

# DYSLEXIA - A MEDICAL OVERVIEW

DR. CHRISTOPHER SCIBERRAS

REGISTRAR - DEPARTMENT OF PAEDIATRICS, ST. LUKE'S HOSPITAL

*"It is a lonely existence to be a child with a disability which no - one can see or understand, you exasperate your teachers, you disappoint your parents, and worst of all you know that you are not just stupid. "*

*Susan Hampshire, President - The Dyslexia Institute, U.K.*

## SUMMARY

*Dyslexia and other related learning disabilities are serious problems. Early diagnosis and educational remediation is of paramount importance. There is no known eye or visual cause for dyslexia and learning disabilities, and no effective visual treatment. Multidisciplinary evaluation and management must be based on proven procedures demonstrated by valid research.*

## INTRODUCTION

Nearly a century has passed since the first published observation that some otherwise normally - intelligent children have specific difficulty in learning to read. The intervening years have seen both an intense search for the mechanism of this disorder and an ongoing debate about whether it exists.<sup>1</sup>

The disorder was first termed "congenital word blindness" by British ophthalmologists, and for several decades it was assumed to be primarily visual, until the 1930's. Then the American neurologist Samuel Orton called attention to the frequent association between reading disability in the primary grades and disorders of spoken language during the preschool years, hence pointing to an underlying disturbance of language.<sup>2</sup> The further association with left - handedness or ambidexterity suggested a disorder of cerebral hemispheric specialisation. This concept of "mixed dominance" was extended to account for the reversals of single letters (b and d) or letter order ("was" for "saw") that were frequently observed in dyslexic readers - a phenomenon Orton referred to as "strephosymbolia."

The 1950's and early 1960's saw a wave of enthusiasm for the interpretation of specific learning disabilities as disorders of perceptual faculties. It was during this period that the distinction between "auditory" and "visual" learners became fashionable, and the popularity of the "language disorder" concept waned. Also during these years, the first studies appeared suggesting that dyslexia may have more than one mechanism.<sup>3</sup> The resulting controversy between "lumpers" who see dyslexia as a unitary disorder, and "splitters", who believe there are multiple causes, persists to the present.

More recently, a series of studies begun by Avan Liberman and co-workers at the Haskins Laboratories<sup>4</sup> have focused on how the brain (specifically the major temporal lobe) uses the "speech code" to make language out of acoustic signals. The resulting formulation of dyslexia as a disorder of phonemic awareness has been supported by a wide variety of

anatomical, psychophysiologic, and neuropsychological findings. The great responsibility placed on teachers and schools in the early recognition of the child with special educational needs with particular reference to dyslexia, emphasises the important role of doctors and other healthcare professionals in this field. This role includes early recognition, medical assessment of the whole child holistically, advising the Local Education Authority and liaising with all the relevant members of the teaching, psychological and health professions as well as the parents.

It is particularly important that the valuable knowledge of the child's early development and strengths and weaknesses should be shared with the teachers. This should enable them better to understand the child and his teaching needs.

The child with dyslexia, who is not recognised early, suffers severe stress and anxiety and frustration as he falls further and further behind his peers. The loss of self - image results in secondary emotional problems and can also severely affect his behaviour.

### Definition of Dyslexia:

( 'Dys' = difficulty, 'lexicon' = words or symbols).

*"Dyslexia is a specific learning difficulty that hinders the learning of literacy skills. This problem with managing verbal codes in memory is neurologically based and tends to run in families. Other symbolic systems, such as mathematics and musical notation, can also be affected.*

*Dyslexia can occur at any level of intellectual ability. It can accompany, but is not a result of, lack of motivation, emotional disturbance, sensory impairment or meagre opportunities.*

*The effects of dyslexia can be alleviated by skilled specialist teaching and committed learning. Moreover many dyslexic people have visual and spatial abilities that enable them to be successful in a wide range of careers. "*

The Dyslexia Institute, February 1996.

Dyslexia is a neurologically based disorder in which there is an unexpected failure to read.

As defined by the **World Federation of Neurology**, the disorder is "manifested by difficulty in learning to read despite conventional instruction, adequate intelligence, and sociocultural opportunity and is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin."<sup>5</sup>

Dyslexia is a learning disability that alters the way the brain processes written material. The effects of the disorder vary from person to person. In fact, the only common trait among people with dyslexia is that they read at levels significantly lower than typical for people of their age and intelligence.<sup>6</sup> Dyslexia is also referred to as "specific reading disability" or "specific reading retardation." It is generally assumed that the failure to learn to read represents a specific syndrome that is distinct from the normal distribution of poor readers. Rather than representing the lower end of a continuum of reading disability and reading ability, dyslexia ( or specific reading disability) is viewed as a biologically coherent disorder that is distinct from other, less specific reading problems. Support for this point of view comes from the work of Rutter and Yule,<sup>7</sup> who found that "children with dyslexia form a 'hump' at the bottom of the normal curve."<sup>8</sup> They used these findings to argue that reading ability is bimodally distributed, with specific reading disability appearing as the extreme lower tail. This notion of reading disability as a specific, discrete entity serves as the basis both for investigations into the neurobiology of dyslexia and for the diagnosis of dyslexia and the provision of services to persons with the disorder.

Rather than following the bimodal - distribution posited by Rutter and Yule, another model continues to dominate thinking in the field. Shaywitz et al.,<sup>9</sup> who investigated both the distribution and the temporal stability of reading disability by analysing data from the Connecticut Longitudinal Study, hypothesised that dyslexia occurs along a continuum and is best conceptualized as the tail of a normal distribution of reading ability. Dyslexia is therefore a specific aptