age nine, there is an eighteen month difference. McLaren (1950) quotes other figures such as that of Burt, that there is a 0.3 year advantage to girls. Ballard confirmed this, suggesting also that from 8-10 years there was 0.4 year difference.
Flemming has put forward a figure of 0.7 year advantage. However, Vernon (1948) could find no difference at all. It would appear that the overwhelming evidence is indicative of some difference in the rate of general maturation in boys and girls, up to the age of about 12-14 years. The average difference would seem to be somewhere in the region of three months to a year.

In the case of the growth of language the maturation rate is implicated. It has been mentioned in chapter 3 that the area of the brain, known as the angular gyrus, has much to do with the language functions and that this area is not fully mature until the age of 3-4 years. If general maturation lags in boys, this may put them behind linguistically at the age of 3-4, and it is not hard to hypothesise that a lag might continue, having developed at such a relatively late stage. This only explains the particular lag in some language skills, and hence probably most early school achievement factors. Nevertheless, there is still the question of the fundamental difference prior to the maturation in the angular gyrus. There seems no reason why this cannot be a basic genetic difference in male and female. It is known that there is a variation in the numbers of eggs at conception. Why not a difference in the potential growth rate? Again, the evolutionary 'reason' for the numerical inequality at conception is that more males die in the womb, at birth, and during childhood, being apparently more susceptible to stress. Maybe stress inherent in the prenatal and natal situation causes an inhibition in maturation which is sufficient to explain the general difference.

Further considerations of sex differences in the general ability of boys and girls is to be found in Stalnaker (1941), which refers to writing ability, and Moore (1939a, 1939b, 1939c) - referring to reading speed.
It has now been established that there is probably a different rate of development from conception to the age of twelve to fourteen in most male and female children, males being behind by a matter of three to twelve months in the later years. Possible reasons for this are summarised below:

1) More boys are likely to be brain damaged at birth, males tending to be heavier.

2) More boys are born prematurely (a factor connected with some cases of low achievement in early school years).

3) Boys tend to have speech defects more frequently than girls — and speech may affect other language skills.

4) Boys tend to be more concrete in thought, possibly making abstract and conceptual work harder.

5) Boys identify less easily with their first language teacher — their mother.

6) Boys tend to spend more time outside a 'linguistic' environment.

7) Schools are more suited to girls than boys.

8) Boys are, for some basic reason, not as skilled in language, and fail more easily in early school years because of the importance then of language.

9) Boys are slower in general development as a result of an inborn factor, and this affects the language skills, particularly, because of the late development of the angular gyrus.

10) Boys are more susceptible to stress and minimal stress may affect their rate of general development.
Now it is necessary to consider whether these suggestions about sex difference in school achievement and general maturation have any bearing on the sex difference of specific developmental dyslexia. Language skills are mentioned as one of the obvious causes of boys lagging behind girls; nevertheless, that a boy is a few months behind in the skill with which he reads, does not automatically assume that he is more likely to be an S.D. dyslexic. However, in some hypotheses concerning the origin of S.D. dyslexia, there is suggested to be a lag in the development of part of the brain - a part concerned in the activity of reading - one mentioned being the angular gyrus. Nevertheless, it is hard to see how a high ratio of 4:1 (boys to girls) can be satisfactorily explained on this basis, although there may be connections. The reason for the sex difference seems more likely to be found in the study of the genetic features of S.D. dyslexia. The work on this will be described in more detail later. However, suffice to say at present, that in a large percentage of cases, a familial tendency can be traced. A form of sex-linked hereditary pattern is a viable proposition, therefore (see Nyklebust and Johnson 1962). An alternative suggestion to this, however, is that a genetic factor exists which predisposes the individual to S.D. dyslexia - thence some of the factors summarised on page 139 may be involved. For example, some form of stress might well cause a manifestation of S.D. dyslexia in predisposed males more frequently than in females - hence explaining the ratio.

There are, in addition to those considering the sex ratio hereditary, some who explain it on the grounds of social factors. Hallgren (1950) demonstrated a considerable sex difference in his study; however he says:-

"The investigation indicates that boys undergo medical examination in view of specific dyslexia to a greater extent than girls. It is possible that the sex
"distribution of specific dyslexia in the normal population, does not differ appreciably from the normal sex distribution."

The fact that boys undergo more medical examinations suggests that, for some reason, S.D. dyslexia is more noticeable in them. Boys might, for example, bring their disability more frequently to the notice of their teachers by causing trouble, as suggested by Vernon. Another possibility that has been put forward, is that parents and society expect higher educational standards from boys, and hence are quicker to notice.

While these social factors possibly play a minor part in the manifest sex difference in S.D. dyslexia, they would not appear to be sufficiently important to warrant the consistent size of the ratios reported. Perhaps social factors act in such a way as to cause the minor variations around a mean ratio that has its origin in, for example, sex-linked genes.

Thus — to sum up the possible reasons for the approximately 4:1 boy-to-girl incidence in specific developmental dyslexia:—

1) Any of the general reasons listed on page 139.
2) Factors in maturation that might predispose boys to S.D. dyslexia more than girls.
3) Genetic factors in S.D. dyslexia —
   a) Direct sex-linked genes.
   b) Genetic predisposition that might be made positive by the effects of stress.
4) Social factors —
   a) That S.D. dyslexic boys are more noticeable behaviourally.
   b) That more achievement educationally is expected of boys, and hence they are noticed more quickly.
CHAPTER 12

THE GENETICS OF SPECIFIC DEVELOPMENTAL DYSLEXIA

The genetics of specific developmental dyslexia has been briefly and speculatively alluded to in chapters nine and ten on the general and sex incidence of the syndrome.

There have been a number of reports of high incidences of S.D. dyslexia in single families, and some of these will be described in this chapter. Such findings are important in the search for a causative factor for the syndrome. In the last chapter, three possibilities were suggested for this - anxiety, low level of maturity, and poor neurological integrity. A real genetic basis to S.D. dyslexia would automatically exclude 'anxiety' from the three, unless there are several forms of S.D. dyslexia. It would also indicate that it is necessary to look for a very specific area of slow maturation, or a specific impediment in neurological integrity.

For a trait to be termed hereditary in nature, a number of features should be present. First, the trait should be present in a certain and fairly steady proportion of individuals who are related by birth. Secondly, the feature should be equally present or absent in monozygotic twins.

A number of terms should be clarified at this point. Where two or more cases of reading difficulty occur in a group of persons related by blood, there are three possible explanations for the co-incidence. The first is that of chance. The second is that the individuals have been exposed to the same environment over a long period (frequently termed social transmission), and the third is that a real genetic factor is involved.
Some of the evidence for the existence of a genetic factor in specific developmental dyslexia will be examined. The case histories presented in chapter eight provide some examples. 'X' mentioned that her daughter had early reading problems. Again, Rutherford (1909) wrote that Bertha Ellen's grandparents and parents were all illiterate, although this may have been due partly or entirely to the lack of educational opportunity.

One of the most detailed reports in the literature is that written by Sydney Stephenson in 1907. He described six cases of 'congenital word blindness' in three generations of one family. The following family tree is drawn out as Stephenson described it. The patient, who supplied the information, is in the youngest generation, and her cousins are not mentioned.

**Fig 12.1**

<table>
<thead>
<tr>
<th>GRANDMOTHER</th>
<th>Seldom, if ever, read to herself, though fond of being read to; she learned to read with difficulty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>male</td>
</tr>
<tr>
<td>Difficulty</td>
<td>&quot;Educated and died at 8-yrs clever&quot;, but - difficulty worse at reading than 'a' worse at reading or 'b'.</td>
</tr>
<tr>
<td>learning to</td>
<td></td>
</tr>
<tr>
<td>read. Seldom</td>
<td></td>
</tr>
<tr>
<td>read for plea-</td>
<td></td>
</tr>
<tr>
<td>sure. Slow</td>
<td></td>
</tr>
<tr>
<td>with speech.</td>
<td></td>
</tr>
<tr>
<td>PATIENT</td>
<td>female</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Another detailed family history is given by Crosby and Liston (1967). In the first generation there are two affected females, and one affected male (out of nine sibs - four females and five males). In the next generation, there are two affected boys in one family, some of an affected mother. In another branch, the daughter of an affected mother is a specific developmental dyslexia - and in the same branch, two out of three of the next generation are also affected (both males).

Such observations as those above, suggests that at least some forms of S.D. dyslexia are hereditary, and that these are not totally sex linked (i.e., the syndrome is both carried and manifested by both sexes).

The less detailed and more common type of report on the hereditary nature of S.D. dyslexia is that dealing with a sample of cases, suggesting what proportion have positive family histories. This method is liable to involve less persistent questioning, and hence is prone to inaccuracies in recollection, knowledge of other branches of the family, and inaccuracies due to suggestive questions.

One of the most detailed reports of a large sample is that of Kutter, Tizard and Whitmore (1970), (the Isle of Wight survey). They use the term 'specific reading retardation', which is defined in an identical manner to specific developmental dyslexia. In a total of 2,354 children tested, they found 3.68% (86) cases. Family histories of cases were compared with a normally reading matched sample. The results are shown in Fig 12.2.
These results certainly suggest some hereditary influence although with further analysis and the fact that 'reading difficulties' were related in some way to family size, the authors were, in their conclusion, somewhat doubtful about the existence of any genetic transmission, considering that social transmission might be the explanation. Such a conclusion is inconsistent with those of most other workers in the field and in view of the statistically significant findings, against a matched control, surprising.

Hallgren (1950) put forward one of the strongest arguments for a high percentage of hereditary S.D. dyslexia. He investigated a sample of 276 children, and found 86% with positive family histories. A number of criticisms have been made of this high percentage - largely because it relied on retrospection of the parents. Owen (1968) merely points out the unreliability of the findings, while Russell and Cashdon (1963) say that the figure is much too high for acceptance. Vernon (1957), is somewhat sceptical about the figure and suggests delaying acceptance until further evidence is produced.

A number of other investigators have noted the high proportion of cases

<table>
<thead>
<tr>
<th>FAMILY HISTORY</th>
<th>SPECIFIC READING RETARDATION CASES (%)</th>
<th>CONTROLS (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>General backwardness</td>
<td>37.8 *</td>
<td>12.0</td>
</tr>
<tr>
<td>Reading difficulties</td>
<td>33.7 *</td>
<td>9.2</td>
</tr>
<tr>
<td>Speech retardation</td>
<td>10.1 *</td>
<td>3.6</td>
</tr>
</tbody>
</table>

* = significant at 0.1% level,  * = significant at 5% level.
of specific developmental dyslexia in which there is a traceable hereditary factor. These workers do not mention the possibility that the explanation might be social transmission (as do Rutter et al). For example, Critchley (1968) has said:

"In this past six years, I have been seeing, I suppose, four to six new cases of dyslexia a week, and it is the exception for me to find a family without one or more similarly affected persons."

Ingram (1964) mentions:

"In the family histories of patients, a remarkable number of parents, uncles, aunts, brothers and sisters are found to have had difficulties in learning to read and write and to have poor spelling ability. The latter may persist into adult life."

He also says:

"A family history of slow speech development also occurs frequently. Rather high proportions of parents, uncles, aunts, and sibs are left-handed or ambidextrous."

(He found that, in one series, 41% of parents were weakly lateralised or sinistral in handedness, and similarly, 39% of sibs; – the significance of these results will be covered in detail in the next chapters)

A further remark of Ingram's is significant in the discussion (in a previous chapter), of the possibly varying incidence of specific
developmental dyslexia in different countries, since it refers to groups of people larger than families - Scottish Clans.

"During the last ten years it has seemed that the offspring of parents who are MacDonalds, Kerrs, McLeans, Campbells and MacGregors are unusually often referred on account of speech defects or specific dyslexia and dysgraphia. The maiden names of the mothers and grandmothers of patients, and the surnames of the mother’s father are now routinely requested during case history taking."

If the incidence of S.D. dyslexia can vary in widely dispersed clan groups, it seems possible that it could vary between races, and hence different countries.

Crosby and Liston suggest a percentage of about fifty for the incidences of positive family histories among S.D. dyslexia cases, and Tjossem, Hansen and Ripley (1962), in a small sample of 24 cases, ("reading difficulties") reported a hereditary factor in eight. A number of workers suggest agreement with the positive findings, while not actually producing figures. For example, NAKAYAMA (1953) mentions the "hereditary relationship of reading disability" as one of the three "considerations which support the existence of the neurological causes for reading disability". Rustis (1947) reports of a family where six members (42%), showed some evidence of reading disability, and Drew (1956) in a very detailed appraisal of the whole subject of 'congenital word blindness', discusses a family in which three are probably affected. Forrest (1968) also mentions findings suggestive of hereditary factors. McLeod (1969) found such factors of sufficient
significance to include a question on this in his 'School Entrance Checklist' and 'Dyslexia Schedule'. (These are tools designed to discover the potential S.D. dyslexics in the earliest days of school).

Another criterion of heredity, mentioned at the beginning of the chapter, is the incidence in twins. Monozygotic twins are derived from the same ovum. They have received the identical complements of genetic material, and hence, if S.D. dyslexia follows a hereditary transmission, and is present in one, it must be present in the other. Dizygotic twins are formed from two ova, being fertilized simultaneously, and hence, while frequently alike, need not be similarly affected.

Hermann and Norris (1958) have summarized three studies on twins —

Fig 12.3 - Table Showing the Incidence of Specific Developmental Dyslexia in Monozygotic and Dizygotic Twins

(Adapted from Hermann and Norris (1958))

<table>
<thead>
<tr>
<th>STUDY</th>
<th>TOTAL NO. OF PAIRS</th>
<th>MONOZYGOTIC (same sex)</th>
<th>DIZYGOTIC (same sex)</th>
<th>DIZYGOTIC (Opp. sex)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hallgren (1950)</td>
<td>6</td>
<td>3</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Norris (1954)</td>
<td>28</td>
<td>7</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Norris (unpub.)</td>
<td>11</td>
<td>2</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>TOTAL: -</td>
<td>45</td>
<td>12</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>
The findings are very convincing, and more research of this nature on larger numbers would be a positive contribution to knowledge. It would be of further interest to determine whether the 33% concordance between dizygotic twins is higher or the same as that in single born sibs.

To summarize this chapter, therefore; there appears to be a positive family history in upward of thirty percent of cases of specific developmental dyslexia, although many workers present figures between fifty and one hundred percent. Most consider that the positive family history represents the manifestation of a real hereditary factor. The wide variation of estimates given for this is partially explicable on three counts:

1) Inaccuracies in the method of investigation (i.e. reliance on memory), and the extent of investigation in each family.
2) Differences in diagnostic criteria for specific developmental dyslexia.
3) Differences in the precise identity of the genetic factor being investigated.

Examples of the latter point are those who consider significant the existence of abnormal patterns of laterality in the family history of specific developmental dyslexics (Newton and Tjan et al). Variation in the use of the term 'genetic' is that of Bannayne (1966)
Here 'genetic dyslexia' is used as an alternative to specific developmental dyslexia to describe a group of children who have not: "inherited in the normal course of events, the specific ability to acquire linguistic functions easily. They form the lower end of a normal continuum which is found throughout the whole population, the normal continuum being linguistic or verbal ability, which we all have to a greater or lesser degree."

Such a continuous variation implies a polygenic system of inheritance, and further implies that S.D. dyslexia is not a sharply definable syndrome and will be present in increasing numbers, the more mild the disability. Newton also puts forward the notion of a 'polygenic' system. The hypotheses of polygenic systems are contrary to those implied by the majority. Hallgren has said:-

"The statistical analysis shows that specific dyslexia, with a high degree of probability, follows a mono-hybrid autosomal dominant mode of inheritance".

A number of workers (e.g. Critchley (1963), Drew (1956)), indicate agreement with this view. The implications of such are that S.D. dyslexia is a specific, delimited state, and that it follows a discontinuous variation. There are likely to be the same number of mild cases as severe cases.

From the survey of the literature in this chapter, it would seem valid to conclude that an hereditary factor is involved in a proportion of cases of specific developmental dyslexia. Of the three possible areas of causation mentioned at the beginning of the chapter, therefore, it is concluded that anxiety is not the universal cause, although it may be causative in a proportion of cases. For the origin to be in a fault in neurological integrity or a maturational irregularity, a specific rather than a general
malfuction is likely, unless the genetic trait is of the nature of a predisposition, not direct.

In discussing any aspect of specific developmental dyslexia, many papers make a brief allusion to the difficulties encountered in the actual reading and writing processes. In the earlier chapters of this thesis, reference has been made to the intricacies of the reading process and the abilities that a child should possess before he will read successfully. However, S.D.dyslexics obviously have some area in the system that is deficient, and that causes a disruption of the entire operation. In the model - Fig 6.1 - many hypothetical causes for reading difficulties are suggested. These are listed on pages 87 and 88. However, there is no part that obviously 'fits' the concept of S.D.dyslexia exactly, and hence there is need to consider what the reading problems of an S.D.dyslexic are, in practice, and further to determine whether these might fit into the model as it is, and thus suggest causation.

An S. D.dyslexic usually has problems in spelling, reading and writing, the former being the most persistent. These respective difficulties on the whole are representative of a series of fundamental faults. For example, if a child cannot discriminate similar word endings by ear, he may well pronounce them incorrectly in reading, spell them incorrectly and hence also write them incorrectly. Since spelling is so closely linked with both reading and writing, it will not here be treated separately, although it is stressed that weird spelling is often the most glaring fault in a specific developmental dyslexic. The categories under which the difficulties will be considered are - reading, writing, and other connected faults that do not exactly fit into either category. Many of these faults have been previously alluded to in the case histories. Such references will not be repeated.
Faults made in Reading by the Specific Developmental Dyslexia.

1) Lack of recognition of familiar letters or words.

A letter or (short) word is presented to the child, and he is unable to name it. Where the word is regular phonetically, a sound by sound analysis may yield the correct word after a time lapse. A similar letter or word may be given in answer - for example, the letter 'y' given for the letter 'u' (particularly in lower case lettering).

This fault may be a result of poor visual discrimination currently, or poor auditory or visual memory when the letter has been shown and named previously.

This is one of the commonest faults associated with S.D. dyslexia, and is mentioned by Vernon (1962); Knehr and Sobol (1968); Krabbe (1954); Johnson and Nyklebust (1967); Ingram (1963); and Hermann and Merrie (1958).

2) Omission and addition of words and syllables and letters.

A child reads, for example, 'though' as 'thought', or vice versa. He spells 'street' as 's-t-e-e-t'. The fault may be in the auditory discrimination of the word given, or visual discrimination of the full letter structure of the word.

More frequently, the mistake occurs in reading a series of words in a sentence. The child adds, or omits, a word - thus, in reading: - "The girl played with her toys", he would read: - "The little girl played with her toys".

This type of fault is mentioned by Critchley (1970), though it is alluded to by a number of others.
3) Substitution of the incorrect word.

The child reads, for example, "He ran inside his house", as "He ran into his house". The word usually makes sense from the context and may not be noticed by the observer. On occasions however, where the child is reading mechanically and is unable to comprehend the context — he may guess incorrectly at the word from the configuration. An example is a child who read the word 'imprison' as 'impossible', and 'soon' as 'so'. Incorrect letters may also be substituted — such as the child spelling u-m-b-r-e-l-l-a as y-m-b-r-e-l-l-a. This is particularly likely to occur where a 'Look and Say' method of teaching reading has been used. Such a fault is mentioned by Critchley (1970); Krabbe (1954), and Johnson and Myklebust (1967).

4) Inability to combine letter sounds into a whole word, and inability to give speech sound for letter.

Auditory blending is an essential part of phonics teaching methods; however, a child taught by 'Look and Say' is not likely to be immediately very accomplished at this. The diagnosis of this fault may be made when the child spells out a word by letter names, seeming thence to be unable to give sounds. He may also, however, be unable to retain the letter sounds long enough to blend them into a word.

This fault is mentioned in the context of wrong teaching method, or inability to blend sounds, by Vernon (1962); Krabbe (1954); Johnson and Myklebust (1967); Ingram (1963) and McGovney (1930). The latter is probably referring to S.D. dyslexia, though is manifestly concerned with spelling deficiency in children of superior general ability.
5) Inability to analyse word sound.

This is the opposite function to that described in (4). To spell a word, the child must break it down into smaller sound units, and thence identify each. This is mentioned by Hermann and Norrie (1958); McNeil and Stone (1965); McGovney (1930); Ingram (1963); Johnson and Myklebust (1967); and Wheeler (1952).

Both (4) and (5) are faults that may be traced to a poor auditory perception skill. The child is unable to remember, distinguish and blend sounds.

6) Failure to notice small differences in words (visually).

Similar words are confused. This is frequently shown where a child ends a word incorrectly - reading 'looked' for 'looking', despite the context.

7) Failure to notice small differences in words (auditorily).

Two words, sounding similar in the experience of the child, are read similarly. Such a fault is very obvious in written work.

Workers who have mentioned the faults elaborated in (6) and (7) are Myklebust and Johnson (1967).

8) Words understood in context, not in isolation.

This is mentioned by Ingram (1963) and would appear to occur more frequently in the highly intelligent cases, who are 'getting by' on understanding of the context. These children also make frequent word substitutions - as mentioned above.
9) Reversals of letters, whole words and series of words.

This is very commonly associated with S.D. dyslexia, when it continues beyond the very early stages of reading. It is sometimes reflected clearly in children who read a passage more fluently when it is shown in a mirror, or even upside down.

The phenomenon of reversal is frequently incorporated in hypothetical causes of S.D. dyslexia, usually associated with a general directional confusion, ambidexterity, etc.

Some examples of common types of reversals are as follows:-
'saw' is read or spelled as 'w signage'. A child confronted with the word 'tub' pointed out that the word spelled 'but' in reverse - but was unable to read it correctly. The word 'from' is read as 'form'. The letter 'd' is confused with 'b'; 'p' is confused with 'q'; 'b' is confused with 'd'; 'm' with 'w'; 's' with 'n', etc. The word 'dad' is read as 'bad', etc. (Some examples of reversals may be termed rotations - as in fact they are swivelled through only 90°, not 180°. However, these would appear to be manifestations of the same basic cause).

Writers who mention reversals (and rotations) are Critchley (1970); Hermann (1959); Hermann and Norrie (1958); Park (1955); Ingram (1963); Miles (1962); Johnson and Nyklebust (1967); Krabbe (1954); Krise (1952). Further discussion on reversals will be included in the text of this chapter.
Faults in Writing Commonly Made by Specific Developmental Dyslexia.

The faults in writing will be mentioned more briefly than those in reading, above, as many are directly related. For the same reason, fewer references will be included.

1) Writing untidy and letters poorly reproduced, etc.

This is a factor usually apart from the problems of lack of knowledge of letters, confusion of letters, confusion of words, and so on. It is frequently related to poor drawing ability and possibly thus to spatial disorganization.

Critchley (1961) mentions such factors as - intrusion of block capitals into the centre of words, strange linkages of letters, fusion of letters, etc.

Such poor penmanship may be deemed representative of dysgraphia - or merely of the limited reading ability.

2) Inability to form letters from a given sound.

When writing a word, even if he can analyse it into smaller sound units, the unit does not automatically suggest to the child the correct motor action required to create the letter, or the visual image from which to derive the activity of writing.

3) Inability to find words or sentence schema with which to express meaning.

This is mentioned by Ingram (1963), and would seem to be more associated with dysphasia than S.D. dyslexia.
4) Reversals and Rotations of and within words, or of several words.

Examples of this would be similar to those in the section on reversals in reading. The reversal in writing may occur even when the child sounds out the word phonetically.

5) Missing out words, syllables or letters when writing.

The child might write 'ringng' for 'ringing', for example. This may be a defect of auditory memory after he has said the word over to himself; however, a child with efficient visual perception would usually notice the slight strangeness caused by the missing 'i'.

6) Words spelled and written correctly in context, but not in isolation.

In this case, it is possible that a word presented in isolation requires a specific effort, that may worry an S.D. dyslexic more than if he comes across it in a string of other words that he is able to cope with. The emotional state may 'block' his response to this word.

Other more General Faults of Reading, Spelling and Writing in Specific Developmental Dyslexia.

1) When reading faulty stress placement in polysyllabic words.

This is probably a by-product of an inability to take meaning from a sentence.
2) Lack of recollection of words correctly read previously.
   The 'reading' may have been mechanical - with little comprehension involved in the process.

3) Slow reading.
   An almost inevitable fault of anyone who has problems in reading.

4) Re-reading of lines several times.
   Again, almost inevitable for anyone who finds reading difficult, but who wants to comprehend the text.

5) Loss of place on line - and preference, therefore, for books and other materials with short lines.
   Many S.D. dyslexics have difficulty in keeping their place on the page, and hence 'finger point'. It is hard to detect a reason why this should be so, unless it relates to visuo-spatial skills. Many beginning readers seem also to have this difficulty. Pointing to a word would possibly concentrate more attention on to it. (See Mosse et al - 1959).

6) Limited vocabulary.
   This is occasionally reported of S.D. dyslexics, and is further discussed in the context of speech. (See chapter 14)

7) Inability to name and identify parts of speech - agrammatism.
   This is reported by Krabbe (1954), and would seem again to be a general result of lack of reading. Grammar is taught in terms of the written word, a linguistic form obviously not as familiar to S.D. dyslexics.
8) Rhyming words not appreciated.

This is noted in S.D.dyslexics who appear to be primarily handicapped in the auditory perceptual functions. However, in the lack of the possibility of fluently reading a poem out aloud themselves, any S.D.dyslexic child is inevitably handicapped in the appreciation of rhythm.

9) Figure/ground difficulties.

Difficulties such as these are general. The child finds it hard to see distinct patterns, or letter forms embedded in material that tends to confuse the clarity of the image. He sees only one figure on reversible figure tests, etc.

10) Drawing lacks detail and is immature.

This applies to some S.D.dyslexics only. Certain writers have attributed high artistic skills to large numbers of them. Critchley (1970) says that his observations do not bear this out.

11) General lack of attention and concentration on reading and writing.

Hyperactivity and low concentration is frequently indicative of brain damage, and hence where marked, this may be the cause of the reading difficulty. In the majority of S.D.dyslexics, the lack of concentration on a subject of tremendous difficulty to them is hardly surprising.

12) Other problems of an auditory-temporal and visuo-spatial nature.

Auditory-temporal and visuo-spatial problems may underlie many of the faults mentioned above - e.g. reversals. They are often present, however, in a pure form. Examples of this
are the inability to repeat an auditory rhythm such as one beaten out on a percussion instrument, or the very poor spacing of work on a page, writing or drawing being squashed in one corner of a large clean sheet of paper.

Writers mentioning this are: Silver and Magin (1964); Krabbe (1954); Gooddy (1963); Johnson and Nyklebust (1967); Walbridge (1965); Sterritt and Rudnick (1966); Rosen (1955), and Miles (1962).

13) Sporadic nature of performance.

The observation that the performance of the specific developmental dyslexic is not constant. This was the central theme of a paper (already discussed in chapter 8) by Pritchard, who noted 'lucid moments' in a specific developmental dyslexic. These occurred "perhaps once or twice a week". This point is not remarked on commonly, however, the sporadic performance of such children has been noted in the Word Blind Centre, and in the writer's own experience, although 'lucid moments' would perhaps seem a little strong in expression.

The explanation of this phenomenon may be simply that the child has spells of heightened motivation - or a feeling that he can overcome his difficulties. Such is felt at times by anyone tackling a hard task. There may be another explanation more deeply bound up in the causative origins of S.D. dyslexia.

On the following three pages is presented some of the written work of a boy of 10½ years, who is diagnosed as dyslexic. This illustrates some of the points made above. (This child is referred to in chapter 8.)
Examples of the Work of a Ten-and-a-half-Year Old Boy
Diagnosed as Dyslexic (I.V. - see chapter 8 for further examples).

Fig. 11.1 Free writing.

THE CAKE

One day I was in my Uncle's house when I saw a cake. So I ate it. Then I grew six inches high. I thought that cake is magic. Then I went down a hole. I was a mouse hole. I went up around the house then I saw a cake I ate 1 I grow to my own height. Then I Had Tea.

The End.

Corrected Version

The Cake

One day I was in my Uncle's house when I saw a cake, so I ate it, then I grew six inches high. I thought that cake is magic. Then I went down a hole. It was a mouse hole. I went up around the house then I saw a cake. I ate one. I grew to my own height. Then I had tea.

The End
The Ball.

One day I was in my garden when I found a ball. It was gray and it was a small ball. Then I went to the park and I rolled it. It went into the pond and sunk. Then I went home.

This story shows a different characteristic of the specific developmental dyslexic's work. This child is 10½ years old, and intelligent, and in writing such a story is certainly underfunctioning for his mental age. It is likely that he could tell a much more complex story, but here he has restricted himself in order to produce fairly correct spelling — i.e., using only words that he knew he could cope with.

*(The 'x' after incorrect words is representative of the manner in which he had been taught to delete words)*
Linda has promised to get Gran a cat. She is having a problem getting a black tortoiseshell cat. She has to have a black cat as Nick, the cat that was killed, was black. Linda visits the vet as he often has cats.

Corrected Version

Then Mick's Dad sells a puppy to a fat man. The puppy licks the fat man's hand. Linda goes to him a dog brush as well from the back of the shop.

Corrected Version

Then Mick's Dad sells a pup to a fat man. The pup licks the fat man's hand. Linda gets him a dog brush as well from the back of the shop.
A general reference to the list of manifest problems in specific developmental dyslexia is that of Monroe (1932). In some ways her approach is naive, as each problem is treated as an entity in itself, with a specific cause, where many might be more usefully grouped as symptoms of a more fundamental cause.

There are several points in the reading, writing and spelling of S.D. dyslexics that require further elaboration. The first is that of reversals. There has been some argument about this fault as it is so obviously manifested by normal children in the early stages of reading. However, the reversals made by an S.D. dyslexic are considered abnormal, because they persist over a long period, without much improvement. The argument stems from those who consider the reversals of an S.D. dyslexic to be within the normal range.

Hildreth has made a study of the reversals of normal children (1934) and has classified them -

a) Reversal of the whole word.
   big  g i b

b) Reversal of one letter in a word.
   d i g  b i g

c) Inversion of order.
   "I see Kitty".  "Kitty see I".

Thorough testing was performed on a sample of children from grades 1-5 in different types of schools and it was found that reversals declined with rising age, paralleled the rate of reading and followed a decline in all errors. He found that poorest readers made more mistakes than better readers but could find no evidence that poor reading was caused by reversals. None of his cases has an exceptionally large number of reversals. He also mentions that he found no association between reversals and handedness,
a feature of interest since definite handedness is often not established in S.D. dyslexics (see later) and reversals are sometimes said to be linked with this.

Norely Krise has also done work on reversals in reading (1949, 1952), and provides a good review of the literature, mentioning many of the theories of why children disorientate letters in that manner. He puts forward a new hypothesis - that reversals will increase in proportion to the similarity of the letters in any orientation, and that reversals are due to the lack of familiarity of the relation of the figure to the ground. Reversals are therefore a problem in space perception. He devised four new figures, therefore, which represented i, a, e, u; but which paralleled b, d, p and q reversal problems. He also devised four non-reversible figures. A series of learning periods was arranged for five University graduates, and after each session, they were tested on the reversible and non-reversible figures. More time was taken to learn the former such that no mistakes were made, suggesting that reversible figures are more difficult to learn, but can be mastered after instruction. The results also suggested that the fault is not restricted to young children, but can occur in the most intelligent adults. The training appears to allow relation of the figure to the ground to become familiar. Thus Krise bore out his hypothesis of space perception problems being the basis of reversals. From this conclusion he makes the suggestion that reversals may be overcome by concentration on the symbols themselves.

In another paper, in 1952, Krise performed more comprehensive testing on adults, incorporating tests of handedness, space perception, reading, and so on. There was a high correlation between space perception ability and the tendency to reverse, and a correlation at the 5% level of probability, between pure dominance and reversals (pure dominance here described the use of right or left hand and the use of the corresponding eye). Such a finding is hard to explain. (See also Benson D. 1970).
The validity of the experiments of Hildreth and Krise for specific developmental dyslexias has been assumed in the mention of the work. The assumption is based on the similarity of reversals made by normal children learning to read, and older S.D.dyslexics. A further assumption from this is that the deficiency behind the reversals is the same and that the latter are maturing more slowly with regard to this particular skill. If, as Krise suggests, the skill is that of 'space perception', then this would explain other faults made in reading, spelling and writing - poor writing and drawing, loss of place on the line, figure-ground difficulties, spatial positioning on the page.

The work of Kolers and Kateman (1968) - see chapter two - is also of relevance here, however, and it might enable a more specific definition to be given to 'space perception'. Kolers et al identified an element of perception that is concerned with the ordering of the input of sequences into the nervous system. If such exists, it would appear that this (rather than the generalization 'space perception') is not fully mature in beginning readers, and is slow in maturing in specific developmental dyslexics.

A further area of research in the problems of S.D.dyslexias is reported in a paper by Hermann and Voldby (1946), entitled "The morphology of Handwriting in Congenital Word Blindness". Handwriting in S.D.dyslexia varies, some being neat and regular, others being untidy, as earlier described. In the latter case, the subject is usually considered to be manifesting disturbances of a dysgraphic nature. Hermann and Voldby categorise the nature of the errors as follows:

a) Confusions of letters (included because frequently the form of letters is contaminated with that of other letters as a result of confusion.

b) Disfigurement of letters.

c) Errors in the linking together of letters (including contamination of letters).

d) Other types of errors (including mirror writing, block letters, reversals).
They analysed the writing of 250 six- to sixteen-year-old S.D.dyslexic children, using tests that corresponded approximately with the age of the child. They say:

"It is our impression that in the great majority of dyslectics (sic) you find writing difficulties, and among them, difficulties of a morphological nature. The diagnosis of dyslexia should never be made or rejected without a previous thorough examination of the patient's writing abilities."

Hearns (1969) also analysed the handwriting of 'dyslexics'. He considered that abnormalities might serve as diagnostic criteria and he therefore studied the handwriting of mentally retarded children and a group of eighty dyslexics. It was found that there were a number of mistakes made exclusively by the latter.

Fig.11.5 Features of Handwriting of Specific Developmental Dyslexics.

<table>
<thead>
<tr>
<th>Features of Handwriting</th>
<th>% Incidence of Features</th>
</tr>
</thead>
<tbody>
<tr>
<td>All sample = 100%</td>
<td></td>
</tr>
<tr>
<td>No embellishment of letters, Tremour or ataxia</td>
<td>30%</td>
</tr>
<tr>
<td>Inverted or transposed letters</td>
<td>25%</td>
</tr>
<tr>
<td>Misspelled letters</td>
<td>65%</td>
</tr>
<tr>
<td>Strong tendency to the left in lower loops</td>
<td>30%</td>
</tr>
<tr>
<td>Very wide left margin</td>
<td>10%</td>
</tr>
<tr>
<td>Very wide right margin</td>
<td>12%</td>
</tr>
<tr>
<td>Very wide right and left margins</td>
<td>20%</td>
</tr>
</tbody>
</table>
An analysis of this nature does not yield a very firm basis for diagnosis, since the probability of an individual suspected dyslexic making a sufficient number of the features listed above, for diagnosis, is low. There are several variables which further complicate this form of diagnosis such as age, severity of disability and the amount of training for handwriting received. While, therefore, study of the incidence of these features is more interesting than verbal description, it does not replace any aspect of conventional diagnostic procedure, it merely enhances it.

In the discussion of the handwriting of S.D. dyslexics, the role of the reading difficulty in causing errors is important. In determining features unique to them, comparison should be made with other groups of poor readers or poor spellers.

Although writing errors are not, alone, very useful in diagnosis, they have value in presenting a permanent record of the way in which a child is processing that which he is writing - for example, in spelling sequence. Spelling is performed in two manners - by auditory or visual means. A child taught by 'Look and Say' is drilled in recognising the shapes of the words, part at a time if necessary, while the child taught in a phonic method, normally will analyse by sound. Probably this basic teaching has some carry-over into adult life, though the manner of spelling may be further resolved by the individual's own particular abilities. Some spell, therefore, by sound, and others by recalling the visual pattern of the word. If such applies also to the S.D. dyslexic, the relative strengths and weaknesses should be detectable from the written word. From such diagnoses, S.D. dyslexics are frequently designated auditory or visual in type, depending wherein lies their greatest problems. The validity of such a division is often disputed, though it would seem to be of value on the remedial side, where the realities of the categories matters little.

A further question arises from the consideration of the nature of the
difficulties of an S.D.dyslexic. What exactly are the symbols affected by the disability? Several series of symbols exist - one written script (occasionally two, as in Japan); a notation of numerical characters; musical notation, and others less commonly used - such as Braille, languages involving hand and finger configurations, Morse, semaphore, and typewritten language. There has been no major cross comparison of the performance of the S.D.dyslexic on the different symbolic series, and thus it is necessary to consider each in turn.

Normal writing has already been considered and it was noted that this causes problems for many S.D.dyslexics. The two scripts of the Japanese language have been described in an earlier chapter, where it was mentioned that they yield diagnostic information about cases of S.D.dyslexia. Kuromaru and Okada (1961), describe the case of a boy of twelve who found it impossible to read by Kana script (see page 129) since he could only take it in letter by letter. He found Kanji letters even harder to learn, however was able to retain them subsequently, since they are wholes in themselves, not requiring further synthesis. It might be hypothesised that the child had difficulties enhanced on the auditory side, and that if his problems were of a more visual nature, perhaps the results would be opposite. It is clear, nevertheless, that this case found word synthesis difficult, as well as having lesser problems in visually perceiving and retaining the graphic forms of the letters.

It is known further that some S.D.dyslexics have problems with musical notation. 'X' (see chapter eight), for example remarks on her difficulties in this sphere. Nevertheless, the problems are not always present, and again, not all children attempt to learn music. Geschwind (1964) offers a speculative reason for the frequent persistence of music-reading abilities in cases of lesions of the brain which affect reading - that is that music notation translated into music playing or singing, is purely visuo-auditory in nature, not involving speech in any way (see chapter two).
Geschwind also mentions numerical characters, as not usually involved because numbers are related to powerful somesthetic reinforcement from counting on fingers. Many specific developmental dyslexics are not handicapped in number work, and this may be the explanation. A fault that does appear in arithmetic, fairly commonly despite skill in manipulating small numbers, is the addition of noughts and misplacement of commas in high numbers.

There is also documentation about problems in Morse and other forms of signalling (see Critchley 1942). It is perhaps permissible to speculate on the other symbolic activities mentioned - thus it seems likely that some blind people might be unable to 'read' Braille, being held back by factors akin to those of specific developmental dyslexia, only affecting largely tactile - auditory, not visuo-auditory senses. Again, it would be interesting to investigate typewriting for a similar finding.

In this chapter, some of the problems of a specific developmental dyslexic have been described, under the headings of reading and spelling, writing and other factors of a more general nature.

The problems are not universal, and each individual tends to have a different spectrum of factors causing him degrees of difficulty. Sometimes such factors may be clarified in activities such as writing, where the nature of certain spelling mistakes has led to a tentative classification of auditory and visual types of specific developmental dyslexia.

Hence there was a consideration of other symbolic series, both of which are known to affect S.D. dyslexics, and on which little has been researched.

At this point it is necessary to reconsider the enquiries that opened this chapter; that is the degree to which specific developmental dyslexia can be 'fitted' into the model (Fig 6.1) - i.e. does the model imply a probable area of causation for S.D. dyslexia? The nature of the errors are seen to be wide, and liable to originate in virtually any stage of the reading process, and hence it is unlikely that it arises at any specific sensory
Further, the very definite nature of the mistakes would tend to preclude any general environmental factor. Thus the 'cause' might be expected to arise from among the factors grouped under 'Variables affecting whole reading process'; or the other item not mentioned as yet, 'Modality shift'. The latter will hereon be considered under the categorization of the former, since it is certainly classifiable as a variable affecting the whole reading process.

It would appear thus that S.D. dyslexia is caused by high anxiety, low level of maturity, poor neurological integrity, or low motivation. Since low motivation is most likely to be a symptom of poor reading rather than a cause (unless it is connected with social background variables, already dismissed) it will be omitted from the list.

Thus - as a conclusion to this chapter, the errors made by S.D. dyslexics are suggestive of the cause being one of anxiety, maturation level or neurological integrity, some of these factors possibly being interrelated. This deduction is in line with those in the earlier chapter, where a number of views of prominent workers in this field were examined.

Whether or not S.D. dyslexia may be attributed to a causation more specific than these will be considered in subsequent chapters when more detailed evidence has been evaluated.
There is, in the literature, a multitude of references concerned with the possible link between cerebral dominance and specific developmental dyslexia. In addition there is evidence that unusual lateral preferences seem to occur frequently among children with some types of speech disorder.

The neurological basis to a discussion on laterality was laid down in chapter four and the implications arising out of this are that:

1) Laterality is related to cerebral dominance, but in a manner as yet unestablished.

2) Laterality is manifested in hand and foot at least, but the relationship between these is unsure.

3) Laterality of hand usage is related in an obscure manner to speech (a factor with a probably link with reading)

4) The left hemisphere appears to have a more frequent connection with speech and symbolic thinking than the right, although strict localization cannot be determined, and the system is very flexible.

Of the large number of observations made on cerebral dominance and its relationship to reading problems, some categorically deny the existence of any connection, others suggest that among cases there is a high frequency of sinistrality, directional confusion and ambidexterity, as well as other similar states, which may be summarized as 'lack of firm
establishment of cerebral dominance'. Most workers have measured only handedness in order to determine their results, however this would appear to be somewhat inadequate. Equally inadequate are some of the methods used to measure laterality factors, as it has been shown by Naidoo (1961) that right handedness, or left handedness is by no means as positive as it is usually made out to be. She used ten tests, and found it necessary to divide the children into nine shades of leftness, "ambiguosness" and rightness in hand usage. Such work suggests that many researchers in this field have tested laterality insufficiently, in addition to conceiving of it in too definite terms. There is probably also lack of attention to factors of social convention in many reports. Nevertheless, some of the figures given in the literature for the numbers of sinistral, dextral and ambidextrous children among reading difficulty cases, are presented below. (Again, the less specific term 'reading difficulty' is used by necessity because there is so much confusion in the literature).

**Fig 13.1** Table of Findings of Handedness and Mixed Dominance in Reading Difficulty Cases

<table>
<thead>
<tr>
<th>WRITER</th>
<th>DATE</th>
<th>TERMINOLOGY</th>
<th>SAMPLE NO.</th>
<th>RIGHT HANDED %</th>
<th>LEFT HANDED %</th>
<th>AMBIDEXTROUS OR LACK OF DEFINITE HANDEDNESS</th>
<th>DOMINANCE IN READING DIFFICULTY CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orton</td>
<td></td>
<td>Strephosymbolia</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>68/32</td>
</tr>
<tr>
<td>Fabian</td>
<td>1951</td>
<td>Reading disability</td>
<td>20</td>
<td>-</td>
<td>5</td>
<td>-</td>
<td>55/45</td>
</tr>
<tr>
<td>Kabinovich</td>
<td>1952</td>
<td>Reading disability + behavior disorders</td>
<td>34</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>53/47</td>
</tr>
<tr>
<td>Ingram &amp; Reid</td>
<td>1955</td>
<td>Developmental aphasia</td>
<td>78</td>
<td>17</td>
<td>11.5</td>
<td>71.5</td>
<td>-</td>
</tr>
<tr>
<td>Writer</td>
<td>Date</td>
<td>Terminology</td>
<td>Sample No.</td>
<td>Right Handed</td>
<td>Left Handed</td>
<td>Ambidextrous or Lack of Definite Handedness</td>
<td>Dominance in Reading Difficulty Cases</td>
</tr>
<tr>
<td>-----------------</td>
<td>-------</td>
<td>--------------------------------------------------</td>
<td>------------</td>
<td>--------------</td>
<td>-------------</td>
<td>--------------------------------------------</td>
<td>--------------------------------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>%</td>
<td>%</td>
<td></td>
<td>Mixed</td>
</tr>
<tr>
<td>Johnson</td>
<td>1955</td>
<td>Children in a reading clinic</td>
<td>32-34</td>
<td>78.3</td>
<td>12.5</td>
<td>9.4</td>
<td>56.2</td>
</tr>
<tr>
<td>Harris</td>
<td>1957</td>
<td>Reading disability</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>25</td>
<td>40</td>
</tr>
<tr>
<td>Zangwill</td>
<td>1960</td>
<td>Specific Educational Failure</td>
<td>20</td>
<td>40</td>
<td>30</td>
<td>20</td>
<td>-</td>
</tr>
<tr>
<td>Silver &amp; Hagin</td>
<td>1960</td>
<td>Specific reading disability</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>74</td>
<td>18</td>
</tr>
<tr>
<td>Hibbert</td>
<td>1961</td>
<td>Dyslexia</td>
<td>27</td>
<td>-</td>
<td>-</td>
<td>85</td>
<td>-</td>
</tr>
<tr>
<td>Kucera, Matajek &amp; Langmier</td>
<td>1963</td>
<td>Dyslexia</td>
<td>91</td>
<td>24.1</td>
<td>9.3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Heller</td>
<td>1963</td>
<td>Word Blindness</td>
<td>28</td>
<td>86</td>
<td>11</td>
<td>3.5</td>
<td>-</td>
</tr>
<tr>
<td>Sargent</td>
<td>1964</td>
<td>Reading Difficulties</td>
<td>100</td>
<td>66</td>
<td>10</td>
<td>24</td>
<td>44</td>
</tr>
<tr>
<td>Shearer</td>
<td>1968</td>
<td>Reading Backwardness</td>
<td>-</td>
<td>72</td>
<td>4</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>Critchley</td>
<td>1970</td>
<td>Developmental Dyslexia</td>
<td>100</td>
<td>79</td>
<td>11</td>
<td>10</td>
<td>-</td>
</tr>
<tr>
<td>Francis Williams</td>
<td>1970</td>
<td>Specific Learning Difficulties</td>
<td>44</td>
<td>68</td>
<td>14</td>
<td>18</td>
<td>-</td>
</tr>
</tbody>
</table>
Handedness.

To give some basis for comparison of these results with those of normal readers, a table is set out below of findings of handedness in normal children, as reported by Maldoo (1961).

The table includes only the clear-cut findings.

<table>
<thead>
<tr>
<th>WRITER</th>
<th>DATE</th>
<th>SAMPLE SIZE</th>
<th>% RIGHT</th>
<th>% LEFT</th>
<th>% AMBIDEXTROUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ojemann</td>
<td>1930</td>
<td>518</td>
<td>93.4</td>
<td>5.2</td>
<td>1.4</td>
</tr>
<tr>
<td>Updegraff</td>
<td>1932</td>
<td>74</td>
<td>89.8</td>
<td>9.2</td>
<td>(1)</td>
</tr>
<tr>
<td>Burt</td>
<td>1937</td>
<td>600</td>
<td>-</td>
<td>5.2</td>
<td>-</td>
</tr>
<tr>
<td>Burt</td>
<td>several thousand</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>7</td>
</tr>
<tr>
<td>Castner</td>
<td>1939</td>
<td>-</td>
<td>95.5</td>
<td>4.5</td>
<td>-</td>
</tr>
<tr>
<td>Scholastic Surveys</td>
<td>1953</td>
<td>72,238</td>
<td>-</td>
<td>6.68</td>
<td>6.1 girls</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6.68</td>
<td></td>
</tr>
<tr>
<td>Halmquist</td>
<td>1958</td>
<td>399</td>
<td>-</td>
<td>9.5</td>
<td></td>
</tr>
<tr>
<td>Harris</td>
<td>1947</td>
<td>61</td>
<td>strong</td>
<td>strong</td>
<td>18.0</td>
</tr>
<tr>
<td>Harris</td>
<td>1955</td>
<td>52.5</td>
<td>moderate</td>
<td>8.2</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1956</td>
<td>14.7</td>
<td>moderate</td>
<td>6.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>67.2</td>
<td></td>
<td>14.8</td>
<td></td>
</tr>
<tr>
<td>Harris</td>
<td>1958</td>
<td>53.2</td>
<td>strong</td>
<td>2.2</td>
<td>8.2</td>
</tr>
<tr>
<td></td>
<td>1959</td>
<td>29.3</td>
<td>moderate</td>
<td>7.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>82.5</td>
<td></td>
<td>9.3</td>
<td></td>
</tr>
</tbody>
</table>
The results from studies of unselected children, and those of children with reading difficulties, are plotted on histograms for direct comparison; however, several points should be noted:

1) The reports of unselected children may include some reading difficulty cases.

2) Studies are not comparable in numbers.

3) Measures of handedness vary, some reports being of writing alone, others being of a large number of tests.

4) The reading difficulty cases vary in the nature of the difficulty. Most studies are likely to have included a substantial proportion of S.D.dyslexics; however, different terminologies complicate the picture.

5) Age group of the samples vary. This will be mentioned later.

**Fig 11.3** Histogram: Reports of Handedness in Children with Reading Difficulties, and in Unselected Children.

1) **Right Handedness (%)**

![Histogram showing the percentage of right-handedness in different age groups for children with reading difficulties and unselected children.](image-url)

- Studies of children with Reading Difficulties
- Studies of unselected Children

% Right handed (reported in ranges of 10%)
The distribution of the reports of handedness in unselected children and reading difficulty cases seems to suggest that a somewhat higher percentage of the former are right handed, and these reports are almost exclusively in the range 80% - 100%. However, reports of right handedness in reading difficulty cases are spread over nearly the whole range 11% - 80%. The inference therefore is that right handedness is somewhat less prevalent in the population of children with reading difficulties.

**Fig 13.b.** Histogram: Reports of handedness in Children with Reading Difficulties, and in Unselected Children.

11) Left Handedness (%)

<table>
<thead>
<tr>
<th>Study Type</th>
<th>Range</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Studies of Children with Reading Difficulties</td>
<td>1-10%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>11-20%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>21-30%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>31-40%</td>
<td>5%</td>
</tr>
<tr>
<td></td>
<td>41-50%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>51-60%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>61-70%</td>
<td>2%</td>
</tr>
<tr>
<td></td>
<td>71-80%</td>
<td>1%</td>
</tr>
<tr>
<td></td>
<td>81-90%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>91-100%</td>
<td>1%</td>
</tr>
</tbody>
</table>

While all but one of the studies of left handedness in unselected children give results in the range of 1% - 10%, the distribution of reports for reading difficulty cases is evenly spaced up to 20%. This suggests that there is possibly a higher incidence of left handedness in children with reading problems.
Fig 11.5 Histogram: Reports of Handedness in Children with Reading Difficulties, and in Unselected Children.

iii) Ambidexterity, (%)  

<table>
<thead>
<tr>
<th>0-10</th>
<th>11-20</th>
<th>21-30</th>
<th>31-40</th>
<th>41-50</th>
<th>51-60</th>
<th>61-70</th>
<th>71-80</th>
<th>81-90</th>
<th>91-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>%</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any inferences from this histogram must be considered to have very little weight on account of the difference in the numbers of reports (nine of reading difficulty cases and five of unselected children). The differences are probably sufficient to explain the two distributions, although further research might corroborate the slight inference and indicate that there are more ambidextrous reading difficulty cases than ambidextrous normal readers, (or unselected readers).

When these results are taken as a whole, there appears to be a consistently wider spread of results on handedness taken from samples of reading difficulty cases, than those from unselected children. Thus, tentatively, the conclusion is either that all children with reading difficulties are more likely to be left handed or ambidextrous than other children - or that among the population of children with reading difficulties, there is a group which
exhibits higher proportions of left-handedness and/or ambidexterity, than is normal in the population of other poor readers, and normal readers. To gain further information on this subject, it would be necessary to define the types of reading problems, compare aspects of handedness within the groups and against a large sample of normal readers.

The survey of findings, described above, certainly suggests that categorical assertions of the connection between S.D., dyslexia and handedness may be misleading, and indeed, a large number of workers are inclined to the view that there is no connection between the two. Perhaps the most convincing publication of these is the Isle of Wight Survey (Rutter, Tizard and Whitmore, 1970), which was both a large study and a study that incorporated a number of tests of handedness, not just one. The results of another survey were published at about the same time (Clark, 1970) and the findings were also negative with respect to reading difficulty and handedness:

"Here again, as in many other community studies, there was no evidence that left handedness, left eyedness, mixed dominance or crossed laterality were significant predictors of failure in reading".

(Clark - 1970.)

Another large survey was that made of Kent children (Morris, 1966), and again no significant differences were found between poor and better readers. Douglas, Ross and Cooper (1967), found similar results - and explained the reports of significant correlations -
"In children within the normal range of ability, selective referral is the most likely origin of previously reported associations between unusual lateral preferences and reading difficulties."

They do not mention, however, that those with low attainment test scores tended to be those with inconsistent hand preference.

Of other studies reporting that there is no significant relationship between reading difficulties and handedness, examples are - Wolfe (1941); Malmquist (1958), and Witty and Kopel (1936). Hallgren (1950) found that -

"the calculations fail to prove statistically that there is a direct association between left handedness and specific dyslexia."

However, he pointed out that there was a consistently higher number of left handed among the cases. Such a remark is made by several of those who found that statistical tests suggested no significance.

**Dominance - Mixed or Unilateral.**

Crossed or mixed laterality refers to preference of the right eye and left hand or vice versa, as opposed to all left or all right. Foot preference may be involved in some figures.

There are few figures on mixed dominance among unselected groups, Clark (1967) has suggested that about a quarter of the population has 'mixed dominance'. Gorton found 26% of his control group with such
dominance, and Harris presents a figure of 10%. These figures give some comparison with those on samples of cases of reading difficulties.

There does appear to be a difference between children with reading problems and others.

**Fig 11.6 Histogram**: Reports of % Reading Difficulty Cases with Mixed (as Opposed to Unilateral) Dominance.

![Histogram showing % Mixed dominance (reported in ranges of 10%)](image)

Mixed dominance has long been associated with 5.D.deyelexia, and yet, where it involves eye/hand preferences, in a logical sense, it is hard to see how this can be a real relationship, as eye-hand is not determined by the same factors as those affecting hand preference. Fig 4.5 (page 63) shows how there is reception of the visual image by both sides of the brain, from both eyes - thus neither side of the brain is dominant as regards primary visual function. The findings, therefore, if they are real, must be demonstrating a relationship at a superficial level - of 'inconvenience' perhaps, although a right handed/eyed individual will find no problem in writing while his right eye is shut. The findings may be artifacts of the more general conclusions that 5.D.deyelexia tend to be less established in
lateral preference than other individuals - or again the findings may be the result of 'searching too hard for results', without the use of adequate controls.

The same considerations of validity must be placed here as were mentioned in connection with the reports of handedness.

Any conclusions to be drawn from this amassing of data on cerebral dominance and reading difficulties must be very tentative. However, it seems that some association may exist. Since the differences between cases and unselected groups of children are small, it is unlikely that the association is manifested in all types of reading problems; nevertheless, if a small group of cases do show aberrant patterns of laterality, some of the variations in the research reports can be explained.

A very small group would be unlikely to show up in a statistical analysis of large community studies where the criteria of reading difficulties are wide. The influence of the small group, however, might tend to raise the figures for unusual dominance slightly for all reading difficulty cases - and this slightly raised figure is commented on by a number of workers. Some of the very statistically significant results for aberrant laterality in reading difficulty cases would be explained by the high degree of selection in the sample. It might be assumed that the affected group was more predominant in some samples - particularly the small, clinically observed groups.

It would appear that the small group, discussed above, includes the specific developmental dyslexies - and yet, studies confined to these children alone do not find 100% correlates with any aspects of laterality. Therefore, two hypotheses must be tendered:-

1) That within the group of S.D.dyslexics, a subgroup exists where all individuals have abnormal laterality.

2) That in the group of S.D.dyslexics, all individuals are more variable with regard to laterality characteristics than is an unselected population.
At this stage it is necessary to consider what variables might affect the manifestation of lateral preference in an individual. Damage to the limb or eye early in the life probably stimulates changes in dominant laterality, although little is known about this. Later in the life of the individual, social convention certainly plays a part, although less so in current times. It is found that many left handed people use a knife in their right hand, and of course, writing is the classic example. Again, Douglas, Ross and Couper (1967) found that there were small differences in social class groups; thus, while 8.2% middle class boys were inconsistent in handedness, such applied to 11.2% manual working class boys.

The variables mentioned so far, are probably of some small influence on the results described earlier in this chapter. However, they are neither universal enough, nor sufficiently far reaching in their effect, to be of real significance in the discussion of laterality and reading problems. Sex, age and the possibility of brain damage, however, may be of greater importance.

Age was mentioned as a variable in the comparison of experimental results on handedness, and mixed or pure dominance. This is based on the observation that with increasing age there is a trend from mixed to unilateral (usually right) handedness (Harris 1957). Belmont and Birch (1965) suggest that handedness is not stabilised until the age of nine. Some others (Orton, Gesell and Ames) have suggested that at a particular age, between two and three years, and six and eight years (approximately), ambidexterity tends to predominate. It was concurrently observed that these stages were critical for language development. (See chapter five - the work of Callaway).

Age in itself is obviously directly connected with reading. However, the factor of maturity may be more significant. There have been a number of observations that children with reading problems, and especially S.D. dyslexics, are generally immature (de Hirsch, 1966, and others).
Not all such cases are generally immature, but it is possible that in a proportion of them there is a specific maturational lag in a part of the brain, which is causal to both the unskilled lateral preferences and the reading problems. A maturational lag may have a similar affect to a small lesion, and therefore the subject is elaborated under the discussion on the relation of brain damage to cerebral dominance.

The connection between handedness and sex is somewhat tenuous. It would appear that there is a slight tendency for boys to be left handed more frequently than girls. A few figures are presented below.

**Fig 13.7 Table Showing the Difference in Handedness between Unselected Boys and Girls.**

<table>
<thead>
<tr>
<th>WRITER</th>
<th>DATE</th>
<th>LEFT HANDEDNESS.</th>
<th>COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Douglas, Ross and Cooper (sample age 11 years)</td>
<td>1967</td>
<td>6.7</td>
<td>5.3</td>
</tr>
<tr>
<td></td>
<td>1967</td>
<td>7.6</td>
<td>4.3</td>
</tr>
<tr>
<td>Scholastic Survey</td>
<td>1953</td>
<td>6.68</td>
<td>4.41</td>
</tr>
<tr>
<td>Malmquist</td>
<td>1958</td>
<td>9.5</td>
<td>5.1</td>
</tr>
</tbody>
</table>

There are two possible means of explaining the anomaly. Firstly, that girls are more likely to be right handed — or that boys are more likely to be left handed. If the first is true, it may be, as Naidoo suggests, that girls are more likely to conform to social conventions. Thus, a sinistrals girl may tend to adopt the right hand for writing, etc., more frequently than a boy. If the latter case has some validity, however, there are several further possibilities to be mentioned. Boys are known to lag behind girls in maturing. Maybe the small difference in figures
for handedness in boys and girls is a reflection of the few who have, as yet, unsettled handedness, and during testing, used the left hand. Perhaps the different figures are due in some measure to a real genetic difference between male and female - a genetic factor that may have links with the genetic factor that gives rise to S.D. dyslexia. (There is a predominance of boys here also, as has been noted.)

A number of workers have suggested that minimal damage to the developing dominant hemisphere in the fetus or neonate can cause a transfer of dominance to the other hemisphere. In such a situation it seems a valid deduction that the reflection of cerebral dominance in hand use would be delayed, being less positive than is usual for a given age. Depending on the extent of damage, the dominance might then settle back to the original hemisphere, or become established in the other.

The above hypothesis is only valid in application to specific developmental dyslexia, if this is due in cause to brain damage at some stage after conception, an assumption which excludes the genetic factors. The hypothesis can, nevertheless, be extended.

It is thought that the state of dominance of one hemisphere is relatively late in manifestation. Before dominance has begun to be determined, any malformation of the hemispheres due to genetic factors, will have developed, and therefore might disrupt the process in the same way as might damage that had occurred since conception, as described above. A maturational lag in the growth of a specific part of the brain (see earlier) could act on the establishment of dominance in a similar manner.

The hypothesis that a form of brain damage or inhibited maturation disrupts the normal establishment of cerebral dominance in specific developmental dyslexics is in accordance with the overall view of the figures on lateral preference quoted earlier in the chapter. All right handed and most left handed individuals have a dominant left hemisphere. It appears
that there are fewer right handed and more left handed S.D.dyslexics.

This would be the situation if a set proportion of potential right and potential left dominant hemisphere individuals changed dominance for the reasons described above. Ambidexterity would be the obvious reflection of the state of transition of dominance. Similarly, mixed dominance might be explained by the differing effects of the transition on hand/arm and foot/leg use.

A further feature, often linked with cerebral dominance and again, very frequently mentioned in connection with specific developmental dyslexia, is directional confusion. This is manifested in a number of ways - the inability to distinguish right and left from self and on another, (object or person), the inability to read a map, the inability to follow spatial direction of any nature. Such a failure probably has some connection, or indeed may be the same as, spatial difficulties.

Presented below are the results of some researches on directional confusion and reading difficulties.
<table>
<thead>
<tr>
<th>WORKER</th>
<th>DATE</th>
<th>TERMINOLOGY</th>
<th>AGE OF SAMPLE</th>
<th>% READING DIFFICULTY CASES DISORIENTATION</th>
<th>% CONTROLS OR UNSSELECTED GROUPS DISORIENTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harris</td>
<td>1957</td>
<td>Reading Disability</td>
<td>7</td>
<td>38</td>
<td>5</td>
</tr>
<tr>
<td>Harris</td>
<td></td>
<td></td>
<td>9</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Hermann and Norrie</td>
<td>1958</td>
<td>Congenital Blindness</td>
<td>9 - 15</td>
<td>44 (Ages 9-14 yrs. Taken as; &quot;More than two mistakes&quot;)</td>
<td>12 (Taken as: &quot;More than two mistakes&quot;)</td>
</tr>
<tr>
<td>Hermann and Norrie</td>
<td></td>
<td></td>
<td>Adults (Age 15-plus)</td>
<td>48</td>
<td></td>
</tr>
<tr>
<td>Gorton</td>
<td>1964</td>
<td>Reading Difficulties</td>
<td>9 - 10</td>
<td>10</td>
<td>1</td>
</tr>
<tr>
<td>Shearer</td>
<td>1968</td>
<td>Reading Retardation. (This did not include child with low IQ.)</td>
<td>7 (No results)</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td>28</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td>23</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

These figures suggest two facts – firstly that directional confusion diminishes with age, and that more reading difficulty cases than corresponding controls were confused. Most of the remarks about age and cerebral dominance may be applied also to directional confusion. Indeed Harris (1957) specifically mentions that directional confusion suggests some neurological immaturity, and Bender (1958), Benton (1959) and Rabinovitch (1954) remark on the fact that right-left disorientation seems to occur frequently among those with
minor neurological defects. Zangwill also mentions immaturity:

"...... a certain proportion of children with ill-defined laterality have, in addition, a certain constitutional weakness in maturation."

A further factor which is very frequently mentioned with directional confusion is the inability of some children to localise a particular finger that is being stimulated (finger agnosia) and, on tests of this, the following results have been obtained.

Table to Show Findings on Finger Localisation in Children with Reading Difficulties and Controls

<table>
<thead>
<tr>
<th>WORKER</th>
<th>DATE</th>
<th>TERMINOLOGY</th>
<th>AGE</th>
<th>FINGER LOCALIZATION CRITERION OF DISCRIMINATION</th>
<th>EXPERIMENTAL GROUP %</th>
<th>CONTROLS GROUP %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shearer</td>
<td>1968</td>
<td>Reading Retardation (No very low IQs)</td>
<td>7</td>
<td>Scores below 35% on test</td>
<td>No score</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8</td>
<td></td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>9</td>
<td></td>
<td>13</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>10</td>
<td></td>
<td>14</td>
<td>1.5</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>11</td>
<td></td>
<td>13.5</td>
<td>-</td>
</tr>
<tr>
<td>Hermann and Norrie</td>
<td>1958</td>
<td>Congenital Word Blindness</td>
<td>'Children'</td>
<td>'Certain' or 'Uncertain'</td>
<td>36 (Elementary Schools 16%; Secondary Schools 3%)</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>'Adults'</td>
<td></td>
<td>22</td>
<td></td>
</tr>
</tbody>
</table>

The observation on finger localization made by Hermann and Norrie are important in their argument that "congenital word blindness" is allied to...
Gerstmann's syndrome:

"...and that both defects derive from the same fundamental disturbance. As congenital word blindness is definitely hereditary, it is suggested that word blindness is a congenital type of Gerstmann's syndrome."

The 'disturbance' referred to is probably a lesion situated in the angular gyrus of the left hemisphere. (See Brain 1961). There are four principle symptoms - left/right confusion, poor finger localization, agraphia and acalculia. Any of these symptoms may appear with the reading problem in specific developmental dyslexia, and cases of Gerstmann's syndrome may exhibit some difficulties in reading. Hermann and Norrie say that the basis of all the symptoms manifested by S.D.dyslexics, is a lack of right/left orientation. They suggest that reading is less affected in cases of Gerstmann's syndrome because:

"the reading process is far more practised than the writing process, and therefore is less easily affected by lesions in the dominant hemisphere."

Such reasoning seems perhaps a little tentative to explain the fundamental differences between Gerstmann's syndrome and specific developmental dyslexia. Kinsbourne and Warrington (1963) would appear to consider also that the analogy requires some qualification at present. They say:

"The functional deficits which these children (a group with poor finger localization) have are remarkably like those of adults patients with acquired Gerstmann syndrome."
"However, these cannot be taken to imply that the syndrome has the same anatomical implications in childhood as in the adult setting."

A number of workers put forward the idea that some aspect of cerebral dominance is the actual cause of reading problems in cases of S.D. dyslexia. These ideas differ from the concept of a third variable causing both symptoms - laterality anomalies and reading difficulties - as is the hypothesis that implicates immaturity factors or a cerebral lesion, as in Gerstmann's syndrome.

Samuel Orton, an American psychiatrist was first to put forward the idea of an aspect of cerebral dominance being the direct cause of reading problems in some children. He observed specific developmental dyslexias in a clinic when he was Professor of Psychiatry at the Medical School of the University of Iowa. The nature of his position - as a practitioner and researcher, led to his extreme interest in the cases. In 1925, he presented a paper on his studies to the American Neurological Association, and subsequently obtained a large grant from the Rockefeller Foundation to continue his work. Having consulted a wide range of experts, he began to assemble a staff, most of whom have since become prominent in their respective fields.

The work that Orton did overall has led to much recognition of specific developmental dyslexia as an inborn disorder, not due to environment, poor education, low motivation or emotional problems. Orton's own work has resulted in the establishment of clinics and teacher training facilities, and such work is now being carried on by The Orton Society.

From his observations in this Language Research Project, Orton constructed a hypothesis to account for the symptoms that he noticed to appear in S.D. dyslexia (or 'strephosymbolia' - 'twisted symbols' - as he
called it). He observed that S.D. dyslexics could 'see' normally, that is, there was no visual defect. He called 'seeing' the first level of brain function in the visual field. The second level was also perfect in cases - they could make "adequate and proper use of visual memories of objects, calling the names of objects and pictures promptly and quickly" (1928). This level of function - perfect visual memory - is certainly not held currently as definitely as Orton put it. Many S.D. dyslexics seem to have particularly poor visual memory. Orton suggested that the dysfunction in S.D. dyslexia existed at the third level of brain function in the visual field, this being "where association between the printed word or written word and its meaning or concept takes place". He stated that, up to the third level, he conceived of the two hemispheres of the brain working in "unison to produce a single conscious impression, i.e. the messages relayed from the eyes to the two sides of the brain are fused so as to give only one impression".

He observed further, that unilateral brain damage affected neither the first or second level in a complete manner, while affecting the third level in an either total or virtually negligible manner. Thus, in a situation of total effect, the subject would have no ability to associate written words with their meaning (alexia). He said that the hemisphere in which specific brain damage would produce total loss of reading, is the dominant hemisphere.

"...and may be either the left or the right, according to the side which habitually initiates the motor responses of the individual. In other words, it is obvious that the visual records of one side only are used in symbolic association and those of the other are slided or inactive in the process".
He pointed out that there is no difference in the appearance of the associative area of the two hemispheres, even though one is active and one is inactive.

"...This silent area must have been irradiated equally with the active to produce an equal growth. Such an irradiation, moreover, would presumably leave behind it some record in the cells of the dominant side which one may call an engram. The engram in the non-dominant side would be opposite in sign, however, from that of the dominant - i.e. it would form a mirrored or anti-tropic pattern. Under usual circumstances only one of these reciprocally paired engrams operates in association with the concept of reading, as is shown by the facts of acquired word blindness (alexia) already cited and its antitropic or mirrored mate is elided or remains inoperative."

He says that specific developmental dyslexia is a state wherein there is incomplete elision of the engram in the non-dominant hemisphere and hence the individual tends to confuse direction and sees such letters as p and q as interchangeable.

He suggests that the severity of S.D. dyslexia is graded and is certainly not related to "general mental retardation", and further that the situation is brought about by "a variant in the establishment of the physiologic lead in the hemispheres". Such views directed Orton to propose that training of these children should begin very early and should basically endeavour to overcome the nature of the double engram, such that the child only 'uses' one, that being the same orientation of that seen by the child.

There are a number of obvious criticisms to be made of Orton's hypothesis.
Firstly, he appears to be very certain about the relationship between handedness and cerebral dominance. It was noted in chapter four that even in the 1960's, a neurologist is uncertain about this relationship, and will not commit himself firmly.

A second point of criticism involves the nature of the reversals that an S.D.'s makes. Why does he not reverse all letters, drawings, etc; for example, the word S.A.W may be written as W.A.S, and yet in the name PETER it may only be the 'P' that is reversed or rotated - thus ETHER. Why is the whole word not reversed? There are two ways in which the word may be reversed - thus RETEP, or TREER.

Again, Orton's hypothesis is put forward to explain all cases of S.D.'s - (since no contrary statement is made). It has been demonstrated in the results quoted earlier in this chapter, that the incidence of abnormal laterality features in reading difficulty cases and S.D.'s is not 100%. It may still be possible that even manifestly strong right handed and footed children have some remnants of the mirror engraving of their non-dominant hemisphere. It might be argued that right sided children with a sinistral parent might come into this group. The table below gives some idea of the inheritance pattern of sinistrality.
**Fig 13.10** Table Demonstrating the Heredity of Laterality Characteristics in Reading Difficulty Cases and Unselected Children, as reported in Various Studies.

<table>
<thead>
<tr>
<th>WORKER</th>
<th>DATE</th>
<th>UNSELECTED CHILDREN</th>
<th>READING DIFFICULTY CASES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mills</td>
<td>1925</td>
<td>26% sinistrals had some family history of left handedness.</td>
<td>-</td>
</tr>
<tr>
<td>Chamberlain</td>
<td>1929</td>
<td>17.34% sinistrals had one or more left handed parents.</td>
<td>-</td>
</tr>
<tr>
<td>Ross</td>
<td>1935</td>
<td>When one parent is left handed, 36.8% of children are left handed. When neither parent is left handed, 5.2% of the children are left handed.</td>
<td>-</td>
</tr>
<tr>
<td>Burt</td>
<td>1939</td>
<td>14% sinistrals had a left handed parent. 31% sinistrals had a left handed relative.</td>
<td>-</td>
</tr>
<tr>
<td>Rife</td>
<td>1940</td>
<td>Where both parents are left handed, 50% of the children are left handed Where one parent is left handed, 17% of the children are left handed. When neither parent is left handed, 6% of the children are left handed.</td>
<td>-</td>
</tr>
<tr>
<td>Zangwill</td>
<td>1960</td>
<td>-</td>
<td>35% (=3 out of 8) fully right handed cases had known family sinistrality. 75% (=3 out of 4) right handed with some left handed tendency had known familial sinistrality. 50% (=4 out of 8) left handed cases had some known familial sinistrality (includes 'shifted sinistrals') In Zangwill's cases of specific educational disability, 50% (10/20) had known familial sinistrality.</td>
</tr>
</tbody>
</table>
This table should be read with the following points in mind:

1) Unequivalent means of measuring handedness.
2) Variations in meaning of reading difficulty.
3) (An important point on this table) Different methods of determining family histories.

Because of these disparities, the table is difficult to read; however, it would seem that family histories of sinistrality are fairly high in cases of reading difficulty. Nevertheless, the figures do not approach 100%, a figure required if family sinistrality is the explanation for the fully right handed S.D. dyslexics, as according to Orton, it is.

A further point arises here, in criticism of Orton's hypothesis - what of the left handed and ambidextrous individuals who do not have reading problems? These two groups may number together up to about 20% of the population. The ambidextrous group do appear (Naidoo 1961) to be slightly slower in speaking, reading, and on some W.I.S.C. subtests, however, this does not make them all, or necessarily any, to be specific developmental dyslexics.
Much of Orton's hypothesis is very speculative, and in the state of present knowledge about the relationships of cerebral dominance, handedness, footedness, speech and reading problems etc., may not be tested directly. However, McFie (1952) made one deduction that did allow testing. If the brain factor that causes reversals in the reading and writing of S.D. dyslexia is the unsuppressed engram in the non-dominant hemisphere, then the degree to which the child reverses is a reflection of the degree to which the mirror engram is unsuppressed — and hence, this is a reflection of the degree of retardation. The findings of McFie were not consistent with those of Orton, as the number of reversals was not directly related to the degree of retardation in reading in the individual. McFie's findings suggested that cerebral dominance had not been properly established —

".....the neurophysiological organisation, corresponding to dominance has not been normally established in either hemisphere".

Newton (1970) makes cerebral dominance the centre of her thesis. Her research method is by use of electroencephalography — a tool that she suggests is the most effective for achieving results on the cerebral dominance of the individual. This assumption would appear too conclusive, since, for such precise work as Newton employs, the technique, encephalography, is in its infancy. Certainly the sample size (25) too creates doubt regarding the design of the experiment and hence the findings.

Newton conceives of 'dyslexia' as a variation from normal and not so much as a specific condition like an illness. This conception is enhanced by her assumption that the pattern of inheritance is polygenic. She suggests as a result of her considerations that we should not automatically expect every child to be able to read, and just as some have 'no ear for music', others will not be able to read, without concentrated instruction.
In her ideas about the cause of reading failure in specific developmental dyslexia, Newton follows closely those of Orton. She hypothesizes that the individual does not have one hemisphere dominant over the other as normal, but has hemispheres of equal dominance - ambilateral. Usually in the perception of symbols, the image formed in the non-dominant hemisphere is elided. However in ambilaterals, Newton says, a mirror image tends to persist, and cause reversed vision. Because of the similarity of this hypothesis to that of Orton, similar criticisms may be used against it.

The principal argument - that not all dyslexies are apparently ill-lateralized, is answered by Newton. She says that it is possible that the usual measurements of cerebral laterality are not necessarily determining accurate cerebral dominance. Certainly the work of Naidoo bears this out to a degree, but still some children with all the symptoms of specific developmental dyslexia show strong right sidedness on any test administered. Again, the experiment of McFie (1952), designed to test a deduction from Orton's hypothesis, is applicable to Newton's work, and as such, presents a further point to be explained.

On the basis of a pilot study of 25 children with the symptoms of specific developmental dyslexia, and 25 controls, Newton suggests that the reason for the ambilateral state is either one of brain damage at birth, or one of a genetic predisposition. She found that five cases had histories of irregularities in the pregnancy of their mothers, and seven had difficult births. She includes these with ten cases described 'Familial genetic' in a category of 'reproductive causality', an unusual term in which to describe the genetic cases. The picture is considerably complicated by the fact that a fifth of the cases with pregnancy or birth difficulty histories also showed genetic predispositions.

Newton has incorporated her ideas about specific developmental dyslexia in a more general hypothesis concerning abilities and dis-abilities
as a whole, suggesting that the skills of an individual are determined in a broad sense by cerebral lateral arrangement. Thus the strongly lateralized are more verbal than the less strongly lateralized, the latter being correspondingly more skilled in activities of a visuo-spatial nature.

Newton says:

"Clinically the picture is often one of predisposition to artistic design and graphic ability in the ambilateral retarded reader. Case histories reveal an association between a retarded developmental pattern of linguistic skills and subsequent success in civil engineering, architecture, dental surgery, draughtsmanship, tailoring, design and medicine. These histories also reveal genetic influences in the patterning of the various skills".

To corroborate this statement she points out that:

"...Claims have been made that there is a significant disparity between the scores of the Verbal and Performance sub-groups of the Wechsler Intelligence Scale in the case of dyslexic subjects. Rabinovitch (1954) cited a large discrepancy (averaging 22.1 points in favour of the performance tests) between verbal and performance intelligence quotients".

Such an observation is certainly not borne out by Newton's own findings. In a normal population it is to be expected that results in W.I.S.G., for both sub-groups, will fall in a normal distribution about 100 (with a variation of one or two points for cultural differences).
Both results for the controls are approximately normal distribution. The results for the verbal tests of the dyslexics are, as expected, not normal in distribution (in fact they represent a nearly straight line on a graph). Newton's conclusion concerning the visuo-spatial abilities of specific developmental dyslexics suggests that their results on the performance tests should be higher than the corresponding results of the controls. This is not the case, and while the distribution of the performance scores is approximately normal in shape, the maximum is placed well below 100. There are three explanations for this finding - either that the cases as a whole were less intelligent than the controls; or that Newton's suggestion about high visuo-spatial ability in the population of specific developmental dyslexics is incorrect at least in application to this group. A further possibility is that the W.I.S.C. performance tests are not examining the same ability as that to which Newton refers. This would seem unlikely however, since Newton herself uses evidence from W.I.S.C. tests to support her statement.

If Newton's observation of the choice of professions of the specific developmental dyslexic is valid, this requires some explanation. The first is that the list of professions mentioned would seem to include most of the
possibilities open to a relatively intelligent middle class child, who finds reading very difficult. Many working class S.D. dyslexics are never discovered, and, in any case, there is a fairly wide range of jobs available to them, which would not require much ability in reading. The second explanation is that a child, very poor in one aspect of the school curriculum, even so wide as reading, is likely to compensate in another area. Thus an S.D. dyslexic may appear accomplished at such visuo-spatial activities mentioned merely in comparison with his academic skills. Critchley (1970) observed:

"Out of my series of about 740 cases of putative dyslexia not more than half a dozen children displayed an above average artistic attainment".

Thus, it would appear possible that the skills that Newton suggests are inherent in S.D. dyslexia as a result of their ambilaterality characteristics, are in fact a more general result of the lack of skills in reading and academic work.

Quadfasel and Goodglass express views similar to those of Newton:

"One can understand primary or specific reading disability only if one sees it as part of a very common variation of function of the brain which makes man less apt in doing certain things and gives another man a great ability or talent to do so".

They do not stress the aspects of cortico-lateral arrangement to the same extent as Newton, but note that poor reading is often accompanied by left-right disorientation and skill in drawing. Those views can be criticised in a similar manner to those of Newton.
Zangwill (1962) is not prepared to make such firm proposals about cerebral dominance and its relationship to specific developmental dyslexia as is Newton and as was Orton. He observes that the children who are ill-lateralized tend to be those with the associated retarded speech, motor problems and defects of spatial awareness, whereas those who are fully right handed and have no immediate family history of sinistrality tend to represent the 'pure' cases of reading problems alone. He suggests that the latter group may be those in whom a genetic predisposition for reading difficulties exists. He calls for further research on this point.

Zangwill puts forward three hypotheses that might account for the apparent relationship between specific developmental dyslexia and atypical lateral preferences. The first is that ".....both poorly developed laterality and reading backwardness, where present together, are due to the effects of an actual cerebral lesion". The second explanation is that a proportion of children with lack of lateral preference, are also defective in some aspects of maturation. Such might be the result of the action of a gene which affects cerebral dominance. A third possibility suggested by Zangwill is that:

".....individuals lacking strong and consistent lateral preferences (and perhaps also those with sinistral antecedents) are particularly vulnerable to the effects of stress (Zangwill 1960). For instance, minimal injury at birth may affect more severely those who show no strong tendency to lateral specialization".

The width of Zangwill's approach to this difficult relationship would, at the present time, seem to be more appropriate than the narrow views held by Newton, and those of Orton. If there was more certainty about the
precise meaning of cerebral dominance, this might not be the case. However, a range of hypotheses is suggestive of areas which require clarification by further research and will thus ultimately lead to the greatest advance in knowledge. The form of research that would be most fruitful in elucidating the situation is that in which children with the symptoms of reading characteristics of specific developmental dyslexia are grouped according to presence of absence of laterality abnormalities, speech problems, motor problems, etc. It does, however, appear strange that, if clear-cut groups exist, they have not been previously observed in a positive manner. The situation might therefore be better explained by a combination of two or three of the hypotheses. The explanatory power of a grouping of Zangwill's hypotheses is high since there is acknowledgement that not all cases of specific developmental dyslexia have any laterality abnormalities inherent in themselves or in their family. There is also explanation for the individuals who are ill-lateralized but not backward in reading.

In this chapter, an attempt has been made to cover the wide field of cerebral dominance and its connection with reading difficulties and/or specific developmental dyslexia. Tables of the findings of relevant research are constructed and include data on handedness and mixed or unilateral dominance. In all cases lists of data from research on groups of unselected children, are given in order to provide some comparison. Such a comparison suggests no very significant differences between the two groups; however it would seem that fewer children with reading problems tend to be right handed, more seem to be left handed, and possibly a few more are ambidextrous and similarly a few more are of mixed dominance. Such overall findings are very tentative, and must suffer from inaccuracy in a number of aspects.

There are also several studies that have concluded that no difference in laterality characteristics exists between children with reading problems,
and those unselected. However, some of these studies, while reporting no statistically significant result, do report that reading difficulty cases more frequently have unusual laterality features. This is a finding consistent with the idea that among the population of reading difficulty cases, there is a small group who are all aberrant, or among whom there is a higher proportion of such patterns. The latter possibility probably applies to S.D. dyslexics.

A number of variables have been found to affect the lateral preferences of the individual, and these are reviewed in order to determine whether any might apply to the instance of specific developmental dyslexia. Early damage to limb or eye, social convention and social class would appear irrelevant to any large degree; however age, sex and the possible existence of brain damage may be connected. If age is interpreted as maturity, a number of observations on the immaturity of many S.D. dyslexics become pertinent. The age of a child would seem to determine his ability to 'tell' left from right and to generally carry out instructions of a directional nature. Directional confusion has also been linked with specific developmental dyslexia. Another faculty involving orientation etc., is that of finger localization. Hermann and Norrie have connected directional confusion, finger localization and general left-right confusion in their hypothesis which propounds a relationship between Gerstmann's syndrome in adults, and specific developmental dyslexia in children. Samuel Orton also proposed a hypothesis of the cause of S.D. dyslexia. This suggests that fundamental is the lack of complete control of language function by one dominant cerebral hemisphere, and that many of the problems encountered by S.D. dyslexics are due to the interference of the non-dominant hemisphere.

Like Orton, Newton has put forward strong arguments for the causal role of the lack of cerebral dominance for specific developmental dyslexia.
She advocates the use of the electro-encephalograph for the recording of these aspects, and bases her conclusions on her findings. It is considered that the use of the EEG is not sufficiently validated, and hence the firmness of Newton's conclusions is not justified. It is similarly found that some theoretical assertions made by Newton are not substantiated by her own research findings. Such elements reduce the credibility of the whole hypothesis.

Kangwill's approach is more general, and in the state of current knowledge about cerebral dominance, the proffered range of hypotheses is considered to be more valuable.

Many of the hypotheses that have been mentioned in this chapter come under some criticism, largely on the basic observation that not all S.D. dyslexia cases have unusual lateral preferences, and many non-specific developmental dyslexics also do have unusual laterality characteristics. The most hopeful area of investigation would appear to be that of minimal brain damage or specific immaturity which disrupts the establishment of dominance, causing it to transfer to the other hemisphere, or to be delayed in stabilisation.
Speech is frequently mentioned in studies of reading difficulties in children. However, the nature of any connection between the two has been rarely researched, perhaps because of the technicalities of testing all aspects of speech.

The subject was raised earlier in chapters three and four. In chapter three was discussed the relationship of speech to reading, its significance, especially in the early stages of reading when the spoken word must be very consciously applied to the written and where inarticulate speech may distort the perception of the graphic equivalents. Chapter four deals briefly with the neurological correlates of the activity of speaking, relating them in the brain to other functions.

When speech problems are mentioned in the context of reading, they are often of a number of widely differing forms. For example defects in speech, currently or in the past, or delayed development of speech at the infant stage. Some writers give the incidence of speech problems in the family history, and a few others have studied the child's use of the spoken language in description, story telling and so on. In all of these areas there seems some possibility of differences existing between normal children and those with reading difficulties or S.D.dyslexia, and such are illustrated on the tables below - Fig 14.1, Fig 14.2, Fig 14.3 and Fig 14.4. The tables are designed such that different characteristics of speech in experimental and control groups may be compared. However, the following points should be considered in the observation of the tables:
1) Inconsistencies in terminology and selection of cases of reading difficulty.

2) Different criteria for 'speech defect'.

3) Different age groups

4) Variation in sample size.

5) Different criteria and variations in recall for 'delayed development of speech'. (Table 14.2)

6) Differing methods of family history recall. (Table 14.3)
<table>
<thead>
<tr>
<th>WORKER</th>
<th>DATE</th>
<th>NO. IN SAMPLE</th>
<th>NO. IN CONTROL</th>
<th>TERMINOLOGY for READING DIFFICULTIES</th>
<th>TYPE OF SPEECH DEFECT</th>
<th>READING DIFFICULTY CASES %</th>
<th>CONTROLS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kagen</td>
<td>1943</td>
<td>100</td>
<td>-</td>
<td>dyslexia</td>
<td>Motor speech defect</td>
<td>30%</td>
<td></td>
</tr>
<tr>
<td>Helggren</td>
<td>1950</td>
<td>276</td>
<td>-</td>
<td>Specific Dyslexia</td>
<td>Inarticulate Speech</td>
<td>41% boys</td>
<td>32% girls</td>
</tr>
<tr>
<td>Hermann and Norrie</td>
<td>1958</td>
<td>180</td>
<td>100</td>
<td>Congenital Word Blindness</td>
<td>Disarthric disturbances (stuttering, lisping, cluttered speech)</td>
<td>Defects equally spread between cases and controls.</td>
<td></td>
</tr>
<tr>
<td>Tjoasen Hansen &amp; Ripley</td>
<td>1962</td>
<td>24</td>
<td>-</td>
<td>Reading Difficulties</td>
<td>Speech Problems</td>
<td>59% (14 out of 24)</td>
<td></td>
</tr>
<tr>
<td>Gorton</td>
<td>1964</td>
<td>100</td>
<td>100</td>
<td>Reading Difficulties</td>
<td>Present defect</td>
<td>14%</td>
<td>8%</td>
</tr>
<tr>
<td>Butter, Tizard &amp; Whitmore</td>
<td>1970</td>
<td>86</td>
<td>147</td>
<td>Specific Reading Retardation</td>
<td>Articulation Defect</td>
<td>14%</td>
<td>6.8%</td>
</tr>
<tr>
<td>Clark</td>
<td>1970</td>
<td>228</td>
<td>-</td>
<td>Backward Readers</td>
<td>Speech defect</td>
<td>27.8%</td>
<td></td>
</tr>
<tr>
<td>Ingram, Mason &amp; Blackburn</td>
<td>1970</td>
<td>82</td>
<td>-</td>
<td>Underachievers in reading/spelling</td>
<td>Speech Difficulties</td>
<td>56%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Underachievers with more general learning difficulties</td>
<td></td>
<td>50%</td>
<td></td>
</tr>
</tbody>
</table>

A proportion of this sample was obtained from speech clinics.
### Fig 14.2 Delayed Development of Speech in Reading Difficulty Cases.

<table>
<thead>
<tr>
<th>WORKER</th>
<th>DATE</th>
<th>NO. IN SAMPLE</th>
<th>NO. IN CONTROL</th>
<th>TERMINOLOGY for READING DIFFICULTIES</th>
<th>SPEECH DESCRIPTION</th>
<th>READING DIFFICULTY CASES %</th>
<th>CONTROLS %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hermann and Norris</td>
<td>1958</td>
<td>180</td>
<td>100</td>
<td>Congenital Blindness</td>
<td>Retarded speech development (diagnosed on case history)</td>
<td>18%</td>
<td>1%</td>
</tr>
<tr>
<td>Kuoera, Matejek &amp; Langmeier</td>
<td>1963</td>
<td>91</td>
<td>-</td>
<td>Severe Dyslexia</td>
<td>Severe delay in speech</td>
<td>20%</td>
<td>-</td>
</tr>
<tr>
<td>Gorton</td>
<td>1963</td>
<td>100</td>
<td>100</td>
<td>Reading Difficulties</td>
<td>Slight delay in speech</td>
<td>20%</td>
<td>5%</td>
</tr>
<tr>
<td>Rutter &amp; Tizard &amp; Whitmore</td>
<td>1970</td>
<td>86</td>
<td>147</td>
<td>Specific Dyslexia</td>
<td>Age of speaking first words - 19-24 months</td>
<td>22.4%</td>
<td>11.4%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25 months +</td>
<td>10.5%</td>
<td>2.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Age of speaking first phrases - 25-30 months</td>
<td>19.2%</td>
<td>9.8%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31 months +</td>
<td>15.1%</td>
<td>3.8%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Critchley</td>
<td>1970</td>
<td>125</td>
<td>-</td>
<td>Specific Dyslexia</td>
<td>Late in acquisition of speech</td>
<td>33%</td>
<td></td>
</tr>
</tbody>
</table>

### Fig 14.3 Family History of Speech Problems.

<table>
<thead>
<tr>
<th>WORKER</th>
<th>DATE</th>
<th>NO. IN SAMPLE</th>
<th>NO. IN CONTROL</th>
<th>TERMINOLOGY for READING DIFFICULTIES</th>
<th>SPEECH DESCRIPTION</th>
<th>READING DIFFICULTY CASES %</th>
<th>CONTROLS %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gorton</td>
<td>1964</td>
<td>100</td>
<td>100</td>
<td>Reading Difficulties</td>
<td>Speech problems in family hist.</td>
<td>28%</td>
<td>6%</td>
</tr>
<tr>
<td>Rutter &amp; Tule</td>
<td>1966</td>
<td>86</td>
<td>147</td>
<td>Reading Retardation</td>
<td>History in parent or sibling of delay in speech after 2½ yrs. old</td>
<td>10.1%</td>
<td>3.6%</td>
</tr>
<tr>
<td>Tizard &amp; Graham</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ingram, Mason &amp; Blackburn</td>
<td>1970</td>
<td>62</td>
<td>-</td>
<td>Underachievers in reading &amp; spelling</td>
<td>Family speech difficulties</td>
<td>30%</td>
<td></td>
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</tr>
</tbody>
</table>

A proportion of this sample was obtained from 20% speech clinics.
The table (fig 14.1) - speech defects - shows that a wide range of results has been obtained - from 14-59%. The three highest results may be misleading however. Ingram, Mason and Blackburn obtained part of their sample from speech clinics and this would predetermine a high proportion of speech defects. The sample of Tjossen, Hansen and Ripley is very small, consisting of only 24 children, and hence to even record the fourteen cases of speech defect as a percentage is questionable.

With these three results considered, the percentage range of children with speech problems and defects is approximately from 14-33%. This percentage is sufficiently high to consider the presence of speech defects to be a characteristic of reading difficulty cases of the nature of specific developmental dyslexia. (See Williams (1965), Gorton (1964, and McLeod (1969)). Similarly many studies of S.D. dyslexia have begun at speech therapy clinics. Children are seen and treated at the age of four or five and in subsequent visits are observed to be slow in learning to read.

The comprehensive work undertaken by de Hirsch in America, began in this way. (See also Mason 1968).

The table showing the incidence of delayed development of speech (Fig 14.2) demonstrates results that appear to be very close. The percentage range of children with reading difficulties or specific developmental dyslexia who are late in developing speech is 10.5 - 33%, and six...
of the results are in the range 18-22.4%. It seems justifiable to conclude therefore, that about a fifth of children with reading problems or specific developmental dyslexia have been late in acquiring the ability to speak. This is to be compared with the controls, the highest percentage report of whom is 11.4%.

Mason (1968) reported an interesting project on children retarded in speech. The sample was taken from a speech clinic and were aged 2½ - 4½; there was a corresponding sample of controls. It was found that only 18% of the experimental group began to read with no difficulties. (This was compared with 85% of the control group). 27% of the speech retarded children pulled up in reading after a bad start, and eight of the children (=16%) appeared to fulfill the diagnostic conditions of specific developmental dyslexia. Mason's conclusions were that -

".....the speech retarded child, in social classes I and II, irrespective of his level of intelligence, is at high risk of experiencing failure in the early stages of learning to read, the risk being, on present evidence, as great as 75% where the speech retardation at 4½ years of age is eighteen months or over. (It seems probable that this risk applies to the other social classes, where environmental factors are less favorable to academic success)."

(Mason's sample was taken from social classes I and II).

Mason was able to generalise that the child who is immature in speech at the age of four to five, is likely to show other developmental lags (some, according to her findings, being those characteristic of the specific developmental dyslexic child).

No real conclusions can be drawn from the data in the table of family
history of speech problems (Fig 14.3), as the criteria used in the Isle of Wight Survey (Butter, Yule, Tizard and Graham, 1966) are more stringent than the other two studies. Perhaps however, the two results of 28% and 30% (reading difficulty cases with a family history of speech problems) give some idea of a proportion to be expected in future research findings, although the figures given for the family of speech problems in the two respective controls differ widely. A number of questions are prompted by this statistic. Are those with family histories of speech problems also with personal speech delay and/or defects? Is there a pattern in the types of speech defect which appear in several generations of one family? Did the relatives of these children with family histories of speech problems also have reading difficulties? Questions of this nature, when answered, will ultimately clarify the relationship between reading and speech problems.

Throughout this chapter so far, the terms 'speech defect', 'speech problems' or 'speech difficulties' have been used. These need further definition, since each has been used in the context of a report by a researcher. Unfortunately, details of the types of defect and of their respective frequencies, are given in very few studies. This is a surprising omission, since such details would be very valuable in attempts to predict future reading problems in young children. Hermann and Norris note this omission (1958), and thence give a breakdown of the 'meaning' of speech defect -

1) **Dyssarthric disturbances** (stuttering, lisping, cluttered speech).

2) **Retarded speech development**.

3) **Other speech defects** (including indistinct articulation, frequent reversals and substitutions of letters and syllables).

As the tables indicate, they found no difference between S.D. dyslexics and
normals in group I, but wide differences in the other groups, which they consider might be generally classified as aphasia. The groupings that they give, form a useful framework for comparison with other less detailed reports of types of speech defects common in reading difficulty cases.

For example Ingram (1964) says:

"...almost half of the patients referred, who were found to suffer from specific dyslexia, had a history of slow speech development, or failure to acquire intelligible words by the age of two years (excluding 'ma' and 'da') and intelligible phrases by the age of three years. Such patients almost invariably still omit or substitute the later acquired consonants and consonant clusters inconsistently when they reach school. More severely speech-retarded children often give a history of difficulty in comprehending speech as well as in talking and some may have shown persistent difficulties in comprehension even at the age of four or five years."

(The later acquired consonants and consonant clusters include /s, z, f, sh, dh, v, st, al, pl, hw, ð (as in 'weather'), and ð (as in 'thick').

Ingram's description would appear to tally well with the groupings given by Hermann and Norrie.

Hibbert (1961) reports that a high incidence of defective articulation was present in his sample of 27 cases (S.D. dyslexics). He remarks that this error was generally limited to the pronunciation of 'th' as 'f' or 'v', and while such is very common in early childhood, the persistence is the significant factor, and as such, could be said to be part of the specific developmental dyslexia syndrome.
McCarthy (1952), speaking of 'non-readers of normal intelligence', observed that three quarters "had also shown delayed speech, lisping, stuttering or articulatory defects at some time." A fifth of a group of stutterers "had also had difficulty in learning to read". It would seem that these symptoms are not entirely compatible with the schema of Hermann and Norris, however, where the indication is that stutterers are not very commonly or necessarily poor readers.

On the whole, all of the types of defect reported to exist among poor readers — and particularly among specific developmental dyslexics, would appear to follow the comment of Hibbert, that the defects are those made by most children, but their persistence is the significant factor.

The two statistics given in the table on other speech factors not covered previously (Fig 14.4) are interesting in that they are both statistically significant, and yet rarely mentioned in other research reports, presumably because of lack of investigation. However, de Hirsh (1966) found that the manner of use of language in story telling and the number of words used were factors that ranked highly (and were statistically significant) in predicting the failing readers. This has been observed in children visiting the Word Blind Centre in London. Also noted here was the frequent inaccurate use of grammar, in many cases despite ideal language environments. There are several possible explanations for this. Firstly, a child who has difficulty with reading, is unlikely to have read widely, and hence loses the benefit of observation of vocabulary and word usage open to other children, especially where speech is poor in his home and school environments. Another possibility is that a general immaturity in the child (observed in many failing readers by de Hirsh), is reflected in his language use. There is also the possibility that this finding is, in fact, not real. Many prominent workers in the field describe the specific developmental dyslexic as a child with an average
or above average vocabulary, and a competent use of language. Gooddy and Rheinhold (1961) say of such a child:— He has ".....a good grasp of spoken language and he often talks fluently, using a large vocabulary". Similarly Critchley (1966) makes the observation that, at examination—

"the child's vocabulary is commensurate with his age; his ability to name objects is unexceptional; and his command of words is adequate in so far as he can narrate a story or hold a conversation".

One possible explanation for the opposing views on this point is that different manners of examination are employed. Fig 11.1 and Fig 11.2 (pages 162 and 163) are examples of the free writing of a S.D. dyslexic of 10½ years. The use of language is very immature, while, in fact, he is known to the writer to be of normally good vocabulary and spoken language use. The inconsistency is due to the special effort that the child made on the spelling, and hence he constructed his story around the simple words that he thought that he could manage. In passage 11.2 there are a number of false starts, and places where he knew what word he wanted to use, but decided that he could not manage the spelling, and hence stopped; — e.g. (Fig 11.2) "It was gray and x It was......". If this child were judged for language use on written work, the conclusion would be far different from a judgement on spoken language.

The judgement of the significance of speech factors in specific developmental dyslexia varies considerably. Critchley mentions it little in any publication, whereas Ingram has based much of his research on the presence of speech abnormalities in cases of specific developmental dyslexia —
"I believe that it is by studying children with retarded speech development, who also show abnormalities in visuo-spatial perception and defective visual memory for letters and words, that we are going to learn more about the nature of specific developmental dyslexia."

(1963)

Ingram (1963) based a 'Classification of Symptoms of Developmental Dyslexia' on speech disorders. This is shown in Fig 14.5.

**Fig 14.5** A Classification of Specific Developmental Dyslexia in terms of Manifestation of Speech Disorders.

(From Ingram (1963) - 'Classification of Symptoms of Developmental Dyslexia and Dygraphia'.)

**AETIOLOGY**

<table>
<thead>
<tr>
<th>Group</th>
<th>Early Symptoms</th>
<th>Speech Disorders</th>
<th>Later Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>'Visuo-Spatial'</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Correlating Speech-sound</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Synthesising</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Word Sense</td>
</tr>
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<td></td>
<td>None</td>
<td>Articulation only</td>
<td>Reading/Writing Difficulties</td>
</tr>
<tr>
<td></td>
<td>None</td>
<td>Articulation only</td>
<td>Reading/Writing Difficulties</td>
</tr>
<tr>
<td></td>
<td>Slow Speech Development</td>
<td>Articulation only</td>
<td>Reading/Writing Difficulties</td>
</tr>
<tr>
<td></td>
<td>Slow Speech Development</td>
<td>Articulation only</td>
<td>Reading/Writing Difficulties</td>
</tr>
<tr>
<td>Congenitally Determined</td>
<td>Dylexia and Dygraphia</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Specific Developmental Genetically Determined</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Congenital Brain Damage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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(1963)
Such a classification has several useful aspects. It demonstrates the possibility of there being subgroups within the syndrome of specific developmental dyslexia, and it shows the beliefs and observations of Ingram, that such subgroups are best considered from the initial point of view of speech. This allows tentative identification of some such children at an early age when they are slow in acquiring the ability to speak (bearing in mind that normal readers may have also been slow to speak). The classification also demonstrates a link between early speech delay and subsequent defects in the individual (see earlier). In the same paper, Ingram classifies other disorders which are more purely confined to speech. Using these classificatory models he is able to compare manifested symptoms and thus demonstrate the similarities between the various disorders. Such an approach is therefore a great advance on the usual rather sterile reports of percentage of specific developmental dyslexia with speech disorders (of, frequently, unspecified nature).

Beyond the direct relationship between S.D. dyslexia and speech defects or delays, is the link between handedness and speech. Reinhold (1963) has pointed out —

"Nothing is known historically of the relationship of handedness to speech, since the history of language must depend upon a written record, and writing, of course, developed long after speech."

This relationship was discussed in chapter four, largely with reference to the effect on speech of damage to one or other hemisphere of the brain, and it was concluded that speech is affected in most cases, by damage to the left hemisphere (dominant), probably for all fully right-handed people (from birth), but for slightly under 100% of the left-handed. Since the
significance of the dominant hemisphere and its relation to handedness seem somewhat uncertain in a few percent of the population, positive statements are not justified. However, certain observations must ultimately be explained by such a relationship. One is the finding by Naidoo (1961) that ambidextrous ('ambiguously handed') children were significantly later in beginning to speak, had more speech defects, and were consistently poorer on tests of a verbal nature than were the strongly lateralized children.

If, as is usually supposed, established handedness is related to the determination of one hemisphere of the brain as dominant and it is thus assumed that lack of established handedness is related to lack of establishment of dominance, then since speech appears to reside in the dominant hemisphere in most cases, a hypothetical line of reasoning can be drawn that links ambiguity of handedness with slowness of speech and verbal skills. This is of relevance to specific developmental dyslexia since it has been concluded that a certain proportion lack established lateral preferences, and similarly a certain proportion also have slow speech development and/or defective speech. Some workers suggest that these proportions involve the same individuals, and that they constitute a subgroup of specific developmental dyslexia. This is unfortunately not often justified numerically, but rather in verbal observations. Birch and Lefford (1964) have said:—

"Only a proportion of children with learning difficulties fail to develop a definite handedness, but those who are ambidextrous usually have associated speech and language difficulties."

The validity of observations of this subgroup will only be established by further research to determine the frequency of the co-incidence of
Late/defective speech, and unsettled lateral preference, in a child showing reading difficulties of a dyslexic nature. Further, if this subgroup can be shown to exist, then explanation must also be sought to indicate why some ambidextrous children have no reading or speech problems, why some children with speech retardation and/or articulatory defects are not ambidextrous and reading normally, and so on. Detailed research may suggest that this pattern is stable, being present, or absent, but that the components may be manifested to such a minor degree as to be unnoticed in some cases. A finding of this nature is indicated in the research of Naidoo (1961).

Another observation that might throw light on the relationship between speech, reading and cerebral dominance is mentioned in chapter thirteen. It is known that brain damage may affect the establishment of cerebral dominance. If the establishment of dominance is connected with the development of speech, as seems possible, then the brain damage will indirectly inhibit speech development. In chapter thirteen the hypothesis is extended to propose that the brain damage may be of hereditary origin, or that a specific area of slow maturation may have a similar affect.

Thus, to summarise this chapter - tables of research findings suggested that the incidences of speech defects, delays, family histories of speech problems and possibly other speech factors are higher in children with reading difficulties or specific developmental dyslexia. The incidence of speech defects in such children would appear to be around a quarter, although the scatter of findings is wide. The reports of incidence of delayed development of speech are less scattered, and suggest that about a fifth of cases are involved. Whether the latter cases represent the same as the former is not frequently documented, and nor, indeed, is the question of whether there are any relationships with the group for whom a family history of slow or defective speech is recorded, these numbering about thirty percent.

Consideration is given thence to the meaning of the term 'speech defect'
and it is observed that too frequently no qualification or definition is
given to the term, nor is there often a breakdown into various types of
defect. A few research reports elaborate in this point, the most tho-
rough being that of Hermann and Norrie (1958). Their results are used
as a model for comparison with a few other less detailed reports, and such
appear to be in relative agreement in suggesting that the most common
errors of children with reading difficulties, or who are S.D.dyslexic,
are of the nature of articulation errors, and not so commonly stuttering
and lisping. However, figures for control groups are needed here.

The results of the fourth table - speech factors not previously
mentioned, are discussed, and the two findings given suggest that a child
with reading retardation (according to the definition of Rutter, Tizard
and Whitmore) has a generally less skillful use of language. Some other
reports support this (not numerically) while others refute the proposition.
Such contradiction may be due to the means for measurement of it, often
merely subjective judgements.

The relationship between speech defects and establishment of lateral
preference, is discussed particularly with reference to the finding that
ambidexterity in non-dyslexics seems to frequently parallel speech defects
and poor verbal performance.

Of the three hypothetical causes of specific developmental dyslexia -
anxiety, neurological integrity and specific immaturity, the latter are
more likely from this consideration of speech factors. A slight local
lesion, or a local area of the brain that is developing more slowly than
the rest, accords well with the delayed or defective speech of some specific
developmental dyslexias. Anxiety is observed frequently to have a similar
effect; however, closer consideration of this in the case of S.D.dyslexics,
shows two areas of disagreement. If anxiety were the cause of the reading
problem, a self-perpetuating system would arise. The increasing awareness
of failure would increase the anxiety level, and hence also the speech
defects. In the specific developmental dyslexic, the defects of speech
gradually diminish over time. A second disagreement with the proposition
is that stuttering is the speech defect most commonly associated with
anxiety, and it has been demonstrated in this chapter that articulatory
errors are those most typical of the S.D.dyslexic.

Other literature of relevance to this chapter is:
Yedineak (1949); de Hirsch (1954); Ingram and Reid (1955); Martin (1955);
Malmquist (1958); Hermann (1959); Wepman (1961); Sampson (1962);
Crooks and Greene (1963); Vernon (1970); and an article in Nursing Mirror
(2nd April, 1971) on aphasia.
CHAPTER 15

OTHER MINOR SYMPTOMS FREQUENTLY ASSOCIATED WITH SPECIFIC DEVELOPMENTAL DYSLEXIA

In this chapter there will be further discussion of factors that are frequently associated with specific developmental dyslexia, that have not yet been covered. In many cases the factor reported is in common with both S.D. dyslexia and cases of minimal brain lesions. In such cases, the terminology of S.D. dyslexia may be disputed, and discussion of this point will be a feature of the following chapters in addition to this.

Factors to be considered in this chapter are:

Motor Factors. (Clumsiness, hyperactivity, lack of fine motor control, etc.)

Other Factors that are characteristic of brain damaged children, but that are observed, in some cases diagnosed, as specific developmental dyslexia. (History of difficulties in pregnancy of mother, illness in childhood, abnormal E.E.G.s.)

Spatial/Tempor al Factors. (Time disorientation, spatial disorientation, lack of appreciation of rhythm, slowness in telling the time, sequencing.)

Perceptual Factors. (Discrimination and memory of auditory and visual stimuli.)

Emotional Factors.

Factors of Birth Order and Adoption Rate.
Most detailed descriptions of S.D. dyslexic children contain some reference to a general clumsiness, lack of fine motor control and so on. The reports are usually vague, being gained from general impressions of the children, rather than from specific measurements — for example, Rabinovitch (1954) said:

"...observations of gait and the performance of motor acts such as dressing, opening and closing doors and the handling of psychological test materials led to the definite impression of a non-specific awkwardness and clumsiness in motor function."

In the 'Dyslexia Manifesto', (1970), a parents' guide to specific developmental dyslexia, Margaret Newton lists under 'presenting symptoms', (among other symptoms) :-

1. Clumsiness, e.g. difficulty in kicking, skipping, throwing, catching, climbing, etc.
2. Tends to fall easily; accident proneness.
12. Restlessness; hyper-activity.

Banks (1970), in her Kindergarten Behavioral Index, includes the following:-

3. Slow and fumbling putting on shoes, coat, etc.
4. Has difficulty doing up buttons.
6. Clumsy — trips over, bumps into, knocks over objects.
7. Has difficulty in hopping, changing from one foot to another.
10. Has difficulty in controlling pencil - presses hard, messy work.
12. Has difficulty using scissors.
32. Overactive - always on the move.
33. Has difficulty sitting still for very long.
34. Fidgets with things.

There are a few numerical reports of motor factors in cases of reading difficulties and specific developmental dyslexia. For example, Tjonna, Hansen and Ripley (1962) reported that "motor awkwardness" was present in ten out of their twenty-four cases (=42%) of 'reading difficulty' (which, from description would seem to have included a large percentage of specific developmental dyslexics). In their study of Isle of Wight children, Rutter, Tizard and Whitmore (1970), measured a number of features of motor function in a group of children retarded in reading. (This category again would appear to have included a large percentage of children who could be termed S.D. dyslexics). They found that reading retardates were significantly different from the controls in the following:-

(ages 9-11 years)

First sitting without support at 9 months or later - 1% level of significance.
First walking without support at 22 months or later - 5% level of significance.
Bowel control only after three years - 5% level of significance.
Very poor co-ordination - clinical assessment - 5% level of significance.

Oseretaky Test* - 5% level of significance.

Marked motor impersistance (This was tested by giving verbal command, e.g., 'close eyes'; 'put tongue out', and measuring the ability to sustain the motor condition.) - 1% level of significance.

* - See next page.
The Osarotsky Test used in the Isle of Wight study was a shortened version (see Yule 1967 and Rutter, Graham and Yule (1970)). The full test involves tests of balance, finger dexterity, eye-hand co-ordination, gross motor activity.

The figures from the Isle of Wight Survey would appear to indicate that a proportion of children, retarded in reading, tend to be delayed in achieving 'motor milestones' - sitting, walking, bowel control, etc. - and then to remain slightly less skilled than normal children.

Another possible abnormality that is associated with the motor development is the lack of a crawling stage. This is speculated on in a number of papers; however, there as yet appear to have been no numerical analyses of the situation.

There have been a number of suggestions in the literature, particularly during the early part of this century, that faulty eye movements are the basis of reading failure. The motor control required of reading is certainly intricate. The eyes must move in a set direction, along a set horizontal plane. The movement along the line is broken by a series of pauses (fixations) and the reduction of the number of fixations is a reflection of the skill and age of the child. Occasionally, the eye will regress, and again, reduction of regressions is required for increase in skill. A child who is clumsy, and has poor motor control, may well find the level of co-ordination required, especially in the early stages, to be difficult to achieve. Poor motor eye movement may account for some of the problems in keeping place on the line, and efficiently moving down to the next line; however, it seems likely that the motor eye inco-ordination and reading difficulty are, in most cases, both caused by an external variable and not directly related.

Despite the fact that it seems doubtful that any aspect of the motor inco-ordination is a causal factor behind the reading problems of
SD.dyslexia, it certainly is liable to hinder remedial attempts, particularly where the child is hyper-active, and has very low levels of concentration. In cases where these characteristics are marked, the children may be given tranquillising drugs.

Any difficulty in motor control, in addition to hindering the reading process, is likely to cause the child's writing to be somewhat untidy, and this is the explanation for some of the cases of poor writing among specific developmental dyslexias. Writing and drawing is often a means used to test the fine motor control ability (this being graphomotor ability). Such was used by Clark (1970), among others. The Bender visuo-motor Gestalt test is widely used, and tests a number of abilities, which include the handling of a pencil. De Hirsch found that both this and a pure graphomotor test, as well as another test of fine motor control, were among the ten best predictors of a reading failure. She found further that the failing readers were often abnormal in activity level, either being hyper or hypo-active. She attributed this to a neurophysiological immaturity, which in turn, she suggested, lead to an impairment of the ability to perceive Gestalten, and that the motor factors resulted from this.

"A motor act is a total Gestalt and since dyslexic children's Gestalt competence is often weak, it is not surprising that many of them are very clumsy."

There does seem, therefore, to be plenty of evidence that some specific developmental dyslexias tend to be generally clumsy and awkward in an indefinite manner. This may be evidence of the presence of brain damage, or it may, especially where mild, be evidence that points to an area of developmental immaturity.

Workers who have mentioned the motor factor with reference to reading,
and have not been alluded to in this chapter are:

Monroe (1932); Silver and Hogan (1960); Bryant (1964); Critchley (1961); Gorton (1964); Monroe (1935); Johnson and Myklebust (1967); Williams (1965); Prechtl (1966).

Other Factors, Characteristic of Brain Damaged Children, but Observed, in some Cases Diagnosed, as Specific Developmental Dyslexias.

This group of factors includes all those that have been mentioned under 'Motor Factors' - clumsiness, lack of fine motor control, etc. The additional elements to be discussed in this section are - a history of difficult birth, prenatal, or postnatal period, a history of early childhood illness, and the presence of abnormal electroencephalogram readings.

It is fairly universally found that a child born prematurely, or one who has undergone a difficult prenatal, or immediately postnatal period, is more likely to suffer from a variety of developmental disorders, most of which clear up spontaneously. Such disorders may be very similar to those of specific developmental dyslexias, and likewise, there are a number of reports that a history of prematurity is common among specific developmental dyslexias.

It is difficult to determine the relationship between these observations.

A number of workers are definite in relating difficulties in reading to various factors before or just after birth. Harris and Roswell (1953) mention prolonged difficult labour, marked moulding of the skull, early sucking difficulties and oxygen deprivation as sometimes factors to be observed in the history of cases of reading difficulty. Again, Tjossem, Hansen and Ripley (1962) found that a high proportion of children in their sample (10 out of 24 = 42%) had atypical births, and they say that their data agrees with that of Kow and Pasamanick, who are perhaps the most
prominent workers in this field. In 1953 Kawi and Pasamanick published a paper on the 'Association of Factors of Pregnancy with Reading Disorders in Childhood'. This described a study of 205 cases of reading 'disorders' (boys aged 10-14 years). Their findings were that 16.6% of these had been exposed to two or more 'maternal complications', as opposed to only 1.5% of a control group without reading disorders.

"The results of this study appear to indicate that there exists a relationship between certain abnormal conditions associated with birth and the subsequent development of reading disorders of the child."

They found that toxemia, and bleeding during pregnancy constituted "those complications largely responsible for the differences found between the two groups."

These results and those in a subsequent paper (1959), on a slightly larger sample, substantiate, to a degree, the hypothesis put forward, that there is a "continuum of reproductive causality", which is composed of lethal components, for example still birth or abortion, and sublethal components which include cerebral palsy, epilepsy, mental deficiency, and behavioral disorders. It was hypothesised that reading disorders in children constituted a component of the sublethal fraction of this. They say further:-

"The prevention of dyslexia and of related functional nervous disorders, therefore, depends to significant extent on the prevention of these complications and on improved methods of treating them when they do occur."

Kasten and Fowlor (1959) studied the language development of a group of children known to have been born prematurely. The subjects that they used
in the experiment were much younger than those used by Kawi and Pasamanick, but the results were similar. They found that of 66 such children, aged two years, 37 (56%) "had retarded development of language". (This criterion included speech, comprehension, etc.) It seems likely that, for many of these children, retardation of language would be reflected in difficulty in the early stages of reading.

De Hirsch studied a group of prematurely born children of Kindergarten age. She found that their performances were almost uniformly poorer than those of children of mature birth. This extended to 36 out of 37 tests, and was significant statistically on 15 of the tests, mainly those of language function, e.g. oral, and reading readiness.

Apart from the children described above, a further group exists in whom certain diseases (e.g. meningitis or encephalitis) or head injuries, predispose the individual to reading problems. Johnson found that 64.7% of his 34 cases had suffered "serious or recurring illness", and 20.6% had suffered head injuries.

Sabulous and Cramblatt (1969) studied thirteen children who had suffered from viral encephalitis. These children developed learning disabilities and various behavioral disorders. Subsequent to the illness they were found to be under-achieving and this continued for the duration of the study. It was found that the degree of difficulty in reading was related to the period of coma or semi-comatose condition. The conclusion of Sabulous and Cramblatt was that:

"...a specific viral infection may cause changes in the information processing behaviors associated with learning."
In the second part of the study, it was felt justified to make a more general conclusion:

"We .... agree with scientists such as Hatton (1966) who have extended the idea that a sizeable percentage of the five to ten year old children, referred to child guidance clinics for 'emotional problems' may well evidence minimal brain dysfunction."

Argument about the inclusion or rejection of the suspected brain damaged poor reader in the group of dyslexics is continuous. Some workers are adamant that children with brain lesions are distinct, both in cause and manifest symptoms, from those whose reading problems have some other causation. Many other workers, however, say that brain damage of some sort is the universal cause of S.D. dyslexia. Goldberg, Marshall and Sims investigated this in a paper entitled - 'The Role of Brain Damage in Congenital Dyslexia'. They used electroencephalography and tests of visual motor function. They concluded:

"The similarity of the E.E.G. and the results of the psychologic tests in the patients with proven brain damage, to some of those with congenital dyslexia, would .... suggest that brain damage is a factor in some of these cases."

They found abnormal E.E.G. in 23 out of 25 cases of 'congenital dyslexia' although they do not commit themselves on the number of the children that they considered were brain damaged. (They also found that two of the brain damaged 'control' had normal E.E.G.s.) The use of E.E.G.s in research on reading has not been wide; this is probably because such
results as there are, show no positive findings, and there is always doubt as to the composition of the sample, for example, the inclusion of cases of brain damage. Some illustrations of the manner in which E.E.G.s have been employed in research on reading pathology are presented below.

Ettinger and Jackson discuss results on eight patients, diagnosed as dyslexia. Their findings suggest that the E.E.G.s, with other factors, indicate an area of defective maturation in the cerebrum—where the visual aspects of language are dealt with. They also mention Spiel (1953) who found a family in which the father, three brothers and two sons had reading difficulties. While the neurological examination of the sons had shown no impairment, the E.E.G.s of both were irregular, indicating a poor development of the parieto-occipital alpha rhythm. There was, however, no evidence of focal lesions. Again, McFie (1952) is reported as having shown unusual E.E.G. features in four out of six reading difficulty cases.

Rabinovitch (1952) reports that abnormal E.E.G.s might be expected in 5% - 10% of the population, but that this may be as high as 60% - 80% in children with psychological disorders. He suggests that characteristic of children with behavioral problems or reading problems is a pattern irregularity, dysrhythmia and oversensitivity to, for example, hyperventilation. There are frequently different amplitudes for homologous regions of the two hemispheres. Similarly, he reports that Lindsley, in 1940, found a greater dys-synchrony between the wave forms of the two hemispheres, where mixed dominance occurred. (Such, of course, would agree with the findings of Newton (1970).) A further report is that of Hughes Leander and Ketchum in 1949. They found 75% abnormal E.E.G.s in a sample of 125 cases of reading difficulty. On the basis of these reports, Rabinovitch examined 47 children admitted to a psychiatric ward. These were aged eight to thirteen years, and of them 34 (≈72%) had reading difficulties. Of the 34, 15 had apparently complete laterality of dominance and 18 had mixed dominance. There was a 71% abnormal E.E.G. incidence among the cases of reading diffi-
culty, although there was no difference in degree of abnormality between readers, non-readers, or those with mixed or pure dominance. Because of these uncertain results, Rabinovitch was unable to refute the postulation of Hill that abnormal E.E.G.s in children reflects a delayed irregular pattern of cortical development. Rabinovitch says:

"..... we have found little evidence of specific patterns (of E.E.G.) in different diagnostic entities, beyond the definitive or focal changes in the encephalopathies or brain injuries."

Silver and Hagin in 1960 also found that some of their sample of reading difficulty cases showed evidence of abnormal E.E.G.s. These were frequently high voltage slow waves with occasional spikes, and they appeared occipitally. They report that their results agree with those of Kennard, Rabinovitch and Waxler (1952) and Yaterka and Katz (1955) in demonstrating immaturity.

In a study of children attending a psychiatric outpatients clinic, Stratton (1953) would appear to agree with Silver and Hagin in reporting the incidence of slow E.E.G.s over the occipital region. In both of these reports, however, it is not clear whether brain damage might have caused the abnormal E.E.G. or not.

Further links of E.E.G. abnormality with reading difficulty is shown by Prechtl and Stemmer (1962) and Prechtl (1966). The former paper is a report on 50 children between nine and twelve years of age, who had poor ability in school subjects. The principle findings on the E.E.G. traces were muscle artifact. In 1966 Prechtl pointed out the presence of similar movements in a high percentage of reading disability cases. Other workers have attempted to make a similar finding, but have failed. (See Rutter, Tizard and Whitmore, 1970, page 65.)
In the most comprehensive of E.E.G. studies, Hughes and Park (1968) looked at the E.E.G.s and a number of other factors in a group of 157 children with normal I.Q., but with reading disabilities. 36% of these showed abnormal E.E.G.s, and it was noted that there was a higher proportion of ophthalmological defects in this group.

Hughes and Park then attempted to correlate other factors with the types of E.E.G. exhibited. The normal E.E.G. group (64%) were the best readers and had average I.Q.s in the sample. Half of the abnormal E.E.G. group showed a 6 - 7 and 14 per second positive spike phenomenon. These were the brightest children and showed the greatest difference between reading ability and potential. A quarter of the abnormal E.E.G. group showed excessive occipital slowing (see Silver and Hagin, above), and represented the poorest readers. These children showed the least difference between actual and potential ability. A small group with slow fronto-temporal waves had similarly little difference between actual and potential ability, but were in addition the group considered to show most evidence of organicity. This applied to a lesser degree to a few children who exhibited epileptiform discharges in their E.E.G.s. The latter two groups were found to have some ocular deficiencies and Hughes and Park considered it possible that these were causal to the reading problems in some cases.

The manner in which Hughes and Park have used the electro-encephalograph is fruitful compared with the other work described. It has enabled sub-groups to be determined and thence matched for other characteristics. The presence of four groups among those with abnormal E.E.G.s suggests one reason for the confusion existing among the other workers. The work would, nevertheless be more valid if a control group had been included (i.e. with no reading disability).

Research findings suggest that abnormal E.E.G.s are not unusual among cases of reading disability. It seems doubtful that there exists a characteristic pattern of abnormality for any specific group of disabled readers,
although further work of the nature of that of Hughes and Park may invalidate this view. More research is needed on a large scale, analysed in several methods and adequately controlled with a group of normal readers, and, if necessary, also a group of children with normal E.E.G.s.

There are several attempts to pinpoint an area of the brain which, when damaged, might give rise to the symptoms apparent in specific developmental dyslexia. Geschwind (1962) for example suggested that pure reading disability might be caused by a lesion in the visual area in the posteri region of the left hemisphere, and in the splenium of the corpus callosum (tissue that joins the two hemispheres). He says that both lesions might be caused by an occlusion of the posterior cerebral artery.

The siting of lesions that might be causal to specific developmental dyslexia is obviously best determined as a result of post mortem examinations. The opportunity to make such an examination is rare. In the case described below, death was ultimately due to a genetically malformed vascular system in the brain. The fact that this was also causal to the reading problem makes this case unusual. A developmental learning disability (the term used to describe the case) is often improving by the age of twelve, not worsening and ending in death. The case is, therefore, atypical and may be unrelated to specific developmental dyslexia. It does, however, illustrate the genetic transmission of factors for brain damage — or malfunction. The case is described by the Doctor who first diagnosed the learning disability in the boy, Billy, at the age of twelve. The disability was mild, and was reflected in reading difficulty, slowness and poor writing. There was also some trouble with arithmetic (again atypical if this was equivalent to S.D. dyslexia). He was slow in learning to tell the time. (at age eleven). Further atypical features were blackouts, disarray spells and recurring frontal headaches. He was not considered dull, nor immature, and had had a normal birth. The family history revealed the presence of
mixed dominance, visual and learning problems, migraine headaches and vascular malformation. The learning and reading problems seemed to be restricted to the males of the family, and Billy had a younger brother with a severe reading problem.

Death occurred in Billy's twelfth year and was due to a massive brain haemorrhage. A number of abnormalities were noted in the patterns of convolution, in the presence of atypical cells and in the large size of the cerebral cortex. It was considered that the malformations of the brain were possibly related to the vascular irregularity.

This section raises very strongly the controversy concerning the minimally brain-damaged child who manifests all of the symptoms that are typically associated with specific developmental dyslexia. Similarly, how is it possible to classify the child with all such symptoms, but who was premature, or who suffered from encephalitis during early childhood? Discussion of this dilemma will be postponed until the full consideration of the theories of specific developmental dyslexia in chapter 17.

Further references on this subject are to be found in: Stott (1959); Silver and Magin (1960); Williams (1965); Doehring (1968); Keeney and Keeney (1968); Luria (1966); Clements ( ); Rabinovitch (1954); Geschwind (1962); Francis Williams (1970); and Rutter, Graham and Yule (1970).

Spatial/Temporal Problems

Another area of frequent difficulty for the specific developmental dyslexic - and also the child with known brain damage - is that of spatial/temporal orientation. This has been mentioned to some degree in chapter 13 on cerebral dominance and S,D,dyslexia, as there is no strict dividing line between left-right disorientation and general spatial disorientation, and for discussion of spatial disorientation reference should be made to chapter 13. The subject has been raised here once again,
because it would seem to be related to the factor of disorientation in time.

S.D. dyslexic children are often spoken of as having little conception of time - as 'timeless children' - not knowing automatically the time of day from the usual clues, for example, lunch time or bedtime. Their ability to 'tell the time' from a clock is also frequently not developed until an unusually late stage. Critchley (1970) found that 100 out of his sample of 125 subjects (≈80%) were late in telling the time. Such an activity involves the spatial and temporal perceptual skills - the relative position of the two 'hands' and the concept of the measurement of time. Further to this, many S.D. dyslexics seem unable to recite the months of the year, days of the week, or even the alphabet (after it has been thoroughly learned). In each case, they are likely to be able to give the component units. However, the ability to order them seems to be impaired. Again, while manifestly being a disorder of auditory sequencing, it must be related to visual sequencing - as in reversing parts of words in writing and reading, etc.

Another related disability is the perception of rhythm. This again may be related to visual or auditory function and is often used to determine at which input the child is handicapped, to the greatest degree. The perception of rhythm may be tested by the use of a tapped rhythm, and a visual pattern of (for example) dots and dashes on paper. The test may be administered in two manners; one in which the child matches a visual pattern with one perceived auditorily, or, matching an auditory pattern with one perceived visually. A child who is handicapped more on the auditory side will find the former more difficult, and vice versa. Such an experiment also involves the ability to shift efficiently from one modality to another, (mentioned earlier).

The perception of rhythm is closely related to that of rhyme. If a child is unable to appreciate rhyme (and this would normally be reflected from an auditory handicap), he is automatically excluded from a large section of material that is drawn upon by teachers of reading.
Disorientation in time and space may be the explanation for the observations that the S.D. dyslexic child is slightly 'odd' when compared with other children. Thus it may act on the child more significantly as a social handicap, than as an educational handicap.

Perceptual Factors:

The perception of spatial and temporal factors described above, requires an adequate ability to discriminate and memorise in both auditory and visual terms, and it may be disability in perception that accounts for the results on rhythm and rhyme discussed above.

It would seem that much of the variation between individual cases of S.D. dyslexia exist in the sphere of perceptual abilities. Some, like Critchley, argue that, at least in the case of visual discriminatory ability, there are few difficulties, whereas others would lay much of the significant features of the whole syndrome at this point. There are a number of variables that would account for these differing reports. Age of testing is certainly one and a general observation is that surveys of groups of older poor readers report fewer perceptual disturbances than those of younger children. It may be that such disturbances act in a manner whereby they do not inhibit reading once a certain minimal level of skill has been reached - i.e. not in a continuous manner.

Auditory and visual memory is often defective in specific developmental dyslexics, and this proves very frustrating in the teaching situation. Methods of teaching which circumvent the poor memory to the greatest possible degree are those which rely on maximising the sensory input. These will be discussed more fully in a later chapter.

Other references to this subject of the perceptual abilities of poor readers, are to be found in:- Betts (1935); Monroe (1935); Fabian (1951);
Emotional Factors.

It would probably be correct to say that every specific developmental dyslexia, or child with reading problems, suffers from some emotional disturbance. It is usually indicated by behavioral means and can be of a very serious nature, even delinquency, or it may be manifested in the withdrawal by the child from all social situations.

The literature on the relationship between reading difficulties and emotional factors is vast and is relatively diffuse. There are two hypotheses on which most papers are based. One is that the reading difficulty (or S.D. dyslexia) is the cause of the emotional problem. The other is that an emotional factor is causal to the reading problem. Many workers, in addition, do not commit themselves, merely presenting their findings.

The fact that many S.D. dyslexics have been thought to be primary emotional cases, has certainly at times diminished their cause. There was a long period during which such thinking was rife, and the clever, but so considered "emotionally disturbed" children were:

"...usually regarded as being victimised by circumstances, and the teachers and others were ready to dart upon such factors as broken homes, drunken or unsympathetic fathers, shrewish or wanton mothers, intersibling jealousy, teacher-pupil hostility, and so on and so forth, as being all-important."

Critchley (1966).
Some of the more typical areas of consideration of this literature will be included as examples of the fundamental patterns of thinking. The bulk of such literature was written in the 1950's in America.

Silverman, Fits and Mosher, in 1959, attempted to give a profile of a 'typical child' with 'reading disability'. In this was included such items as: severe anxiety, one parent in the family, disturbed mother-child relationship, depressive trends, and that the parent(s) had a traumatic childhood or a history of nervous illness. They arrived at such a description from the division of a group of 35 cases into children with individual psychopathy, children whose families were psychopathic, and children who had undergone a frightening experience ('structural factor') in their early school experience. They concluded from their research that reading disability should be considered as an 'indicator' for another factor.

Milner (1951) was also concerned with the effect of the parents on the child in the context of reading readiness in grade one. She found that children who scored low, tended to be those of lower class status, and that in general they enjoyed less "emotionally positive interaction with their parents" than the higher scoring, (on the whole) middle class children. She suggests that the "lower class child seems to lack chiefly two things upon entering school as compared with the middle class child of this study: a warm positive family atmosphere or adult relationship pattern......an extensive opportunity to interact verbally with adults of high personal value to the child." Such a discrepancy between groups of children would appear to explain some of the later emotional difficulties undergone by intelligent but lower class children in school. This paper does not relate to children who as yet have severe reading problems, and hence would seem to exclude reference to specific developmental dyslexia cases. An interesting elaboration of the ideas expressed in Milner's paper is to be found in McCarthy (1953). She also stresses the role of the mother as representing 'security' to the child, and says that where the mother is
tense and nervous, the child will also be affected —

"The child may then show his anxiety in some form of retardation or defect in language development."

Gann (1945), covers the whole field of emotional factors and reading problems, and she says that the origin of the personality difficulties of poor readers is in the home environment:

"The writer suggests that these (personality difficulties) have originated in the home situation and that the insecurity and instability have resulted from unfortunate parent and sibling relationships."

The method of research used here was Horschach Tests — which would certainly indicate problems of personality, but would seem not to be sufficiently wide or objective to elucidate the cause of the reading problem. Lynn (1955) used an interview technique (as described earlier) on poor readers and found them to be more anxious both about themselves and others. He does not attribute cause to the anxiety; indeed he maintains that probably too much anxiety is as "undesirable" as is too little.

Fear, jealousy and insecurity are certainly well stressed in their relationship to poor reading. Need they always be causal? A child who fails in school and can see himself failing, feels the encouragements of his parents, but cannot work harder, or achieve more, is liable to experience tremendous emotional disturbance — and certainly this is the case in the experience of many parents of S.D. dyslexics.

Preston (1939) was concerned with the effect on the child of the parental reaction to reading failure. She says:
"In general, failure in arithmetic has been long
accepted in a matter-of-fact way, with the excuse
that the child has 'no head for figures', often adding
that the child 'takes after' the mother ...... The
child that cannot read is one set apart, abnormal,
queer, not quite right."

Preston recorded the reactions of the parents of 72 boys and 23 girls,
all cases of "reading failure". The sample was of equal distribution of
socio-economic class to a series of controls.

Amongst the parents of 'cases', she found 66% of the mothers, and 28%
of the fathers expressed degrees of anxiety. 10% of the mothers and 11% of
the fathers were "baffled", "shocked", "despairing", and "hurt". Fury
and annoyance was expressed by 10% of the mothers and 21% of the fathers.
However repressed such emotions were in the parents, the home life would
seem to be automatically less secure for the child. The feelings were
certainly not all suppressed, as 87% of the parents were reported to make
cutting remarks to the child about reading, and further, 96% reproached
the child for lack of hard work - 67% called the child 'lazy', 40% 'stupid'
and 49% other comments such as 'dunce'. (See the personal account of 'X',
page 107).

In all, Preston says:

"On being asked the cause of failure, 36% of the parents
said it was due to a poor start, 16% blamed it on the
school, one laid it to mental deficiency (i.e. - 112),
one complained that there was no need to read with radios
around, and 52% laid the blame entirely on the child -
(will not concentrate, won't try, too lazy, won't work)."

In 1940 she published a further paper on the insecurity experienced by these
children. She noted that when their reading improved, their security improved also.

Since 1940 it is to be expected that parents would have changed views and attitudes to reading failure, in the light of wider communication on the subject. This, however, does not apply to the majority, nor, most significantly, does it apply to all of the teaching profession. It must be concluded that education of parents and teachers will considerably contribute to the emotional well-being of children who have difficulties in reading.

Much of the lack of consensus on the subject of emotional problems and reading difficulties is due to the qualitative nature of the research. A few workers however have attempted to provide a quantitative aspect.

Gates made an early estimate in 1941 when he reviewed eight studies, all of which were concerned with children who exhibited signs of maladjustment as well as reading problems. In an overall conclusion he reported no very specific patterns of cause and effect, but made some estimates:

"My estimate is that among cases of very marked specific reading disability, about 75% will show personality maladjustment. Of these, the personality maladjustment is the cause in a quarter of the cases, and an accompaniment or result in three quarters."

Thus Gates estimated that about 19% of specific reading disability cases are caused by maladjustment.

Missildine (1946) looked at a group of thirty children seen at a psychiatric department. These children did all exhibit reading problems; but this was not the only reason for referral to a psychiatrist; there were others such as behavioral problems in school, etc. The conclusions from a study of
the 'emotional backgrounds' were that ten children (33%) "were burdened with overtly hostile mothers"; another ten children (33%) "had mothers who were markedly tense, criticizing and coercive in their attitudes towards their children". Four of the children (13%) "suffered from acute sibling jealousy reactions at the time they were learning to read," and a further two were "indulged, then neglected or rejected as they reached school age", and two were "overindulged". He was able to find only one exception to these thirty "insecure, restless, emotionally ill persons". He concluded:-

"We therefore must consider reading disability to be a symptom of underlying emotional illness in a great many children who, having trouble with reading, do not respond promptly to specific remedial techniques."

Perhaps Missildine would not have made such far reaching conclusions had his sample been from other than a psychiatric department of a hospital.

Bouise (1933) studied a group of 30 children, all at least twelve years old, both chronologically and mentally, and of normal or better intelligence but backward in reading. There were 28 superior readers for comparison. A number of measurements of 'adjustment' were made, and the following table is a summary of results:-

Table showing a comparison of a number of good readers, with a number of poor readers, showing maladjustment symptoms.

(Adapted from Bouise, 1933.)

<table>
<thead>
<tr>
<th>READER</th>
<th>NUMBER IN SAMPLE</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good readers</td>
<td>28</td>
<td>Taking test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Showing maladjustment 6 (21%)</td>
</tr>
<tr>
<td>Poor readers</td>
<td>30</td>
<td>Taking test</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Showing maladjustment 14 (4.7%)</td>
</tr>
</tbody>
</table>
Thus, while only 21% of the good readers were maladjusted, 47% of the poor readers demonstrated such. Bouise was somewhat more guarded than Missildine about 'cause and effect', and concluded that, for some children, the reading problem was primary, and for others, the emotional problem.

Margaret Clark (1970) has given figures for maladjustment among her sample of 230 backward readers (aged eight years). The assessment was by teachers. She found that 109 (47.4%) of the backward readers were maladjusted. The criterion used for 'maladjustment' was a score of nine or more on the questionnaire developed by Rutter (1967); this was filled in by teachers. It included 46.4% male backward readers and 48.9% of the female backward readers, and therefore there would seem to be little difference in sex incidence in maladjusted poor readers in this study.

The figures were subsequently broken down into anti-social and neurotic types of maladjustment.

Fig. 15.2 Table showing types of maladjustment in backward readers. (Adapted from Clark, 1970)

<table>
<thead>
<tr>
<th>MALADJUSTMENT</th>
<th>TOTAL MALADJUSTED BACKWARD READERS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anti-social</td>
<td>60 (=55.1%)</td>
</tr>
<tr>
<td>Neurotic</td>
<td>41 (=37.6%)</td>
</tr>
<tr>
<td>Undifferentiated (anti-social</td>
<td>8 (= 7.3%)</td>
</tr>
<tr>
<td>and neurotic scores equal)</td>
<td></td>
</tr>
</tbody>
</table>

There was found to be again no sex difference. There was a tendency for maladjusted backward readers to be anti-social rather than neurotic.

For the Isle of Wight Survey (Rutter, Tisard and Whitmore, 1970) a control group was used and this allowed a wider deduction to be made from the results.
Fig 15.3 Table showing the results of Parental and Teachers' Questionnaires on Adjustment of a Group of Retarded Readers and a Group of Controls

(Adapted from Rutter, Tizard & Whitmore)

<table>
<thead>
<tr>
<th>QUESTIONNAIRE</th>
<th>CONTROL GROUP</th>
<th>CHILDREN WITH SPECIFIC READING RETARDATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parental questionnaire (score 13+)</td>
<td>Number maladjusted 11 (7.7%)</td>
<td>Number maladjusted 20 (24.1%)</td>
</tr>
<tr>
<td>Neurotic</td>
<td>3 (2.1%)</td>
<td>6 (7.2%)</td>
</tr>
<tr>
<td>Anti-social</td>
<td>4 (2.8%)</td>
<td>10 (12%)</td>
</tr>
<tr>
<td>Undesignated</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Total number tested:</td>
<td>143</td>
<td>83</td>
</tr>
<tr>
<td>Teachers' questionnaire (as used by Clark, 1970) (score 9+)</td>
<td>Number maladjusted 14 (9.5%)</td>
<td>Number maladjusted 32 (37.2%)</td>
</tr>
<tr>
<td>Neurotic</td>
<td>7 (4.6%)</td>
<td>11 (12.8%)</td>
</tr>
<tr>
<td>Anti-social</td>
<td>7 (4.6%)</td>
<td>20 (23.6%)</td>
</tr>
<tr>
<td>Undesignated</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Total number tested:</td>
<td>147</td>
<td>86</td>
</tr>
</tbody>
</table>

For comparisons with control group

$^*$ = $p$ 0.05
$^{**}$ = $p$ 0.001

The results shown above demonstrate a considerably higher frequency of anti-social retarded readers than controls, and while neurotic tendencies of the former were slightly higher than of the controls, this was not statistically significant. These findings are in approximate agreement with those of Clark (given above), although on the whole there were found to be
more reading retarded anti-social boys than girls and the girls tended to become more neurotic than boys here. The questionnaire items were broken down, and the most significant in comparison with the general population (significant at level $p < 0.001$) were as shown below:

![Fig. 15](image)

Table showing the most significant items on the Behavioral Questionnaire for a Group of Retarded Readers and a Control Group.

(Adapted from Rutter, Tizard and Whitmore, 1970)

<table>
<thead>
<tr>
<th>ITEM GROUP</th>
<th>PARENTAL QUESTIONNAIRE</th>
<th>TEACHERS' QUESTIONNAIRE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BOYS</td>
<td>GIRLS</td>
</tr>
<tr>
<td>'Motor' items</td>
<td>Fidgety; Poor Concentration.</td>
<td>-</td>
</tr>
<tr>
<td>Developmental Items</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Anti-social Items</td>
<td>Destructive; Fights; Disobedient; Steals.</td>
<td>Fights.</td>
</tr>
<tr>
<td>Relationship Items</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Neurotic Items</td>
<td>Miserable; School tears.</td>
<td>-</td>
</tr>
<tr>
<td>Other Items</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Further analysis of the results from the Isle of Wight Survey revealed "that about two fifths of the children (both boys and girls) with a disorder involving anti-social symptoms, were severely backward in reading". This was a very much higher rate than for the control group, and was not explained by the preponderance of boys. The reading ability of neurotic
children was little different from that of the normal population.

In endeavouring to establish a cause and effect relationship that would explain the relation between anti-social behaviour and reading retardation, a comparison was made between retarded readers with anti-social behaviour and a group without anti-social behaviour. The characteristics tested were such as those discussed throughout this thesis as being 'symptoms' of specific developmental dyslexia - e.g. imperfect right-left differentiation, etc. No statistically significant differences were found, and from this it appeared that reading retardation in children with and without anti-social behaviour was similar in nature. This refuted the hypothesis that anti-social behaviour was causal to reading problems. Rutter, Tizard and Whitmore could not isolate any groups in which this hypothesis seemed valid.

In order to sift the results further, comparison was made between good and poor readers (all male) among the anti-social group. Here again, there was much similarity. The only significant differences were that good readers had more difficulties in sleeping (a perhaps surprising result); poor readers were more frequently of "very poor concentration" at school; and came from broken homes more often; and good readers came from families with four or more children significantly frequently. These items were not very useful in respect of cause and effect, as they tended to show that "the children with both reading retardation and anti-social behaviour had more in common with children with 'pure' reading retardation than with a 'pure' anti-social disorder".

Rutter, Tizard and Whitmore were not finally able to indicate which of two hypotheses explained their results more satisfactorily - either that "the reading difficulty is the primary handicap which then leads to secondary anti-social problems, or that both psychiatric and educational difficulties stem from a third group of factors evident in the child and his family
from an early age in the child's development". (Quoted from Yule and Rutter (1968) - a much briefer account of the research on maladjustment.)

The work of Rutter et al. on the link between maladjustment and reading problems is very valuable in particularly two aspects. Firstly, in the depth and detail to which it extends, and secondly in the manner that it emphasises the problem of maladjustment in poor readers and that the latter is not just the result of the former. It is to be hoped that this work will inspire future research that will ultimately unravel the complicated cause and effect relationships.

In this discussion not all cases discussed have been specific developmental dyslexies. Since the same emotional disturbing influences are likely to be evident in any cases of severe reading difficulty, the wider survey is justified. Many would say that a cause of severe reading difficulties is maladjustment, or emotional blocks, etc. This may be so for some children, but Gates, in a period when such thinking was very common, estimated that only 19% of reading difficulties were caused by this, and Rutter, Tizard and Whitmore could find no evidence that any such group of children existed in their survey. Despite this, the three fairly close reports of the percentage of reading difficulty cases with problems of maladjustment must be explained.

**Figure 15.5** Table showing Summary of Results Reported in Previous Tables of Findings on Maladjustment and Reading Difficulties.

<table>
<thead>
<tr>
<th>Writer</th>
<th>Date</th>
<th>% Reading Difficulty Cases Showing Maladjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bouissé</td>
<td>1955</td>
<td>47.4%</td>
</tr>
<tr>
<td>Clark</td>
<td>1970</td>
<td>47.4% (Teachers' Questionnaire)</td>
</tr>
<tr>
<td>Rutter, Tizard &amp; Whitmore</td>
<td>1970</td>
<td>24.1% (Parental Questionnaire)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>37.2% (Teachers' Questionnaire)</td>
</tr>
</tbody>
</table>
An adequate explanation of this high percentage of maladjustment among cases of reading difficulty, would seem to be made in terms of the pressures of society on the child who cannot read as well as his peers. Probably the percentages reported above do not reflect sufficiently the universality of the link between failure and anxiety.

To conclude this account of the relationship between emotional factors and reading difficulty, a passage from a paper written in 1930 is presented. It was written by J. Strachey (the biographer of Freud), and illustrates the lengths to which some go to attribute emotional reasons to the presence of a reading problem in a child -

"According to Freud, the book stands for a woman, and it will be seen that this by no means contradicts Ernest Jones' interpretation of printed matter as faeces. For if the book symbolises the mother, its author must be the father, and the printed words the author's thoughts, fertilizing and precious, yet defiling the virgin page, must be the father's penis or faeces - within the mother. And now comes the reader, the son, hungry, voracious, destructive and defiling in his turn eager to force his way into his mother, to find out what is inside her, to tear his father's traces out of her, to devour them, to make them his own, and to be fertilized by them himself."

Further references to the subject of emotional disturbances and specific developmental dyslexia and reading difficulties are to be found in: - Morris (1966); Corton (1964); Kallmer Pringle (1965); Gann (1945) - a good review of other literature; Monroe (1932); Cricklady (1970). These are observations made on fairly large numbers of children.

Zolkos (1951); Kanner (1943); Wolfe (1941); Stewart (1950);
Spaeehe (1954); Blanchard (1927) and Norman and Daley (1959). These are somewhat more generalised.

Young and Geier (1951); Miller and Kole (1965); Stratten (1955); Louitt (1955); Kurk and Steinbaum (1957), and Malpass (1955). These are concerned with specific aspects of the subject.

Factors of Birth Order and Adoption Rate.

Neither of the observations discussed in this section are substantiated in a sufficient manner to dismiss the involvement of chance completely. More work is needed on them, first to determine statistical probability and then to investigate the problem in more detail.

The first is the observation that a specific developmental dyslexic tends to be among the younger rather than the older children in a large family.

Rawson (1968) collected the following data from a group of 56 boys. Those were classified according to the severity of their language disability. Medium ranking included 16 boys either mildly dyslexic, or non-dyslexic "but with some symptoms of language difficulty". Low ranking included 20 boys with "moderate or severe dyslexia".

Fig 15.6 Table of Birth Order of Cases of Language Disability and Specific Developmental Dyslexia
(Adapted from Rawson, 1968)

<table>
<thead>
<tr>
<th>SIBLING POSITION</th>
<th>NO. FAMILIES IMPLICATED</th>
<th>MEDIUM RANK</th>
<th>LOW RANK</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only Child</td>
<td>9 (=16%)</td>
<td>1 (= 6%)</td>
<td>5 (=25%)</td>
<td>6 (=17%)</td>
</tr>
<tr>
<td>Oldest of 2+</td>
<td>47 (=84%)</td>
<td>7 (=44%)</td>
<td>5 (=22%)</td>
<td>13 (=22%)</td>
</tr>
<tr>
<td>Middle of 3+</td>
<td>24 (=43%)</td>
<td>3 (=19%)</td>
<td>3 (=15%)</td>
<td>6 (=17%)</td>
</tr>
<tr>
<td>Youngest of 2+</td>
<td>47 (=84%)</td>
<td>5 (=31%)</td>
<td>4 (=20%)</td>
<td>9 (=15%)</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>56 (=100%)</td>
<td>16 (=100%)</td>
<td>20 (=100%)</td>
<td>36 (=100%)</td>
</tr>
</tbody>
</table>


The table is complicated by the fact that in some cases, more than one child comes from the same family. Reason was unable to find any significant results from these in the table, though the order of the four categories - from largest to smallest number affected - would seem to be:

- Only children
- Oldest of 2+  In medium or low language
- Middle of 3+  learning faculty rank
- Youngest of 2+)

This, while being non-significant statistically, does suggest an opposite result to that obtained more frequently elsewhere.

Critchley (1970) found the following birth order among his sample:

<table>
<thead>
<tr>
<th>BIRTH ORDER</th>
<th>MALES</th>
<th>FEMALES</th>
</tr>
</thead>
<tbody>
<tr>
<td>First born</td>
<td>31</td>
<td>6</td>
</tr>
<tr>
<td>Second born</td>
<td>39</td>
<td>9</td>
</tr>
<tr>
<td>Third born</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Fourth born</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Fifth born</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>Adopted</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>100</td>
<td>25</td>
</tr>
</tbody>
</table>

This table would be more informative if some datum on family size were to be included. If, however, it is assumed that the majority of these children were from families with two or three children, then the second born would seem to be more likely to be S.D.-dyslexia than the first. Critchley pointed out that data on maternal age would have complemented this table. He gave a number of findings on birth order from other workers. Of these, (other than the Reason study mentioned above), two suggest that the eldest
child, or solitary child, is not often affected, two suggest that the youngest child is more often affected, and one suggests that the results are probably not significant.

The results of research on birth order are not conclusive, but do suggest that more detailed work might implicate the younger child (or the child born at a relatively late age) as more frequently S.D.dyslexic. Such a finding would tend to uphold the views that S.D.dyslexia can originate from pre-natal brain damage.

A number of workers have noted that the percentage of adopted children in samples of specific developmental dyslexics is high. Silver (1970) has analysed a sample of 80 children with 'neurological learning disability syndrome' (not necessarily the same as S.D.dyslexia). Ten of the sample were adopted, all before three months and all from non-relatives. In every case the child was thought to be normal at the time and abnormalities were noted between the ages of two and three years. The proportion of one in eight was three or four times the national average (one in twenty-six) and five times the local average (New Jersey, where one in forty were adopted).

Research on the adoption rate for any group of children is severely handicapped by the difficulty of obtaining pre-adoption data, a necessity if the problem is to be elucidated. It would be essential to know the academic status of the real parents, and information about the condition of the pregnancy - nutrition of the mother, drugs administered to her (for example, drugs prescribed for depression or other emotional disturbance, which are less likely to be taken by a mother who was keeping her child), and the nature of the delivery. Until such data is made available for analysis, Silver notes that there is little more possible than observation of the figures. It would seem likely (if the adoption rate for specific developmental dyslexics is high) that the reason for it will be found in
the conditions of pregnancy, i.e. minimal brain damage will have been caused in the child.

McGlannan (1968) has demonstrated the possibility that the incidence of twinning may also be higher among 'cases of genetic dyslexia'. He studied three generations of 65 families and found that twinning was 26.3% higher than the expected rate of one in eighty-eight to one in one hundred and ten. Such a finding would probably be explicable in terms of deficient nutrition or oxygen.

McGlannan produced some other interesting statistics as a result of this pilot study. He found, for example, that an inproportionate number of individuals had fair or ginger hair. This is supported by another observation that there are many blue-eyed S.D. dyslexics. McGlannan also noted certain unusually frequent drug reactions. He suggested from his study that a 'vulnerable family' syndrome exists. It is unfortunate that some of the new relationships that he purports to have found have not been further investigated.
Perhaps the most demanding aspect of any attempt to explain the cause of specific developmental dyslexia is the number of factors or characteristics that must be included. However, it is probably the very existence of these that maintains the concept of constitutional dysfunction—rather than one of environmental, emotional or educational origin.

The nature of this chapter as a summary is an attempt to clarify exactly what a theory of causation of specific developmental dyslexia must explain. This will be a basis for the discussion of some of the proposed theories in the next chapter (chapter 17).

Thus, a theory of cause of specific developmental dyslexia must provide explanation for the following:

A) The Major Symptom

1. The difficulties encountered by the specific developmental dyslexic in reading, spelling and writing (chapter 11).

Reading, writing and spelling are interrelated and a problem in one sphere may be reflected in the other two.

The types of faults made are—reversals, lack of recognition, lack of recollection, lack of blending skills, lack of word analysis ability, poor auditory discrimination, poor visual discrimination, poor auditory or visual memory, etc. Specific to writing are—poor, untidy writing, and the lack of ability to find words to fit the meaning intended.

Many of the faults cited may be related to one another, and
may be functions of a generally poor visuo-spatial or temporal ability.

2. Difficulties in drawing.

3. The presence or absence of difficulty in working with musical notation in the presence of reading difficulty.

4. The presence or absence of difficulty in signalling Morse and other such symbolic languages in the presence of reading difficulty.

5. The difficulty in working with one linguistic form rather than another.

6. The presence or absence of difficulty in working with numbers, of single or multiple digits, in the presence of reading difficulties.

8) The Minor Symptoms, or Characteristics.

These may be observable only when a very large sample is surveyed, or the tendency may clear in observing only a few cases. Some in the former case may be artifacts due to research methods. The first is an example.

1. The differing reported incidences in different countries.

2. The differing incidence of S.D.dyslexia reported in males and females.

3. The involvement of a hereditary transmission of a particular cause.
of, or predisposing factor to, specific developmental dyslexia.

4. The lack of, or late development of, established lateral preferences.

5. The possibly higher incidence of left handedness and ambidexterity in S.D. dyslexia cases as compared with the normal population.

6. The higher incidence of directional confusion in S.D. dyslexics as compared with the normal population.

7. The higher incidence of poor finger localization in S.D. dyslexics than in the normal population.

8. The relatively late development of speech.

9. The presence of speech defects.

10. The family history of speech problems.

11. The general paucity of the use of language (complexity, use of vocabulary, etc.)

12. The presence of defects in motor activity (clumsiness, lack of fine control, etc.)

13. Pregnancy difficulties and serious illness in childhood.


15. General disorientation in space.

16. Poor perception of rhythm.

17. Slow in learning to 'tell the time'.

18. Poor sequencing ability.

19. Poor auditory discrimination.

20. Poor visual discrimination.

21. Poor auditory memory.

22. Poor visual memory.

23. The presence of emotional factors.

24. The possibly higher incidence of specific developmental dyslexia in children born last. This may implicate maternal age.
The fact that the minor symptoms of specific developmental dyslexia improve and disappear during the first twelve years of life, and that the reading, writing, and spelling problems tend to undergo a rapid improvement at puberty.

That few specific developmental dyslexias exhibit more than a dozen of these minor symptoms — and some may exhibit only one or two if any at all, in addition to the reading problem.

The close observation made of each of the minor symptoms yields a further point — the fact that there is much interrelationship between the factors. For example, laterality abnormalities are mentioned in the literature as being associated in some cases with speech problems, spatial difficulties, motor factors, poor use of language, and so on. This applies both to children with reading problems, and children without associated reading problems. This may mean that many of the minor symptoms mentioned separately in fact are sub-groups of a more general category of disability, or developmental characteristics. However, to explore the extent of the interrelationships, a diagram has been constructed to show the links between the minor symptoms of S.D. dyslexia that have been mentioned separately. The relationships are either obvious (e.g. that a child who is generally disorientated in time, will be late in telling the time), or are mentioned in the literature, though they may not have been alluded to previously in this thesis (e.g. Naidoo, 1961) reports that Rilitee (1941) found that children with speech defects were more clumsy than those without).

Fig 16.1 Diagram Illustrating the Interrelationships of Minor Symptoms of Specific Developmental Dyslexia.

(Some relationships are possibly invalid, whereas others unmarked may be valid. The diagram is designed to give a general picture only).
SPECIFIC DEVELOPMENTAL DYSLEXIA.

- Sex Incidence
- Pregnancy/Birth Factors
- Birth Order/Maternal Age
- Motor Factors
- Speech Factors
- Genetic Transmission
- Laterality Factors
- General Paucity in Language Use
- Directional Confusion
- General Spatial Disorientation
- Poor Finger Localization
- General Temporal Disorientation
- Poor Visual Memory
- Poverty Discrimination
- Lack in Telling Time
- Poor Auditory Discrimination
- Poor Auditory Memory
- Poor Rhythm Paraphon
- Poor Sequencing Ability
- Variation in Performance
The large number of minor symptoms that may or may not characterize any one case of S.D.dyslexia, has lead to suspicion that there is more than one syndrome described under the term specific developmental dyslexia. Such a proposition helps in the explanation of the number and variety of symptoms; however, the existence of sub-groups is not clear and many deny the validity of the hypothesis. The possibility of sub-types is not likely to be shown in the diagram (Fig 16.1), since this includes all minor symptoms and it has been shown that most S.D.dyslexics have but few. However, the diagram might be suggestive of sub-types if symptoms present in one case were, indeed, found to be related. This is the manner in which some workers have proposed sub-groups.

Ingram is an example of one worker who claims the existence of sub-types. The basis of his work is in the aspects of speech, and this was discussed in chapter 14. He suggests that three types of specific developmental dyslexia exist (1964 - these groups result from re-categorisation of those mentioned in chapter 14). One group includes children with difficulties in the realm of speech - sound difficulties. These are termed the 'audio-phonic dyslexics'. The second group is the 'visuo-spatial dyslexics'. The third group is inclusive of those with both speech-sound and visuo-spatial difficulties. The first two groups are classified similarly by Kinsbourne and Warrington (1963), and Johnson and Myklebust (1967), but these workers use different terminology. Many workers on the remedial side would also agree with this breakdown as they deal very specifically with manifest weaknesses and strengths, and hence notice the children whose difficulties are on the auditory or visual side in particular.

Critchley is somewhat critical of the concept of sub-types -

"....the supporting evidence is not yet convincing ......

Clearly these are interesting ideas, but today they cannot be regarded as more than expressions of opinion."

Such a criticism is not very useful, since the concept of sub-types as held by most workers is in the form of a model for comparison with findings in future research. No evidence has been presented in this survey of the literature that contradicts the possibility of sub-types. Indeed, if the cause of specific developmental dyslexia is in the nature of a brain lesion or an immature area of the brain, it is not unlikely that the brain area affected is one determining visual or auditory skills specifically.

Similarly, it might be the case that every individual spells by sound or by sight recognition of a word, and that such deficiencies or proficiencies are more marked in specific developmental dyslexies, either as a consequence of their efforts to learn, or as a consequence of the fundamental disability.

Despite the controversy about the existence of sub-types, the concept is both valid and useful in the teaching situation, and thus should be regarded far more concretely than "expressions of opinion".
CHAPTER 17

THEORIES OF THE CAUSE OF SPECIFIC DEVELOPMENTAL DYSLEXIA

This chapter will primarily examine theories of what is the cause of specific developmental dyslexia. In so doing, it will consider two questions, the first of which will have been largely answered previously in the thesis; however, it is of importance for the conclusion.

1. Does the "theory" explain any cases of specific developmental dyslexia at all?
2. Does the theory explain specific developmental dyslexia?

The word 'theory' and 'hypothesis' will be used interchangeably. However, the latter is properly correct.

Some of the theories to be discussed have been included in detail in the chapter relevant to their subject matter. Others will be discussed in detail in the current chapter.

General Theories

Emotional Causation.

This is discussed in chapter 15. It explains very few of the minor symptoms - e.g., unusual lateral preferences. It does explain why some children are emotionally disturbed, although this factor would seem to be very much a consequence of a reading problem rather than a cause. There
may be a few children who are wrongly diagnosed as specific developmental dyslexics, and yet are so emotionally disturbed as to cause a reading 'block'. In such cases one would expect the presence of very few, if any, of the minor symptoms linked with S.D.dyslexia.

There are a number of theories based on psycho-analytic considerations, but to the writer these appear bizarre and without observable foundation, and the explanations proffered for the reading failure tend to be fitted to the individual case in a scientifically unacceptable manner.

**Environmental Factors** - Home and School, and Educational Factors.

Environmental and Educational factors certainly can be causal to reading difficulties. A poor background wherein there is no encouragement towards educational achievement, and no opportunities for private study is very likely to have a down-pulling influence on potential. Similarly, to a degree the child is limited in achievement by his intellectual level; however, these factors do not adequately explain many of the very wide range of symptoms that are commonly associated with specific developmental dyslexia. There may be some difficulty in distinguishing S.D.dyslexia from low I.Q. as causal to a reading problem, where the latter is below 70-80.

**Sensory Factors.**

The role of sensory deficiencies was discussed in chapter 3, and chapter 4. Certainly some children are held back in early reading by sensory defects, and a number of ophthalmologists have reported large numbers of visual defects in S.D.dyslexics. Their findings are somewhat difficult to explain in the light of current research, in which visual and
auditory testing is one of the first aspects of any project. No current findings suggest that sensory deficits are causal to S.D.dyslexia, although a child who does not hear, perhaps over a small frequency range, may exhibit some of the minor symptoms of S.D.dyslexia — e.g. on the visual and auditory side. He may also look awkward, and exhibit bizarre spelling.

Hormonal/chemical Cause.

Smith and Carrigan have put forward a very elaborate theory to explain the cause of specific developmental dyslexia (1959). It is based on the concept of an imbalance (compared with that normally expected) between acetyl choline and choline esterase in the brain. These substances are concerned in the mechanism of transmitting a nervous impulse from one nerve cell (neurons) to another across a small gap, known as the synapse. Acetyl choline is the transmitter substance, and choline esterase is an enzyme that hydrolyses it, thus re-creating the original state, ready for another nerve impulse to pass.

In describing their ideas, Smith and Carrigan use the example of blending skills, certainly very significant in the process of learning to read, especially by a phonic method. Blending involves the fusion of two consecutive sounds. The first phoneme, they say, sets in motion a reverberatory system of nerve impulses in a neuron network. If acetyl choline secretion is too high then there will be insufficient choline esterase to hydrolyse it all, and the synapse will not be ready for a second impulse. When ready at last, the reverberation of the system for the first phoneme will have ceased and the phonemes will not be easily blended.

They use a similar explanation (that one input cannot be compared with a subsequent input) to account for slow reading rate, poor comprehension, and some discriminatory difficulties.
They link the imbalance of acetyl choline and choline esterase with a dysfunction of the endocrine system, and on this observation they base therapy, suggesting that there has been some success with this method. The involvement of the endocrine system in the theory suggests also some explanation for the role of anxiety in reading difficulties. They propose that anxiety determines an excess production of epinephrine (adrenalin) and nor-epinephrine (nor-adrenalin), in the adrenal medulla. This, in turn, inhibits acetyl choline and enhances cholinesterase — again creating an imbalance.

This chemical theory appears to explain much, and could be extended to explain many of the 'minor symptoms'. However, it appears to be very naive in its treatment of the neurological facts. For example, Bell, Davidson and Scarborough (1963) say:

"Although there is ....... strong circumstantial evidence implicating acetyl choline as an important central transmitter, it is still not known for exactly which interconnection within the brain are cholinergic".

This was written six years after the publication of Smith and Carrigan's book.

While the theory in its entirety would thus appear naive, there still is the possibility that a metabolic dysfunction may cause symptoms that include reading failure — as well as the minor symptoms. Many mental defects are caused in this manner, and when the cause is discovered treatment has been totally effective. The defect may be in the form of the lack of ability to metabolize a substance found in food, harmful proportions of which, or a derivative of which, may affect the brain in a specific area. There are certainly some known hormonal defects that will affect reading along with other features of learning and behaviour, for example, hypothyroidism.
Another possible cause of specific developmental dyslexia, not mentioned in the literature, is that of an external chemical agent. One such example is lead, which has increased vastly in the human environment since it has been added to petrol as an anti-knock device. Lead attacks the nervous system, and in excessive doses damages the brain. Children who, for some reason have been so exposed, show a range of symptoms which are similar to those exhibited by cases of brain damage at birth, i.e. mental retardation, immaturity in mental development and so on. The effect of the symptoms is accompanied by emotional disturbance. Some experiments of treatment of the cases with the antidote to lead poisoning have shown some tentatively positive results. References to this are Bryce-Smith, 1971 (a and b).

While it would be wrong to make any conclusion on this, such possible causes of specific developmental dyslexia must not be ignored, particularly since the recorded incidence of S.D.dyslexia has increased approximately in parallel with those for lead in the human environment - (although, as was mentioned in chapter 9, the former statistic is probably an artifact of recording efficiency).

Theories of a More Specific Nature.

Theories based on aspects of cerebral dominance.

A number of theories are based on the observation that specific developmental dyslexias are more likely to lack stable lateral preferences. Such theories are apparently tenable on the surface, especially in the consideration of the large number of minor symptoms associated with specific developmental dyslexia that occur with laterality abnormalities in otherwise normal children. (Fig 16.1).
The main theory to be discussed in this section is that of Orton. He suggested basically that S.D. dyslexia is caused by the imperfect irradiation of the visual image received by the non-dominant hemisphere. The result is the creation of a mirror image. Despite the current wide acceptance of this theory, it suffers from naivety. Why is it that only symbols are affected? Why is only one letter in a word reversed? How does it explain the existence of strongly lateralized S.D. dyslexics, and ill-lateralized normal readers? Similarly, Orton's theory does not explain some of the minor symptoms very efficiently. The criticisms above are discussed in more detail in chapter 13.

Another theory which can be criticised on much the same grounds is that of Newton (1970), again described in chapter 13. Basically she suggests that a difference exists in the cortico-lateral organisation of normal readers and S.D. dyslexics. She says further that the type of organisation in the latter - ambilaterality - predisposes them to good visuo-spatial ability, and poor language abilities. This seems strange when it is considered that a number of workers actually name a type of S.D. dyslexic who has particularly marked difficulties on the visuo-spatial aspect.

Apart from the criticisms already mentioned under Orton's work, others to be made of Newton's hypothesis mainly concern her methodology (the use of the E.E.G. patterns of her subjects), and parts of her hypothesis which she retains despite totally opposite experimental findings. Certainly Newton's ideas are far from verification by any experimental work as yet performed.

Zangwill puts forward three hypotheses (chapter 13) which are designed to account for the relationship of atypical cerebral dominance to specific developmental dyslexia. The first is that poorly developed laterality and reading backwardness are due to the effects of a brain lesion. The second suggests that some ill-lateralised children are defective in aspects of maturation, and the third is that ill-lateralised children are more
susceptible to stress (e.g. minimal brain damage).

The lack of positive dictum makes Zangwill's suggestions more valuable than that of Newton, and it appears likely that one of the hypotheses will ultimately be found to be closer to the facts than others, if, that is, all three are not tenable in some cases.

The hypotheses of a more specific nature than those of Zangwill are open to a wide range of criticism in their inability to explain the cases of specific developmental dyslexia which are strongly right-sided, and the cases of normal children who are imperfectly lateralised or sinistral. If, however, these hypotheses are to be rejected, then the factor of cerebral dominance abnormalities must feature high on the list of factors to be explained by any other theory.

Theories which implicate Brain Damage as fundamental to Specific Developmental Dyslexia

Hermann and Norrie have strongly argued that S.D. dyslexia is a developmental form of Gerstman's syndrome. This was discussed in chapter 13, and it was concluded that the link was somewhat tenuous, and while the analogy is acceptable, it is too vague to raise to the importance that Hermann and Norrie ascribe to it.

Birch (1962) proposed three possible explanations for the cause of S.D. dyslexia. These are based loosely on a factor of brain damage being fundamental to the impairment of the perceptual organisation in the developing child.

The hypotheses are:

1) That sensory faculties develop in a hierarchical manner. Thus, to a young child, visceral stimuli are of greatest importance, and auditory and visual stimuli are disturbing rather than helpful in their perception.
He suggests that later this position is reversed. However, perhaps in some children the change does not occur. They then have great problems in reading. He says that research on this hierarchical organization might yield interesting results.

2) That the intersensory patterning mechanism is impaired. Thus visual and auditory equivalences are not created.

3) That different levels of perception exist, and while it is very difficult to break down the ability to distinguish an object, it is relatively easy to impair the ability to perceive words.

The hypotheses put forward by Birch and Zangwill are on entirely different levels, and could, indeed, be complementary to each other, Zangwill concentrating on the original cause, and Birch on the intermediate pathway. It is hard to criticise Birch, since his ideas are probably all equally feasible, separately, if not more feasible in combination. It may be that the defect however, implied in S.D. dyslexia, operates at a higher cognitive level than is suggested in any of the three hypotheses.

The other principal theory of the cause of S.D. dyslexia which is based on brain damage, is that of Kadi and Pasamanick. This was discussed in detail in Chapter 15. They suggest that there is a continuum of reproductive causality from prenatal death through cerebral palsy and mental deficiency to behavioural and reading disorders. This hypothesis would appear to explain a proportion of cases, but it is unlikely to be relevant to cases where birth was completely normal.
Naturational Lag Hypothesis.

The concept of a maturational lag was put forward by Bender (1958) and implies that an area of the brain is lagging in the maturational process. This explanation is consistent with the frequent observations that S.D. dyslexics are immature in behaviour and abilities, compared with others of similar chronological age. It is also consistent with the observation that most of the minor symptoms are only significant as defects when the age of the child is taken into consideration. That is, that they are the persistence of a normal developmental stage to a point at which it is abnormal. For example, the articulatory errors of a specific developmental dyslexic are nearly the same as the speech sounds last acquired by a potentially normally reading child.

The theories of maturational lags cannot be entirely differentiated from those of brain damage, since it is conceivable that minimal brain damage will cause a lag in the development of that part of the brain.

Throughout the later chapters of this thesis, many of the proposed causes of specific developmental dyslexia have been continuously reviewed for their explanatory power of the minor symptoms of the syndrome. The proposal that emotional factors are causal is excluded on many grounds. That of brain damage or of maturational lag is upheld in virtually every case, although each frequently required closer definition. For example, to comply with the notion of a genetic transmission, a brain lesion would require to be localized or restricted to one particular physiological system (e.g. the vascular system). A similar argument would apply to a maturational defect.

The factor of unusual lateral preferences is explained adequately by either theory. If minimal damage or a maturational lag is present
when cerebral dominance is being established, the process could be liable to
disruption, such that genetic potential is reversed, or the stabilization is
delayed. This explanation is also applicable to the observations of late
speech development, since speech is related to the establishment of hemis-
pheric dominance. Other minor symptoms may be explained in a similar
manner - or more directly, that a maturational lag or small lesion affects
their development.

There are some factors that are not explained adequately by either
theory. First the observation that drastic improvements in reading and
other deficiencies usually occur at puberty but still leave bizarre spelling
and poor reading. If an area of the brain is lagging in development, why
this sudden spurt, and then the persistent poor spelling - and probably
poor reading as well? Why does this brain area never apparently 'catch
up'? This is the most difficult criticism for the proponents of matura-
tional lag theories to explain. It is, perhaps, possible that for the
presence of the complete ability in language functioning, there should be
parallel development of all areas of the brain. If this were the case it
would parallel the mechanism that occurs in the developing embryo, where
substances, produced at a certain maturational stage of one process, stimu-
late another to start.

The principal criticism to be leveled against theories of brain damage,
is that in many cases, despite detailed neurological examination, no evi-
dence is found that implies the presence of a lesion. In other cases,
where identical symptoms are manifested, a lesion can be clearly detected.
Perhaps the most common attitude to the dilemma is to assume that, in termi-
nology at least, that two types of reading disability exist, both with similar
symptoms, but one being specific developmental dyslexia, and the other, still
called 'dyslexia', but used when the symptoms clearly originate from a
lesion in the brain. Many workers, while naming these syndromes separately,
pronounce them as inseparable in practical diagnosis. The distinction remains, therefore, hypothetical. Examples of these terminologies are to be found in chapter 6.

Critchley is one of the few workers who argues that specific developmental dyslexia is clearly distinct from brain damage cases, in both cause and diagnostic criteria. His reasons for such an opinion are based on three observations. Firstly, he argues, the hereditary characteristics of S.D.dyslexia are strong; secondly, that no lesions have yet been located in children diagnosed as S.D.dyslexic, and thirdly, that minimal brain damage in early life would be compensated for by the plasticity of the nervous system. This last remark does not, it seems, refer to observed cases of brain damage, with reading difficulties directly attributable to the lesion. He says:

"In all probability, the cases of reading retardation which have been observed after brain traumas at birth differ from the genuine instances of developmental - i.e. specific dyslexia. They probably belong to the category of 'symptomatic dyslexias', where problems in learning are associated with unmistakable and incontrovertible evidence of cerebral damage."

Therefore, while it would be very desirable to come to a firm conclusion about the cause of specific developmental dyslexia, to do so on the grounds of current knowledge would seem to require the omission of important facts. It is therefore concluded that S.D.dyslexia may be caused as the result of congenital brain damage, a congenital predisposition to some form of lesion, or it is the result of a specific lag in the maturation of an area of the brain. It is possible also to hypothesise a situation wherein a combination of brain damage and maturational lag is present.
Here, it is suggested, a very minor damage might be totally undetectable, and act as an inhibition on the part of the brain that it affected. If this were the case, it would be possible to envisage as a continuum, starting at the point at which that of Kawi and Pasamanick leaves off.

Both the brain lesion and/or maturational lag are suggested to be placed in an area of the brain whence they are liable to affect a large number of developmental processes, while not affecting the intellectual capacity of the individual. Such an area would seem to be in the parieto-occipital area of the brain.

Thus the most probable explanation, in terms of causal diagram, is as set out on the next page.
With these conclusions about the cause of S.D. dyslexia, the model of reading abilities can now be adapted to demonstrate factors that will cause reading difficulties, including specific developmental dyslexia. (See the model in chapters 2, 3, and 6.) The model of reading difficulties is thus presented below (Fig 17.1).
The other hypotheses, rejected as inadequate causal explanations for specific developmental dyslexia are:

- Emotional Factors.
- Environmental Factors.
- Educational Factors.
- Motivational Factors.
- Sensory Factors.
- Chemical/Hormonal Factors.
- Factors related to Cerebral Dominance.

Undoubtedly, the first five groups mentioned are causal to reading problems; not, however, of the nature of specific developmental dyslexia. Chemical/hormonal factors and those related to cerebral dominance are not acceptable in current form, but may possibly be tenable in some respects, and hence, while rejected now, they must be considered in all future research.
CHAPTER 18

THE PREDICTION OF READING DIFFICULTIES

One of the most important features of the practical side of the study of specific developmental dyslexia, or any reading difficulty, is that of its early detection. This is a field of study strangely neglected, and where work has been done it is in urgent need of being applied in the schools. (See Ingram, 1969).

Ravenette (1968) justifies this need -

"Persistent failure leads to an identity of failure which leads to a prediction of failure by both child and parents. This chain of events is difficult to break . . . . Reading failure in an older child starts with an incipient reading failure in a younger child age. Unfortunately, the child who is retarded in reading is not usually recognised as such until he is eight or nine years old."

Naidoo (1970) says - (speaking of the specific developmental dyslexic) :-

" . . . . early identification is not always easy, since certainty of diagnosis rests on a real failure, which is not usually apparent until a child is seven and a half or eight years old. An indication of future failure can be obtained at an earlier age, although a child may then come under suspicion unnecessarily. But surely it is better so to err even if occasionally it means helping a child who
Banks (1970) introduces her prediction study -

"There is a need to identify a child with learning disabilities as early as possible, in order to stimulate the areas of maturational lags, minimise the development of faulty learning patterns, leading to educational failure and to prevent the secondary emotional disturbances which frequently constitute a further handicap, leading to a devalued self image and personal failure."

In this chapter, the term specific developmental dyslexia is not included in the title. This is because all natures of reading difficulty require to be discovered at the earliest possible point in time. It is thus necessary to deal with a vast range of causation, and therefore the predictive indices must be correspondingly wide, without in any way being generalised. While an index for all reading problems is the ultimate aim, most currently existing work in this field is biased towards the prediction of only certain types of problem.

Another consideration about the prediction of reading difficulties is the time span to be covered. This will directly affect the components of the index. The three examples that follow are short term studies, and relied on single areas of function - reading, listening and visual discrimination.

Hoe (1957) used 'auding' as a basis. This covers a wide area of ability including the comprehension and interpretation of language. It was compared as a predictor of reading success with mental age - verbal and non-verbal I.Q. test. Auding was shown to be a useful predictor in early
grades, but more efficient when mental age was held constant.

Lauderville (1958) investigated the value of a first grade 'listening test'. This was administered at the beginning of the first grade, and its effectiveness of prediction was tested at the end of the year. This test would seem to have been concerned with similar aspects to the auding test of Moe, since it "attempted to measure pupils' ability in these areas of reading following directions, noting detail, concepts of sequence resolving main ideas and making inferences". Tests of reading were administered at the same time — and in all, 174 children were involved. The conclusions were that a listening test, such as that used, "was as effective in predicting success in reading as was a standardized reading readiness test."

Barrett (1965) created a reading readiness test which utilized six out of the nine items as visual discrimination tests. This was administered to 632 children (first grade), from high, middle, and low socio-economic classes. The best predictive aspects were reading letters and numbers, pattern copying and word matching, and his findings led him to suggest that reading readiness factors might be weighted differently for the two sexes. He pointed out in conclusion that the visual discrimination tests should be supplemented with observation for reliable prediction. (See Cane and Smithers 1971).

It would appear that the single area of function in these studies limits their usefulness. It also forces the question as to precisely the function measured, the variables that affect it, and its relationship to the ability of an individual to learn to read. Auding and listening, as used in the studies, both involve a general use of language, a factor that would certainly differentiate the child from a poor home environment from the rest from rich language environments. Some S.D. dyslexics would show up, but again, because auditory factors are not necessarily involved, others might not. Children with hearing deficiencies would show up, and yet those visually handicapped would not. Opposite arguments may be applied in a like
manner, to Barrett’s study.

A number of other research projects have used wider ranges of tests for the prediction of general reading success.

Deputy’s study in 1930 was on 103 children in the first grade of some New York schools. He found that the best single predictor of reading achievement was the Pintner Cunningham Primary Mental Test. He devised a formula, weighting each predictive test according to its effectiveness -

<table>
<thead>
<tr>
<th>Predicted Reading Score</th>
<th>Mental Test Score</th>
<th>Visual-visual Discrimination Test Score</th>
<th>Word Test Score</th>
</tr>
</thead>
</table>

This gave a correlation of 0.746 between predicted and actual reading test scores.

He concludes:

"This investigation has shown the possibility of predicting first grade reading achievement to an extent which justifies its use in beginning reading. Future studies along this line will, in all probability make more accurate prediction possible, but there will always be a group of factors, such as health, attitude towards school work, personality traits, teaching procedures, and the like, which will lower the correlation between predictive tests and reading achievement."
In 1935, Monroe devised a series of tests of 'reading aptitude' for "the prediction of success and failure in beginning reading". These included tests of visual recognition of orientation, visual memory, auditory memory, motor abilities, articulation, writing, laterality and more general language skills. The tests were standardised on 434 children age 5½ to 8½ years. The final testing was based on the records of eighty-five six-year-olds. The most efficient predictor of reading achievement was a combination of all of the tests - as Deputy. However, after this, in efficiency, were auditory and visual tests, followed by the intelligence test (different to Deputy). Then came the tests of articulation language and motor functions.

Wilse Hirst (1970) found, unlike both Deputy and Monroe, that the intelligence test that she used was not a significant predictor of reading success. This was a W.I.S.C. test which includes specifically verbal elements. She studied 300 kindergarten children of three socio-economic areas, for three years. She found that the following data significantly predicted reading success in the first grade. (0.05 level of significance.) -

Sex. Digit span sub-test of W.I.S.C.
Mother's Education. Numbers and matching tests of Metropolitan Readiness Test.
Teacher's Predictions. Visual 3 sub-test of Gesell Development Test.
Reading Percentile. Complete-a-man.

In the second grade the following were most efficient predictors:-

Teacher's Predictions. Teacher's see peer rating.
Socio-economic status. Information sub-test of Metropolitan Test.
Reading Raw Score.
This research was probably in all aspects more efficient in prediction than that of Deputy or Monrose, as it involved a very wide frame of reference for the tests, including such factors as socio-economic status, etc.

Fite and Schwarts (1965) were somewhat more explicit about their aims in a screening test project. They suggested that the percentage of constitutional factors (weaknesses in sensory discrimination, perception, motor function, etc.) might be higher in culturally disadvantaged children, and might represent difficulties largely specific to them.

They used a sample of 105 first grade children coming from largely low income areas. They found that all their results were bound up with emotional difficulties, and they were able to come to no definite conclusions. They were able to differentiate a number of patterns of difficulties, but etiology was not clear.

Castner, in 1955 suggested a series of tests and indices of potential "reading disability" in children prior to entrance of the first grade. This paper implies that it is concerned with specific developmental dyslexia, since speech abnormalities, reversals, sinistrality in the individual or his family, are the types of factors to be observed. Castner's work would have been valuable if carried out to a more complete extent. It strongly fore-shadows work carried out only recently. Bank's work is an example of such. Initially she scanned the literature for items of behaviour characteristic of children with "learning disorders". A Behavioral Index of 65 items was thus constructed. This was distributed to schools - (Kindergarten Classes), and was completed for 2,504 children. After a year a reading test was administered, and the healthy, normal children scoring in the lowest quartile were selected as the experimental group. A control group matched with these and scoring above the twenty-fifth percentile, was also selected and the respective scores on the Behavioral Index were compared. Thirty seven items discriminated significantly between the two groups, these representing "a diffuse syndrome of developmental
functions, involving sensory-motor abilities, language, perception, cognitive abilities, social attributes and behavioral patternings". The actual index is given as appendix to her paper. Validity studies suggested that a score of more than three adverse responses would discriminate optimally between the groups, leaving 18.5% of the experimentals undiagnosed and 10% of the controls mis-diagnosed.

In conclusion, Banks says that this index should not be considered as a "test", "but a structured guide for those familiar with the child's day to day performance".

The Behavioral Index would seem to have advantages in the ease of administration. It needs no special staff, and is suited to use by teachers. The margins of error are fairly high for an instrument that could strongly influence a child's future. The error would also appear to be weighted on the wrong side. Mis-diagnosing controls matters less than leaving one in five of the experimentals undiagnosed. For an index of which the results could have such profound effects, there seems no justification for limiting items tested to those of behaviour. Even if extra persons were involved, it would seem worthwhile extending a test like that of Banks to include simple tests of perception, i.e. memory, discrimination, etc. Thus it would be made more efficient, and possibly even more acceptable to schools as a regular first year event.

The research of McLeod (1966, 1969) was in Australia, as was that of Banks and is similar though somewhat more detailed. It also refers directly to S.D. dyslexia. The initial list of items for the construction of the two final indexes (Dyslexia Schedule and School Entrance Checklist) were obtained from the literature. Validity studies were then carried out and a total of six or more adverse responses was found to discriminate sufficiently between the experimental and control groups, to be considered as a cut-off point. Above six adverse responses on either schedule, McLeod considers that the
child should be suspected of being a specific developmental dyslexic, and further observation and testing given to check the findings.

The Dyslexia Schedule was designed for clinical use. For example, if a child is to be seen at a clinic because he has reading problems, it was envisaged that the parents would fill this in prior to the visit, thus saving time. McLeod suggested that the Schedule might be useful as a nucleus of an interview with parents on such an occasion. However, diagnosis of a diffuse syndrome like S.D. dyslexia, takes forms designated by the personal preferences of those at the Clinic. McLeod's schedule would not, therefore, be suitable in every case.

The School Entry Checklist was designed for use as a screening instrument at the stage of school entry. It is not limited to behavioral items as is that of Banks, but even so is limited by the nature of the questions that can be put into a questionnaire. Both questionnaires are limited by methodological disadvantages. In this case, particularly the misinterpretation by respondents, the variability of judgements of the respondents. Some of the questions from both questionnaires are imprecise; for example:

"Was he slow in establishing whether he was right-handed or left-handed?"

No / Yes
Give approximate age.

Since there is no stable expert opinion on the age at which the average child establishes handedness, it seems hardly useful to ask this of a parent. The age of establishment would also vary from activity to activity. Many adults use left hands for some activities, while being manifestly right-handed.

Another question is:

"Was he over-active?"

No / Yes
The answer to this question is dependent on the age at which the questionnaire is completed. 'Over-active' implies that a comparison has been made with someone who is less active. The judgment might therefore vary between an only child and one in a large family.

Another disadvantage of the questionnaire used in the manner of McLeod, applies only to the School Entry Checklist. Parents of children going to school for the first time, are unlikely to suspect that their child is anything but normal, with a good reading potential. It is essential, therefore, that their interest and concern is aroused. It is doubtful that it would be possible to communicate by letter in a sufficiently comprehensive manner to explain the presence of the many of the seemingly odd and unrelated questions on the questionnaire. Unless the parents are prepared to accept the possibility that their child is a S.D., dyslexic, therefore, it is unlikely that they will devote maximum effort to filling in the questionnaire, and thus inaccuracies are likely to occur.

A scheme for the prediction of reading failure is suggested at the end of this chapter. It overcomes the narrowness of Banks' Index and it does not have the many disadvantages of the questionnaire instrument of McLeod.

DeHirsch, in America, is engaged on what would seem to be the largest study of the possibilities of predicting failing readers. Her initial work was performed on 53 children between ages 5 and 6½ years. This group of children was selected out of a larger number because they appeared normal in most respects and had I.Q.'s between 84 and 116.

The children were studied over a period of nearly three years. Testing involved four visits of one to two and a half hours. At the first visit, the background information was gained, and also the children were tested for fundamental factors such as vision, hearing and intelligence. In the second visit, a series of 37 Kindergarten tests was administered, and these were
categorised - Behavioral patterning, Motility patterning, Gross Motor patterning, Fine Motor patterning, Laterality, Body Image, Visual/perceptual patterning, Auditory/perceptual patterning, Receptive language tests, Expressive language tests, Sentence development, Reading readiness, and 'Style'. A profile of the child was also written.

At the end of the first grade, the children were tested in reading and writing. Similar, but more complex tests, and a spelling test, were administered at the end of grade two, together with four of the Kindergarten tests - in order to determine the progress being made.

A reading index was constructed from the second grade reading tests and this significantly related to nineteen of the Kindergarten tests. Similarly, twenty Kindergarten tests related to the spelling and sixteen to the writing tests.

Finally, ten tests that together were most efficient in predicting reading and spelling (not writing) were chosen to constitute the Predictive Index - which would undergo further testing on validation studies. Tests included were :=

- Pencil use.
- Bender visuo-motor Gestalt test.
- Weisman auditory discrimination test.
- Number of words used in a story.
- Categories.
- Horst reversals test.
- Gates word matching test.
- Word recognition I.
- Word recognition II.
- Word reproduction.

The use of the index on the initial sample of children picked out ten of the eleven who subsequently failed in reading and spelling in grade II;
and picked out four children who did, in fact, pass the grade II tests.

A sample of prematurely born children was followed through the same process, in order to determine the value of the index on a clinical sample, and it was found that more tests were predictors of performance, especially in the range of writing.

De Hirsh recommends a transition class between Kindergarten and the first grade in which the children picked out by the Index could be intensively drilled and brought up to the maturity and ability level required for grade I. However, such a class would bring all of the characteristics of failure to a child from the start of his education, and therefore is by no means ideal. It would be preferable to keep a child, backward only in reading, as much as possible with his age group. In this way he has the chance to compensate for his disability by 'shining' in other subjects.

The studies made by de Hirsh et al, leading to the construction of the Predictive Index are reported in Keeney and Keeney (ed) (1968) and papers written in 1954, 1955 and primarily in 1966 (a book by de Hirsh, Jansky and Langford) and a further undated paper.

The work has been criticised by Ziecky and Page (1968) on the grounds of inadequate statistical methods and on the selection of the sample. The fact, for example, that de Hirsh found intelligence at the level of low ranking (twelfth) saying that it was "one of the most interesting findings" is pointed out by Ziecky and Page to be due to the criteria for the selection of the sample (I.Q. between 84 and 116), a range in which it is generally accepted that reading is little affected by I.Q. A further point which should be made in connection with the studies described in this chapter is that most were made in America, where children begin school at six years old. Since, by then, the average British child is already engaged in his first attempts at reading, this makes the findings somewhat out of step for direct
application here. Such indicates the need for further work on British children.

All of these studies which attempt to predict success in reading are only valuable if applied — and this aspect is perhaps far more difficult to achieve than any involved in the research processes. Some of the studies described in this chapter have involved consideration of how the research should be applied. McLeod's was one such study. However, the considerations in this case do not appear to have been sufficiently wide, as there are many points ignored. No prediction programme, put forward without deep discussion of its method of application, can be considered as other than useless.

Research of a thorough nature, is urgently required such that reading failure can be predicted at an early stage. Monroe called for this thirty-six years ago. There is still, however, no really complete and adequate predictive programme available for use in Britain, and there has been no comprehensive thought on how such might be applied.

The application of a predictive programme could be at one of four stages in a child's life: before birth; after birth, but before the stage of serious reading (up to about age six); after reading has begun to be taught but before the stage at which reading failure is usually noticed; at the stage when failure is becoming noticeable. The first stage is based on the hereditary aspects of S.D.dyslexia. There is a certain probability that the offspring of parents who have suffered from reading failure due to specific developmental dyslexia, will have similar problems. The probability is higher than that for unaffected parents. The value of such a prediction would be negligible, as the numerical probability would not be sufficiently high to affect the decision of whether to have children or not.

The second stage at which to predict reading failure is optimal. Reading has not advanced sufficiently for failure to disturb the child
deeply, and similarly, the emotional disturbances are not advanced enough to
disrupt attempts at remediation.

The third stage for prediction is not currently used to the extent
which is possible. Teachers have the chance of observing the progress of
the child in reading, and comparing this with their overall assessment of
the child’s potential (including such factors as intelligence, background
and motivation). Many teachers are not equipped with the knowledge of the
significance of slow progress in reading, and others probably do not pay
sufficiently deep attention to the individual child and his errors and
method of reading.

The fourth stage for prediction is too late. Failure and the trauma
associated with failure are present. Unfortunately it is at this stage —
the age of eight or nine, that most dyslexics are diagnosed these days.

There would seem to be a definite possibility of predicting reading
failure due to S.D. dyslexia, before a child has actually begun to read.
This would be based on the presence of minor symptoms, in a similar manner
to Banks, McLeod and de Hirsch.

There are two points in a child’s life up to the age of six, when a
screening test could be practicably administered. The first is soon after
birth, when the child is examined for abnormalities. This stage obviously
precedes the potential manifestation of many of the minor symptoms, so is
little better than the stage before the child is born. However, there may
be suspicion of minimal brain damage, due to disorders in pregnancy, prema-
turity or a difficult birth. Such individuals should be noted and observed
during their postnatal development, since they are likely to have difficul-
ties in early education.

The second, and by far the most useful point at which to administer a
screening test, is when a child first enters school. Here a large number
of children assemble. They are of similar ages, and the conditions are
suitable for the administration of such a test. It is assumed that real
diagnosis of dyslexia is only possible at the age of seven upwards (as Naidoo has said - see the beginning of this chapter). The aim of the screening test is therefore to indicate the children who are educational risks with regard to early reading. Below is presented a hypothetical scheme for the administration of a 'prediction programme'.

It is envisaged that a 'Reading Officer' should be allocated to schools in a particular area. This would be a specially trained person, capable of the organisation and conduction of the scheme. Before the child entered school at five, an information letter would be sent to his parents. The letter would explain the need for prediction, the organisation of the programme and the nature of help given to the children picked out. The letter would invite the parent(s) to an individual meeting with the Reading Officer and would indicate the procedure of the meeting, for example, the questions that they would be asked.

At the meeting (in a school - or preferably a special centre), the parent would be asked standard questions about the child. The questions would be based on the minor symptoms that a dyslexic might be expected to exhibit, or have exhibited, by the age of five. Examples of the areas of questioning are shown below:

- Immature drawings (or continuous scribbling stage).
- Poor memory for pictures or other graphic material shown recently.
- Lack of preference for one or other hand.
- Slow in development of speech - and/or subsequent speech defect.
- A tendency to use language in a less mature manner than expected on grounds of age and socio-economic class.
- Clumsy, falls over easily, unable to make fine movements.
- A tendency to be unconscious of the passing of time - e.g. not knowing when it is meal time or bed time, etc.
Lack of appreciation of rhythm.

Poor memory for nursery rhymes, names, etc.

Tendency to mis-hear things said to him.

Perhaps the most important items in that list at the pre-reading age are those factors of speech and motor ability. Any items in the list would become more significant when:

The child was premature, or was known to have suffered brain damage.

The family has a history of reading problems.

There is a family history of late speech development, and/or defect.

Possibly - if close members of the family are left-handed or ambidextrous.

Possibly - if the child has had severe illness in early life, e.g. meningitis or encephalitis.

At the interview, the child would be given a few tests that, by their nature, are to be administered to the individual. Examples are hearing, speech and sight tests, and possibly a simple intelligence test.

During the first school year the school would administer specially designed group tests at defined times in the year. These tests should be given in a manner that does not constitute a 'grand occasion'. The children might be asked to draw a man. The only differences from a normal drawing session would be the standardisation of instructions and materials, and the lack of help from the teacher. Another time the children might be asked to copy a pattern from cards handed out to them. The completed tests would be sent to the Reading Officer for marking. The details of the tests, with those of the interviews would give a fairly efficient prediction of the children likely to fail in reading. Lists of 'at risk' children would be communicated to the schools towards the end of the first school year.
Children listed, perhaps four or five per class, would be observed very closely, and at the first signs of failure in reading, given extra help. Remedial aid would be best administered from the school itself, although such an arrangement could not occur in overcrowded schools. The administration of such a prediction programme as that suggested would require changes in the remedial system, for example the concentration of more aid on the younger children. It might also be found that less aid was needed at the later stages, if trauma of reading failure was prevented. Discussion of remedial facilities is continued in the following chapters.

So far, the prediction programme has restricted to the children who fail in reading due to specific developmental dyslexia. In this form, it is unlikely to be acceptable to those who would implement the scheme. Within the format suggested, however, it would be possible to add a few more items to enable the prediction of failure due to other causes than S.D. dyslexia. Of major importance here would be the interview of parent(s) and Reading Officer.

There is an important point that must influence the design of such a prediction programme. Few specific developmental dyslexics appear other than perfectly normal at the age of five years. Parents are therefore likely to resent or not comprehend the involvement of their child in the programme. It is necessary to reassure them continually, and to design the letter, for example, with very great care. This was a point ignored by McLeod in the design of his questionnaires.

The ideas put forward in the last few pages, exist at present in a hypothetical form. However, it is planned to investigate their potential in a research project starting next year. This will involve the following of about 200 children over the first three years of their school life. The
children will be apparently normal at the age of five, and the gradual failure in reading of a certain percentage, will be watched carefully. The early characteristics of their failure will thus be elucidated.

Details of further research on the subject of the prediction of reading failure is to be found in Francis-Williams (1970) — particularly concerning children with minimal brain damage; Thompson (1953), and Bannatyne (1964).
Following the discussion of the nature of specific developmental dyslexia, it is possible to predict some factors in the process of teaching reading that will either help or hinder the affected individual.

Firstly, general principles require consideration. A child who has difficulties in any subject, will demand more teacher attention than the normal child. In a large or even average sized class, such attention will either be inadequate, or insufficient, and hence the first essential for remediation is a low teacher-pupil ratio. A one-to-one ratio is usually necessary for some of the time, especially during the early stages.

A second requirement for effective remediation is a full realization of the role of emotional disturbance in reading difficulties. The child is probably very keen to learn to read, and hence there is little point in attempting to treat the disturbance in isolation from reading. It is necessary to prevent any aspect of the learning-to-read process from engendering further emotional problems (which would, any way, block the learning-to-read process).

Another requirement is a comprehension of the nature of the difficulties that the child is likely to encounter, in order that diagnostic observation may be made in the actual teaching situation; for example, the relation of particular errors to the presence of particular difficulties. In this way, teaching may be more meaningful and time need not be wasted in concentration on areas of function in which the child has no problems.

Many methods have been devised to treat the problems of the specific developmental dyslexic or children with similar difficulties in reading. Certainly some are better than others. However, in assessing the validity
of each, a major variable—very significant—is the character and enthusiasm of the individual teacher. It has been said that the success of the method is the degree of enthusiasm of the teacher. Nevertheless, if this variable is held constant and at optimum, it must be assumed that some differences in effectiveness between the methods would become apparent.

The main requirement of a remedial method is that it suits the child, either in built-in concentration of treatment on his precise difficulties, or in being a self-adjusting method which adapts automatically to the pattern of ability of the child. Modern ideas favour the latter, which seem to be the most useful. Such methods are largely categorized under the heading 'multi-sensory' methods, and the concept behind multi-sensory learning is the maximisation of sensory input relating to reading skills. The assumption is that auditory, visual and kinaesthetic skills contribute to learning of reading materials. Kinaesthetic, in this context refers to two factors; firstly the sensory input from proprioceptors in muscles and secondly the sensation of the motor speech mechanism. Some methods also include reference to tactile sensation, and exploit the input in tracing letters and words. It would appear that the useful input of nervous impulses in this process is usually that of proprioceptors, since the tactile input would merely be a continuous input of identical impulses unless they varied over the surface of the letters, (and it is hard to see how this would work). A child trained to read in this method would certainly never achieve any of the tactile skills of the Braille reader, and the nature of the apparatus presented would not be designed to allow that degree of skill. There is one activity in which pure tactile input is certainly involved, and that is where the teacher (or another pupil) writes on the back of the child. This is a technique not widely exploited, but which gives an extra sensory dimension.

The theory behind multi-sensory learning seems to be sound, and is
certainly justified by deductions made in the course of the discussion of specific developmental dyslexia in this thesis. That is, that the syndrome may be manifested in a wide range of ways, each varying in the pattern of difficulties that the individual presents, and thus a 'self-adjusting' remedial method is optimal.

On this assumption it is necessary to consider further aspects that may be present or absent in any of the several multi-sensory methods.

The first aspect is the degree of interest that the method generates in the learner, and the meaningfulness of the early material. Interest is easily overlooked, and is far more important for children who have a history of failure than for those who are approaching reading for the first time. With yet another attempt to teach him to read, the specific developmental dyslexic will need immediate inspiration. If he is presented with material in which he can see no useful aspect, he will give up immediately and the method will have failed. This difficulty in overcoming the influence of previous failure is discussed elsewhere in this thesis.

Based also on the need to inspire the learner from the start is the need to maintain the interest throughout the remedial treatment. This must be related to the knowledge of the child that he is achieving and is learning to read. Since the child who has failed to read by conventional methods will be slightly older by definition, the best approach may be one in which he is taught some of the structural basis of language. This has several advantages in addition to the interest that it generates. Firstly, it is new and the child has not failed in attempts to learn it earlier. Secondly, it gives the child knowledge that he knows is not possessed by his peers. He must no longer rely on a faulty memory and can deduce for himself the way in which a word is spelled. Certainly many normal readers would benefit from the knowledge of such language structure. Careful thought would be required about its placement in the curriculum, since the normal age of
learning to read is five or six, and at this stage the child would be unable to comprehend the complexities of the structure of language, and the teaching of reading rarely extends to a sufficient stage.

A further aspect of a remedial method is its relative treatment of the strengths and weaknesses of a child's ability. Multi-sensory methods overcome the need for this decision to some degree, but it is still necessary for the awareness that remediation may endeavour to strengthen the weak areas, or make the activity of reading rely on the abilities in which the child is adequate.

The last comment to be made of the aspects of multi-sensory methods is that of the need for flexibility. This is related in some ways to the last point about strengths and weaknesses. The child's improvement during treatment is likely to be uneven, some dis-abilities becoming adequate more rapidly than others. It is necessary, as skills develop, to change emphasis and concentrate on more backward abilities until they too are adequate. Herein lies another advantage of a multi-sensory programme, but even these vary in flexibility of the sequence of teaching, and dependence of one unit of material on what has been covered previously, etc.

The points discussed above will now be considered in relation to two multi-sensory remedial methods which are used with specific developmental dyslexia. The first is that of Gillingham. This was developed when Gillingham was the Research Fellow under Orton, and his role in directing the development of the method was one of his greater achievements. Orton's basic principles were two —

1. That auditory, visual and kinaesthetic stimuli should be associated simultaneously (1928).

2. That units should be utilised in the teaching, such that the size of the unit is small enough for the individual to cope with. Training is then directed towards the fusion of the smaller units into larger wholes. (1937).
Gillingham (in association with Stillman) presented the concept of the linkages of the sensory modalities in reading as a model. From this she derived the two important linkages - that of speech and that of writing. The former is represented as Visual-Auditory-Kinaesthetic, and the latter Visual-Kinaesthetic. The sensory associations are developed into drills which are designed to aid the child in the learning of specific aspects of reading. The letters are taught firstly, and are presented on cards. Here the Visual-Auditory-Kinaesthetic linkage is illustrated. A card is displayed to the child. He repeats the name of the letter after the teacher. When the name of the letter is known, the sound is taught and repeated. The repetition is essential since it involves a kinaesthetic input to the brain (the 'feel' of the functioning of the speech mechanism). When both letter name and sound have been mastered, they are drilled in a set sequence so that the child is completely adept in reproducing sound for the letter and vice versa. The sequence involves a 'key-word', the first letter of which is that being drilled. A letter-card is held towards the child. He gives the 'key-word', then the letter. Writing is involved immediately. The pupil watches the teacher write the letter and she points out features of orientation, starting point and stroke direction, to him. He traces over her model, writes it and then rewrites it with his eyes closed. Subsequent to these primary learning activities, there are drills of the pupil responding to the letter card, the spoken name of the letter, or of the kinaesthetic input created when the teacher guides the child's hand as the latter looks away.

Blanding the letters into words begins when enough letters have been taught. Phonetically regular letter cards are placed in front of the child. He produces the sequential sounds as quickly as he can, and thus produces a word. When the concept of blending sounds has been introduced, the idea of analysis of words follows logically - spelling. A word is pronounced
slowly by the teacher. The child repeats the word, names the letters, puts the card for each sound on the table, and then writes the word, naming each letter as he writes it and then reading the whole word back. Soon the cards are dropped from the sequence, but all other parts are strictly adhered to. The simultaneous speech while writing the word is one of the bases of the method, and represents the involvement of an extra sensory channel as reinforcement to memory and as a comparison for the memorised material. Reading back the written word forces the child to check his work, provides an additional stimulus and gives the child a degree of satisfaction when he is right. The spelling and writing sequences are most effective when a blackboard is used. There are three main advantages of this; firstly that children like to write on blackboards, secondly that they can easily rub out their mistakes and thirdly that they are able to maximise the movement of their arms, correspondingly maximising the kinaesthetic input to the brain.

Subsequently more vowel and consonant sounds are added with some of the less regular phonograms. Simple spelling rules are introduced and followed up with many examples. The first reading material is short sentences which include phonically regular words with which the child can cope, connecting sight words being supplied by the teacher. The child prepares the sentence and then reads it. He is expected to read it perfectly. The same sentences may be used for dictation. The child repeats the phrase after the teacher has dictated it, writes it, naming each letter as he goes, and, at the end of the dictation, he reads it back. He is allowed to correct any spelling, and compare what he has written with the original.

Work is continued on the basic material described above. Additional rules are brought in and concepts of language structure introduced such that the child works out spelling for himself as often as possible.
This is one of the greatest advantages of this method as the specific
developmental dyslexic seems, in many cases, to be unable to absorb the
concepts of language structure as does the normal child. With the inherent
satisfaction that he has the basic equipment to work out words, he is likely
to gain a great deal of confidence in reading activities. He also is pro-
bably better equipped to spell accurately than normal people.

The teaching of the basis of the Gillingham method is reinforced with a
large range of other material - games, apparatus and so on. Apart from
reinforcement, these are designed to create the desire to read, and to sug-
gest that reading is enjoyable. Perhaps more important, however, every ac-
tivity is within the capability of the child, and he can thus gain satisfac-
tion and the sense that he is achieving.

Another frequently used method is that of Fernald. This was one of the
earliest methods that stressed the importance of the kinaesthetic input, the
technique employed being one of tracing. The method was devised not only
for specific developmental dyslexics but for a wide range of disabled readers.

The teaching in Fernald's remedial method is divided into four stages.
In the first stage the child and teacher endeavour to determine a manner in
which the child can write words correctly. A word is selected by the child.
It is written for him in large characters, and the child traces it with his
finger, saying each part as he comes to it. When the word is known, he
writes it from memory. The word is then incorporated into a story of the
child's own composition. The story is typed immediately, and read back to
the teacher. Words learned in this way are filed alphabetically for future
reference, and also to impart knowledge of the alphabet.

Two main features of the first stage are the immediate use of words as
units of any length, and the incidental learning of the alphabet. Second
is the use of words in context, this being suggested to make the process more
meaningful for the learner.
The second stage of remedial treatment includes the gradual dropping of the tracing. This begins as a decrease in the number of tracings required for each new word, until some words need none. The important connection between the first two stages is, however, the maintenance of vocalization of the parts or the whole word (never the letters alone). Fernald stresses the necessity to equate the vocabulary range and the reading matter itself to the intelligence and not the reading age of the child. She says that more difficult material will produce higher motivation.

Stage three involves the transition from vocalizing to sight reading. At this stage only are books introduced and allowed to be read. Unknown words are now told and the retention of them is checked later. In the fourth stage the child tackles new words on his own, working them out from resemblances to words already known.

Fernald suggests that the child should not be read to until he is able to read for himself, hoping that at this stage he will find that his own reading is quicker and preferable to listening to others. This aspect of Fernald's method would seem to be in the nature of a deprivation to the child who is conscious of his failure in reading, and many other workers encourage the reading of stories for the child, to increase the motivation of the child to read for himself. (opposite reasoning to that of Pernold.)

The remedial method of Fernald and Gillingham differ widely in many aspects. A comparison of the two will indicate specific areas of difference where one method might logically appear to gain over the other. Both will be examined with respect to the four aspects of multi-sensory methods mentioned earlier in the chapter. The first concerned the interest generated in the learner. There should be interest in the idea of reading, as well as interest in the manner in which it is being taught.

Manifestly, the method of Fernald is preferable to that of Gillingham from this point of view, since the first stage involves the process of reading a word that the child has chosen to learn. The word is presented
in context, and incorporated into a story of the child's own composition. Such a step introduces an immediate use of language and vocabulary in a totally free manner, a factor which is valuable to the child who is deficient in language skills (as are reputed to be some specific developmental dyslexics). The subsequent typing out of the story represents a reward factor to the child. Gillingham does not introduce the actual reading process until the child has some basic knowledge of how to read, and of the letters in the words that he encounters. The delay in introduction of reading is criticized by Deshant (1964) and Gates (1947). They point out the need for meaningfulness in the early stages. Meaningfulness, however, would seem to be a concept which varies in definition for different ages, levels of intellectual ability and mental ability. For a young child, or one of relatively low intellectual power, Gillingham's approach is probably less suitable than that of Fernald from the interest point of view. But the intelligent or older child with a history of failure may find the stability and positive-ness of learning letter by letter, and building from small unit to larger unit, both logical compared with previous efforts to teach him and interesting because it is leading him to his ultimate goal of the ability to read. If he should find the basic learning of letters tedious then there still remains high motivation as a compensation. Gillingham's method requires the reinforcement of the fundamental learning by additional material and this should be made as interesting as possible.

Another aspect on which the views of Gillingham and Fernald differ, which also has relevance to the interest to be generated in the learner, is that of the standard of the material used, in relation to the standard of the reader. To some extent, the views are predictable from the methods. Gillingham insists that all material must be within easy grasp of the child, whereas Fernald considers that more difficult material will generate more interest in the child. Both views are put, perhaps too strongly, since
the principle variable is the child, his personality, motivation and more particularly, his emotional state. If he is still very sensitive about his initial failure in reading, then to present him with material too difficult would appear to be incorrect, and a similar but opposite argument is applicable to the highly motivated child presented with material too easy.

Following on from a consideration of the interest generated in the learner, is that of the structural nature of the methods. How much does each method continually inform the child that he is approaching the stage of full ability in reading? The positive and step by step progression of Gillingham's method is certainly advantageous here, since it starts with small units that are common to all words. When the child knows the letters and their sounds, he is in possession of knowledge applicable to any word that he will ever desire to read. The child following Fernald's method however has, at an approximately equivalent stage, only knowledge that applies to a few words, those that he has learned. This is one of the strongest criticisms to be made of the Fernald approach, and one of the strongest points in favour of that of Gillingham (it being originally stressed by Orton).

The next point of comparison is that of the relative treatment of the strengths and weaknesses of the child's skills. It is suggested that Gillingham concentrates on an auditory input, reinforcing that by multi-sensory means. If the child happens to have weaknesses in this area, he might have slight difficulties with the approach. However, reinforcement visually and kinaesthetically should compensate if the programme is followed strictly. The inherent concentration on auditory skill is essential to the method since it is based on phonetics. Fernald stresses the kinaesthetic aspects of her method. This has a somewhat different status to auditory skills in later stages of reading, since it is less applicable (if applicable at all) to the working out of the spelling of problem words.
A weakness in kinaesthesia may slow the child in his achievement of reading by the Fernald method, while not actually affecting his future reading ability. Ultimately both of these methods help the child to rely on the skills that he possesses, while (in involving and reinforcing by multi-sensory input) improving the weaker areas of function.

The last comparison is of the flexibility of the methods in adoption to any age of ability, and in the feasibility of missing stages when the child does not appear to require them. Obviously the Fernald method is the more adaptable of the two, since the sequence of teaching the various stages is much looser, and one stage is not directly reliant on the previous. Such adaptability only applies to the Gillingham method in the later stages, when letters and the fundamental phonic training have been taught. However, as has been explained earlier, the rigidity of the method has other advantages.

This form of analysis is applicable to other methods of remedial teaching, and is valuable in deciding which is liable to fulfil the needs of the child and the teacher most satisfactorily. It would almost certainly be wrong to conclude that any one method is better than any other, because there are so many variables to be considered, not least of all the method that is preferred by the individual teacher.

However valuable these remedial methods are in ideal conditions, they would fail utterly within the organisation of most remedial teaching as it exists in this country today. Samson and Pumfrey (1971) have recently studied the state of remedial education in sixty-one local education authority areas. They found that the proportion of children receiving help with reading in secondary schools is from 4% - 27%. Most of these children only qualified for help when their reading age was below nine. This is not satisfactory at the age of eleven (i.e., two years behind in reading), but it is very inadequate when the duration of provision is considered. Samson and Pumfrey found that two thirds of remedial help
was finished at the end of the third year. The remedial teacher is usually a full time member of staff, and he has only a five percent chance of being specially trained for the job. Furthermore, help at the individual level exists in only 20% of the schools, and is usually arranged so that both teacher and pupil must lose a lunchtime break.

Remedial education at the primary level is better arranged, but in most cases, organizational and training factors would preclude the introduction of such methods as those of Gillingham and Fernald without vast changes in policy.

Not many references have been included in this chapter, as material has been gleaned from a wide range of comment on the subject. The most useful references were the following:

Orton (1966); Seddon Johnson (1966); Wolff (1970); Nyere and Hansmill (1969); Fernald (1936, 1943).
CHAPTER 20

THE FUTURE FOR A SPECIFIC DEVELOPMENTAL DYSLEXIC

The chapter need not apply only to specific developmental dyslexics, but will do so primarily since the majority of cases of persistent severe reading difficulties will indeed be S.D.dyslexics.

If diagnosis of the problems in a failing reader are made sufficiently early, much can be done to alleviate some of the problems and the chances of educational achievement are much higher. Normally the child is not noted until age eight or nine. By then he will realise that he is failing and will be becoming emotionally disturbed. Such a state of mind is a formidable block to remediation. In chapter 6 it was explained how he might be treated after being recognised - either by referral to the educational psychologist, or through his G.P. Chapter 18 proposes a reform of the remedial system. Vernon (1970) gives some statistics on the probability that the child, given remedial treatment, will achieve normal reading compatible with his age.

Fig 19.1 Success of Remedial Treatment at various ages.

(Adapted from Vernon (1970),
from Schiffman, cited by Goldberg (1968).)

<table>
<thead>
<tr>
<th>AGE</th>
<th>NUMBER ACHIEVING NORMAL READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 - 7 years</td>
<td>82%</td>
</tr>
<tr>
<td>8 - 9 years</td>
<td>42%</td>
</tr>
<tr>
<td>10 - 12 years</td>
<td>10% - 15%</td>
</tr>
</tbody>
</table>
Many S.D. dyslexics do not achieve completely normal reading — to the extent that they read for pleasure. Others do read for pleasure, but perhaps are left with poor spelling ability, which may prove a handicap to them, depending on their chosen career — but again, others may improve in reading, writing and spelling to the state of complete normality. Such an improvement is very often made rapidly over the age range eleven to thirteen or so, to the extent that many who have struggled continuously in primary school are ultimately able to take 'O' level and 'A' level examinations. However, English and other language subjects may require to be delayed for a year or two. Subsequently many specific developmental dyslexics are able to go on to Higher Education — although again, their subject choice is more likely to be mathematics, engineering and other subjects that do not lay heavy stress on written work. It may be that hard struggles for achievement in earlier years creates a continual educational motivation in these children — so in some cases, it might almost be said that specific developmental dyslexia is ultimately beneficial. There are of course, many more who find the early lack of reading ability a tremendous handicap and never completely overcome it.

It is certain that specific developmental dyslexia is a major contribution to the problem of adult illiteracy. Public concern about the problem is currently increasing as there are more and more reports of the large numbers of children who leave school with reading ages of less than nine. It is being discovered that local Education Authority evening classes in reading and writing are attracting alarmingly large numbers of virtual illiterates who have hidden their handicap very skillfully for many years. If these people have sufficient intelligence and motivation to learn to read now, why did they fail before? An unsympathetic and misunderstanding approach to S.D. dyslexia during childhood must be the answer in many cases.
The difficulties and worries of adult illiterates are well exemplified in two case histories described by Hill (1971 b).

Little work has been done on the follow up to cases of S.D.dyslexia. Rawson (1968) has made a thorough study in America, and while educationally and vocationally, direct application cannot be made to Britain, it is worth noting the findings. The study included detailed observation of 56 boys with language disability throughout their elementary school days. The follow up, was made about 30 years later on average and involved interviewing the individual or a close relative or friend. The socio-economic background of this sample predisposed most individuals to aim for a higher education, and it was found that those with the poorest language facilities, (classified as "moderately dyslexic or severely dyslexic"), subsequently spent on average a longer period (in years) in higher education. Those with medium language faculty ("non-dyslexic but with some symptoms of language difficulty", or "mildly dyslexic, clear, but not crippling symptoms, individual help required") subsequently were in higher education for longer than those with high language facility ("non-dyslexic"). Ten of these had "no suggestion of specific language disability", ten others "showed some slight symptoms". The differences were not significant. Rawson says of some of these results :-

"This seems, indeed, an encouragingly good record to have been made by a group of true dyslexics, some of them with severe initial handicaps. Could one conjecture that a disability when it is not insuperable, may act as a spur to achievement? Some research in motivation and learning points in that direction....."
The results of higher education investigation, and of socio-economic class distribution suggested that "these dyslexics have made as good records as their non-dyslexic fellows.....dyslexics cannot be judged to be poor risks on the basis of language disability alone..... Advice to keep the educational and occupational sights very modest would have been inappropriate for most of these boys".

These results are certainly encouraging. However, the socio-economic class distribution of the families was exceptionally high - 36 (82%) of the 44 fathers were in Class I, by Warner's (1949) standards - and the educational achievements of the sample is only consistent with this. The conclusion should therefore be perhaps generalized - given optimum opportunity, some specific developmental dyslexics are able to achieve educationally as much as a non-affected individual with similar opportunities. The extra motivation acquired during the early struggles may compensate for persistent minor handicap in language usage.

The opportunities of help for the specific developmental dyslexic in Britain are depressingly few. Many are never diagnosed and the discrepancy between potential and actual achievement is never made up. Diagnosis helps in preventing the development of unfavourable and unfair opinions about a child, and it may help a remedial teacher to tailor make a 'learning to read' schedule to help the child. However, diagnosis is not usually made until the age of eight or nine is reached. There is then only a year or two before the child joins a secondary school, where there is very little provision for remedial tuition. So the parents of a child, diagnosed as a specific developmental dyslexic, ask "Now what?". If they can afford it, probably one of the best courses of action is to find a fee-paying school which accepts the concept of specific developmental dyslexia, and gives remedial tuition at a favourable teacher/pupil ratio (which should also include some individual help). A list of such schools - Boys' and
Co-educational has been constructed. This is described by Cosford (1970).

Some secondary schools are very sympathetic towards the problems of the S.D. dyslexic, and a few are beginning to run in-school remedial classes. The parent should investigate his rights of demand for suitable education for his child under the Chronically Sick and Disabled Persons Bill (1970). Such rights are currently being fought for by the various societies and associations formed for parents of S.D. dyslexic children. They are rapidly increasing in number, and include such areas as Scotland, N.Ireland, several in London, Surrey, etc. These arrange meetings, with speakers, and for general discussion, and certainly are useful as pressure groups. They jointly publish a journal - The Dyslexic Review, - which provides news, ideas and book reviews. Such organisations help parents to feel less alone in their struggles to educate a specific developmental dyslexic child.

Private tuition concurrent with a secondary school education is another possible way of overcoming the problems of combining remedial reading with other school subjects suitable for the age of the child. This, however, depends entirely on the efficiency and understanding of the tutor.

It is likely that the problem will gradually become resolved in the future as consciousness develops and parents demand suitable educational facilities. The form which this might take is not settled, although current thought is away from the separate remedial school, for which children miss games and playtimes to visit, but for trained remedial teachers, visiting the schools, perhaps a number allocated to a specific area.

Many children have parents who do not ask "Now what?". They may know that something is wrong, but do not find out why their child cannot read, or they may not bother about the educational process at all. This lack of interest is certainly relevant to the consistent finding that children and adolescents with reading problems make up a high proportion of those who reach the courts on charges of delinquent behaviour. It is also found that
many perpetual offenders in the prisons are virtually illiterate. Obviously there are many reasons why such individuals should be non-readers. Most of them will have encountered maximum adverse conditions to education at every stage of their lives - and here, the reading difficulty is symptomatic rather than causal, although it may assume the latter role. Critchley (1970) and others have observed the high percentage of cases of S.D. dyslexia among delinquents and this is consistent with the finding in the Isle of Wight Survey, that anti-social disorders were present in a third of those who were severely retarded in reading (28 months or more retarded), and that a third of children exhibiting anti-social disorders are retarded in reading by 28 months or more. The term 'anti-social' was used to cover various categories and the following table demonstrates the findings from a breakdown of the term.

Fig 19.2 Table showing types of Delinquency present in Anti-social Children with severe Reading Retardation (two years or more).

(Adapted from figures by Rutter, Tizard & Whitmore 1970 - Isle of Wight Survey)

<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>I</th>
<th>II</th>
<th>III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-delinquent anti-social disorder</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delinquency confined to house</td>
<td>5 (boys)</td>
<td>16</td>
<td>31%</td>
</tr>
<tr>
<td>Trivial delinquency only</td>
<td>2 (girls)</td>
<td>5</td>
<td>40%</td>
</tr>
<tr>
<td>Delinquency which extends outside the house</td>
<td>5 (4 boys)</td>
<td>8</td>
<td>63%</td>
</tr>
<tr>
<td>Children not tested</td>
<td>15 (1 girl)</td>
<td>36</td>
<td>42%</td>
</tr>
<tr>
<td>TOTAL:</td>
<td>27</td>
<td>70</td>
<td>39%</td>
</tr>
</tbody>
</table>
These results suggest that children with severe reading retardation tend to exhibit delinquent behaviour outside the home more often than other aspects of anti-social behaviour, although this type of delinquency is more common among all children with anti-social tendencies. They were also more likely to be categorized delinquent than non-delinquent compared with all anti-social behavioured children, and they tended to be more frequently in the category of trivial delinquency. This type of delinquency would seem consistent with the child of 9-11 years old who is becoming increasingly aware of his failure compared with his peers.

Delinquency is often an extention of emotional disturbance, and hence much of what is discussed under that heading in chapter 15 is of relevance here, and particularly the discussion of whether reading problems cause emotional disorders or vice versa. Two papers which discuss reading problems and delinquency, suggest that emotional disturbance is at the root of both. Margolin, Roman and Harari (1955) talk of a reading disability-truancy-delinquency syndrome, among 76% of children in trouble, who were screened prior to entry to a reception unit. They found that parents of many of these children were in a "depressed socio-economic bracket", and were often neglectful and careless of the lack of educational achievement of their children. Such a situation would invite truancy. It seems possible, however, that middle class parents would be more interested in school progress, preventing any attempts of their child at truancy - and thus again, or in other ways, stopping the delinquent tendencies.

It was the finding of Petty (1960) also, that many of his sample (75% N=50), of delinquents with reading problems had backgrounds not conducive to educational encouragement (e.g. broken homes). Petty does not attribute the delinquency directly to this factor, but suggests that it is generated in a vicious circle which develops when, for some reason, the child is unable to learn to read in a manner consistent with his potential capacity.
"The severe frustration experienced by the child in his unsuccessful effort to learn to read, makes him conspicuous in a socially unfavourable way - he is hurt and ashamed. The continued lack of success with concomitant and a feeling of insecurity may bring on emotional maladjustment. A particular child may develop feelings of inferiority, i.e. feeling of being stupid which may be enhanced by the attitudes of classmates, parents and even teachers, if they fail to understand the situation. Reading and school activities become disliked and the child seeks opportunities to avoid it. A variety of techniques may be employed, such as - becoming withdrawn, indulging in excessive daydreaming, developing nervous habits (i.e. nail biting or appearance of hysterically motivated illness), or compensation for feeling of inferiority in the form of anti-social behaviour."

In conclusion, delinquency is certainly high among the population of individuals who suffer difficulties in reading. Much of it is probably due to the discrepancy between the reading performance of the individual, and that which he feels he should achieve, or that of his peers. It seems likely that this effect is enhanced (or the state of delinquency encouraged) by the presence of an unstable or poor family background, where perhaps truancy or similar reactions are not discouraged. There would also appear to be a situation in middle class homes which would encourage delinquency. This is where parents are over-ambitious in their aspirations for the child's educational future. If this is incompatible with the child's performance (very likely when he is a specific developmental dyslexic), and the parents are unable to adjust, a very stressful situation will develop around the child, one to which he may react with delinquent behaviour.
In 1933, Margolin et al attempted to give numerical substance to the problem. This applied to the United States, and they calculated that — "during the course of any year, approximately 7,500 children appearing in court are in need of specialized remedial help." In an overall conclusion they said:— "Preventing the development of learning difficulties is one of the first steps in preventing the growth of delinquency". This is a point that is rather noticeably lacking in many otherwise good reports on truancy, violence and general classroom disorder, for example, Hill (1971).

To summarise the type of future that is depicted for the child with severe reading problems:— he may do well given optimum conditions, as did Rawson's sample. He may have higher motivation for achievement, and surpass that which he might have achieved without his reading difficulties. Given an unstable situation, with either no parental interest in him, or anxiety derived from over-ambition of the parents, he may founder, and feel the need to react against his hostile world, becoming awkward and anti-social.

In Britain, facilities are not good for such children, but with determination and money, it may be possible to secure suitable education, and carry the child over the worst stages of his disability. The choice of a career depends largely on educational achievement of the child and the aspirations of the family. Certainly a University Education is not beyond the realms of possibility — and this puts almost any career in prospect. However, it may be that the ex-dyslexic would find more suitable, a job not involving a great deal of reading and writing.

Whatever the problem is, however, and certainly there are many, the future situation should be an improvement as the current wide publicity given to specific developmental dyslexia begins to seep through to the public at large.
CHAPTER 21

AN OVERVIEW - A SUMMARY OF THE CONCLUSIONS

Because of the design of this thesis major conclusions are not confined to the last few pages, but are spread throughout. This chapter will summarize and consolidate them.

The basic enquiry has been concerned with the existence in reality - or in mere terminology - of a reading disorder, specific developmental dyslexia. Arguments flow back and forth, with eminent names to be found on either side, Sir Cyril Burt being one of those in opposition to the existence of the syndrome (Burt 1966). In the article: "Counterblast to Dyslexia - Disability in Reading", he says:

"Whenever I hear that someone, whether child or adult, has been diagnosed as a 'congenital dyslexie', I myself succumb to what Dr. Rheinhold describes as the 'agnostic syndrome'; in the homelier English of Patay Frig, "I don't believe there's no such a person."

Miles has been one of the primary proponents of the existence of the syndrome - and such is stated in many papers (1972, in particular).

The first few chapters were presented in order to 'set the scene' for the main discussion. As it was stated in the Introduction, many investigations of reading difficulties ignore the state of normal reading and hence have somewhat narrow outlooks. It appears essential to consider how a normal child reads, and there is a peculiar lack of research on this topic.
The chapter on 'The Reading Process' demonstrates the use of models to speculate on the factors involved in the process, and introduces the model to be used throughout this thesis. Gibson has broken down the concept of reading into component skills, and then has proceeded to examine the actual manner of application of the sensory apparatus to these components. This approach has penetrated the blanket concepts of 'reading' as a complete activity and should, for this reason, inspire much other research in this field.

Even in its present embryonic state, the consideration of the reading process allows a deduction of what abilities and conditions are necessary for a child to read. Some aspects of these are given more substance by a discussion of the anatomical basis of reading. If, as appears to be the case, some reading problems are based on a neurological deficit, then research should aim to pinpoint the nature of it. The methods of study of the individual, however, are few, and relatively inefficient -

1) Observation of individuals with specific brain damage.
2) Observation of individuals to whom drugs have been administered.
3) Observation of individuals undergoing electrical stimulation of areas of the brain.
4) The use of electro-encephalography.

This has determined the reliance on statistical methods on large samples. The individual variations make this less than optimal.

A chapter on the teaching of reading, again presents necessary material for later discussion. The most hopeful realm of teaching for children with reading problems is that utilising multi-sensory methods.

With background information now consolidated, there is possible a continuance of the deductions from the model of conditions and abilities
necessary to the reading process. Logically, the absence of any factor from the model might be predicted to be a cause of reading difficulties — and this, it appears, is the case. The list deduced as a result, is presented on page 87. The list is then compared in content with other classifications of reading difficulties, and appears from this to omit dyslexia, a term usually defined by negative rather than positive inference. It is not, according to most workers, caused by environmental, educational, or emotional factors, assuming average or above average I.Q., and adequate sensory apparatus. A few workers propose different types of dyslexia, some terms being inclusive of brain damaged children.

The continuing chapters examine the concept of specific developmental dyslexia and concurrently consider some of the suggested causes. The average reported incidence of the syndrome is about 10%. This is considered on a subjective basis to be high. An evaluation of the nature of the reports suggests a figure nearer 5%.

The incidence of S.D. dyslexia has been frequently said to vary between countries; a dictum that may be a reflection of a real variation, or one of the facilities for diagnosis in that country. Certainly linguistic structure may enhance or diminish the visible symptoms. Another characteristic of S.D. dyslexia is the different incidence in males and females. A ratio of about 4:1 seems to be the average finding, and this may be due to a number of factors, some real, and some a result of different frequencies of diagnosis of males and females. It may also be the result of genetic factors. Certainly heredity does appear to play a part in the occurrence of the syndrome, although the frequency of this is not possible to conclude from the literature. The range of possibility, however, is from 30% to 100% of cases.

Specific developmental dyslexia, for the purposes of this thesis is conceived of as a syndrome consisting of a major symptom of the problems in
reading, writing and spelling and a range of minor symptoms, each of which may be present or absent in any individual. Few, indeed, exhibit all of the minor symptoms. Many of the minor symptoms may be present in normal children, who do not have the language problems. In normal children there are observations of clustering of these symptoms, suggesting that perhaps there should be investigation of the presence of larger groupings. These symptoms are nearly all of a developmental nature and the individual usually 'grows out of them' by the age of eleven to thirteen. The difference between the specific developmental dyslexic and the other children with, maybe, a few of these minor symptoms is:-

1) The presence of the reading, writing and spelling problems.
2) The S.D. dyslexic normally exhibits more than usual of these minor symptoms.
3) The minor symptoms tend to persist for longer in the S.D. dyslexic.

The minor symptoms are grouped in the discussion under:

1) Those concerned with cerebral dominance.
2) Speech factors.
3) Motor factors.
4) Factors other than 3, that are usually taken to be characteristic of brain damaged children.
5) Spatial/temporal factors.
6) Emotional factors.

The major symptom of S.D. dyslexia is the actual difficulty encountered by the child in learning to read, write and spell. There is a pattern of numerous small and large faults, which are typical of the syndrome, but
this is a pattern not constant in the individual. The most commonly men-
tioned fault is that of reversing words or letters, but there are many more
that occur such as omission of letters, of words, substitution of incorrect
letters, etc. The characteristic of this major symptom appears to be of a
persistence of the type of faults made by every beginning reader, beyond a
stage that is normal for the majority.

Also included under the 'major symptom' are the difficulties in other
systems of symbols; for example, morse, semaphore, musical notation, numbers,
etc. The difficulties here are somewhat more sporadic in occurrence, a fact
that suggests that they differ from letter reading in a specific and funda-
mental manner, such that S.D.dyslexia may affect one or both or different
degrees of both.

A survey of the literature which is concerned with cerebral dominance
abnormalities and S.D.dyslexics, suggests that the latter are less frequently
fully and strongly right handed; more seem to be left handed (up to 20%) and
possibly more are ambidextrous. The overall finding is probably best summa-
rized by the term 'poorly established lateral dominance'.

Speech appears to be frequently later to develop in some S.D.dyslexics
(18%-22%) and also there are more articulatory defects (in 14%-35%). The two
features are probably present in the same individuals, but research has not
clarified this point. The type of articulatory errors appear to be similar
to those of normal, but younger, children; hence the significance is in
their persistence.

Motor clumsiness is a factor again mentioned frequently in connection
with S.D.dyslexia. Figures on this are not common in literature, judgements
being based on 'impressions'. This makes it difficult to assess the valid-
ity of the factor as a minor symptom of S.D.dyslexia. The Isle of Wight
Survey, however, yielded figures on many of the motor 'milestones' — bowel
control, walking, etc. — and children retarded in reading (despite ade-
quate I.Q.) were statistically different from a control group in a number
of such factors, being later in the development of the skill.

Motor clumsiness is a usual characteristic of children who have known brain damage, and other factors such as this are common to both S.D. dyslexics and those with known brain damage, for example the incidence of prematurity, or possible brain damage pre-natally, at birth, or post-natally, (sometimes in head injury or disease). This factor suggests that either S.D. dyslexia is posing as an alternative term for children with minimal brain damage - and perhaps only a difference of degree separates them, - or that some children diagnosed as S.D. dyslexics have problems caused by brain lesions, while in others, there is a different causation. Certainly the presence of a genetic factor interferes with the first proposition.

Spatial and temporal orientation is possibly a category that should include aspects of cerebral dominance, and aspects of perceptual factors that will be mentioned later. The S.D. dyslexic is frequently observed to be 'odd' in some usually indescribable manner. This is probably due to a confusion in space and time, from which he may suffer.

The perceptual factors are those of vision and audition – certainly related to space, and probably time, respectively. It may be possible to distinguish at causal source between those who have problems in visual function and those who have auditory difficulties. The problems involved, however, seem to be parallel – those of discrimination and memory.

Emotional factors are very frequent, if not universal in children with reading problems. This is understandable, though maybe not sufficiently understood by a number of workers who attribute the whole syndrome of S.D. dyslexia (not necessarily by that name) directly to emotional or maladjustment problems. The most conclusive quantitative evidence of the cause and effect relationship here, is that from the Isle of Wight Survey. It was deemed improbable that the emotional problem was causal to the reading problem, and such a relationship was found in no group of cases of retarded reading.
If the minor symptoms are to be taken to be linked with the syndrome of specific developmental dyslexia, then they must be explained by any theory that attempts to suggest the cause.

For various reasons (chapter 17), the following theories or categories of theory to explain the cause of specific developmental dyslexia, were rejected:

- **Emotional causation.**
- **Environmental factors (including educational and motivational)**
- **Sensory factors.**

The following are also rejected — although there are elements in them which are compatible with findings:

- **Hormonal/Chemical.**
- **Theories that implicate cerebral dominance factors.**

There are two groups of theories that seem to fit most of the findings reported about specific developmental dyslexia:

- **Theories implicating brain damage.**
- **Theories which suggest a specific immaturity in the brain.**

Both of these hypotheses are retained.

Brain lesions can certainly cause most if not all of the symptoms concerned in specific developmental dyslexia, but the hereditary factor is hard to explain in those terms. To say that a specific immaturity is the cause in all but those with known brain lesions is unsatisfactory in the case of S.D. dyslexies who have only suspected brain injury (e.g. have been
premature, or have encephalitis or meningitis). Some neurologists say that there is no problem here, in that they are readily able to distinguish children with brain damage. Others, still eminent, are not happy about their ability to distinguish. The dilemma is probably best treated in the manner of several workers who suggest two categories of specific developmental dyslexia, one for those without any evidence of brain damage, and the other for those with possible or known brain damage.

The last two chapters are concerned with the prediction of children with potential reading problems, and what should be done with them once they are diagnosed. Prediction seems to be feasible such that a child now diagnosed at eight or nine might have been predicted at the age of five or six. As for the future of the individual, given optimum help, encouragement and chance, an S.D. dyslexic can do as well, if not better, than a comparable but normal reading child. Given anything less than the optimum, however, then their future may be very bleak.
Since the thesis was completed, the following have become available:—

1) Report from the National Children’s Bureau (Kellner Pringle).

The report considered the consequence of illegitimacy for a child. It was found that twice as many illegitimate children are backward in reading at the age of seven. This probably links with the higher incidence of adoption in cases of specific developmental dyslexia. It seems to be best explained in terms of inadequate care during pregnancy. This might also be a factor of physical manifestation of emotional disturbance during the period of pregnancy.

Cambridge University Press.

The function of 'Reading and its Difficulties' would seem to be to bring up to date some of the issues raised in Vernon's previous book, 'Backwardness in Reading', (1957). As such, it functions well and proves an excellent source of references on the subjects of reading, perception, dyslexia and other forms of reading failure. However, the references used in the text are not often discussed individually, being merely the statement of findings relevant to that particular subject matter. There are few references included that conflict with Vernon's argument, and there is little criticism of the work mentioned. For example, she quotes the findings of Newton (1970), saying that they
throw "new light on the neurological functions associated with lateral dominance in dyslexia". Newton's study was a pilot study and involved only 25 experimentals and 25 controls. Therefore the expression 'new light' is hardly appropriate, particularly when the nature of the work is considered. Electro-encephalography is a technique in its infancy for the uses to which Newton put it. (See page 198 of this thesis).

An improvement to the book would have been a more comprehensive introductory chapter which discussed the reading process and thereby indicated to the reader why the ordering of the book is such, and why the categories chosen to discuss are - visual perception, auditory and linguistic factors, reasoning and intelligence, and motivational and emotional factors. There seems little justification for the very close linking of auditory and linguistic factors. The chapter on dyslexia is mentioned in several of the earlier chapters, but it is not clear how they are related to dyslexia. This would be much clearer if a longer conclusion had been added at the end of each chapter, rather than in the last eight pages. The separated conclusions, in respect of the chapter on dyslexia, are very elaborate, in a manner that is not consistent with the information put forward in the chapter itself. This does not matter a great deal when the reader is conversant with the literature on the subject of dyslexia, as he will then have opinions of his own. However, for the less knowledgeable reader, the conclusions are not adequately justified by the evidence. More controversial ideas should have been added, discussed, and retained or rejected. Only then would the comment following have been justified -

"The evidence adduced in the preceding chapter would seem adequate to establish the existence of a basic disability (i.e. dyslexia) in at least some backward readers. In these
"cases, the reading difficulty is not caused solely by poor intelligence, inadequate motivation, or environmental circumstances, such as uncultured homes or ineffective teaching...."

Vernon's book is difficult to criticize on more specific points, because these are usually the points made by others, merely being quoted in this work. It is a pity that Vernon does not add more personal comment as this would have made the book more stimulating.

One review of the literature can add little to another review of the literature unless one contains many personal interpretations, or opens new fields of relevance to the study. Vernon's book does neither, and thus, even if it had been available earlier, it would not have contributed much to this thesis.

On page 172 of Vernon's book there is a brief discussion of the relative merits of the Fernald and the Gillingham methods for the remedial treatment of specific developmental dyslexia. The conclusions are similar to those made in chapter 19 of this thesis.


This book represents a collection of fifty-five articles from such sources as journals and conference proceedings. Many of the articles are old, having been first published as much as sixteen years previous to the publication of the present book. Since many of the articles are reviews of the literature, this is unfortunate.

The book would also seem to be unbalanced. Out of the fifty-
five articles, only three have any relevance to reading difficulties. Two of these are short, and concern instructional causes of poor reading and the interrelation of emotional problems and reading problems. The third is a very comprehensive article on 'Factors Related to Disability in Reading', by M. Seddon Johnson. Despite the fact that this is one of the best summaries of the literature on this subject, it was first published in 1957, twelve years prior to its presentation in the book. It is therefore out of date. Taken away from its role in Karlin's book, however, the article can be assessed for its real value.

Seddon Johnson's article summarises nearly two hundred references prior to 1957. Under the heading: 'Origin of Specific Reading Disability', she mentions P. Ranschburg (1928). He determined that the cause of 'specific reading disability' was a lack of blood reaching the 'visual memory centre for words'. He considered that the brain was not structurally imperfect. Ranschburg's ideas are interesting in application to the description of the post-mortem in chapter 15 (Drake, 1968), where the cause of the reading problem was found to be malfunctioning of the brain due to vascular irregularities.

Seddon Johnson examines the relationship of 'selected' factors to 'specific reading disability'. She concludes that visual functioning is not directly related to reading achievement. However, visual difficulties may contribute to disability, and correction "may enhance comfort and efficiency in reading". She finds no evidence that auditory acuity is a causative factor in reading disability, but considers that auditory discrimination "appears to be rather definitely linked to... reading disability". These findings are of relevance to chapters 3 and 15.

After observing the literature on speech and language development, Seddon Johnson concludes that ".....problems in either or both of the
areas may be indicative of some more basic problem of which the speech and reading disabilities are symptoms. She says also that deficiencies in speech and interpretation of oral language may interfere in the development of reading "because of the sequence in which language develops."
The first statement of this paragraph agrees with the general conclusions of chapter 14. However, the second is unusual and may be applicable in cases of reading problems other than those that she terms 'reading disability cases'.

Regarding the literature on cerebral dominance, Seddon Johnson finds inconclusive evidence — as was the case in chapter 13 of this thesis. She considers that some of the reports of high incidences of 'lack of clear-cut lateral preference' are biased for the following reasons:

1) Achieving and retarded readers were not adequately defined.
2) Disproportionately high numbers of cases with unusual lateral preferences may have been studied by some of the investigators because "of their special interest in such cases".
3) She finally concedes that some cases of reading disability may show unusual lateral preferences as a symptom, not cause.

The above comments may be applicable to more recent research, but probably not to the same degree (particularly 2). Seddon Johnson's conclusion shows the emerging idea that accompanying factors to retarded reading are not necessarily causal.

She next considers the issue of 'Reversal Tendency' in cases of reading disability. She concludes that poor readers make more such errors than good readers, but this may be due to the fact that they are
forced to read materials that are too difficult for them. The suggestion is made that reversal errors are no more common than any other type of error. This would seem likely, and reversals might be reported more frequently as they show up clearly as abnormal. Other errors are similar to errors made by normal (but young) readers in effect but not in intensity.

The most useful area of coverage of Seddon Johnson's article is that dealing with social and emotional adjustment. As it was mentioned in Chapter 15, many of the more superficial studies of the relationship between reading and emotional factors were made in the United States in the fifties. This article originates from the end of this period and reviews the studies in a critical manner. Seddon Johnson concludes:

"Certain weaknesses of these studies.....make it impossible to state definitely the part which emotions play in reading disability and the effect of reading disability on the personality organization".

She makes some general conclusions:

1) There is no single personality trait that is always present in cases of reading disability (or in good readers).
2) Personal maladjustments, causing inability to attend probably have "a negative effect on the development of reading ability".
3) The presence in quantity or intensity of personal maladjustments is "more frequently associated with failure in reading than with success in reading".
4) Emotional problems and reading problems aggravate each other.
5) The influence of home conditions is great in both emotional factors and reading achievement.
6) The greater the emotional problem, the more likely the necessity for individual instruction (and psychotherapy).
Regarding point one, Rutter, Tizard and Whitmore did find a personality trait fairly typical of the retarded reader - anti-social behaviour. However, this has only been recent, and only showed up after thorough analysis which was not usual in the studies reviewed by Seddon Johnson. While she does not stress the commonly held view of the time - that reading difficulty is caused by emotional problems, it is unfortunate that she does not more strongly mention the possibility of the existence of the relationship in an inverted form.

R. C. Plenty, in an article entitled 'Reading Ability and High School Drop-outs', reports the finding that three times as many poor readers as good readers dropped out of school before graduation (mainly during the tenth grade). The level of reading of the poor readers who stayed on was not any different from the leavers, and the factor of social adjustment seemed to be significant in reasons for staying or leaving. These findings are of relevance to chapter 20, regarding the future for an individual with reading problems.

Also of relevance to chapter 20 is the article by Strang R. on the 'Interrelations of Guidance and Reading Problems', although this is written in rather a conversational manner.

An article by Havighurst R. on 'Social Factors the Influence Learning and Reading', reviews very adequately the work of Bernstein on restricted and elaborate language. It is of relevance to chapter 3 - 'The Abilities and Conditions to be Considered in the Reading Process'.
4) Ingram T. T. S. (1963) - Chronic Brain Syndromes in Childhood, other than Cerebral Palsy, Epilepsy and Mental Defect.
In: 'Minimal Cerebral Dysfunction', MacKeith R.M. and Bax M.
Published by Heineman, London.

Ingram discusses the use of the term 'minimal brain damage'. He presents a 'Suggested Provisional Classification of Chronic Brain Syndromes other than Cerebral Palsy, Epilepsy and Mental Defect'. The classification (presented below) clarifies the concepts of minimal brain damage which have been used throughout this thesis, and is particularly relevant to chapter 17. It is an artificial classification in that it is ordered in terms of manifest symptoms, but it is the first stage of a natural classification and as such has value.

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<td><strong>DEFINED CLINICAL SYNDROMES WITH CONSTANT EVIDENCE OF BRAIN ABNORMALITY</strong></td>
<td><strong>DEFINED CLINICAL SYNDROMES WITH INCONSTANT EVIDENCE OF BRAIN ABNORMALITY</strong></td>
<td><strong>SYMPTOMS IN WHICH BRAIN ABNORMALITY MAY BE AN INCONSTANT DIRECT OR INDIRECT CONTRIBUTORY CAUSE.</strong></td>
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<td><strong>EXAMPLES:</strong></td>
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(From Ingram, 1963)

Ingram points out certain factors that may blur categorization. In group one, environmental factors may affect the manifestation of symptoms. He warns that group two are liable to be associated with the presence of brain injury, where this is not necessarily present. There may be a hereditary effect, and the wide range of abilities in the population should be considered in diagnosis. Similarly there may be environmental effect.
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In this fairly extensive list of references, these papers are considered to be the most informative on the general aspects of Specific Developmental Dyslexia, and other reading difficulties.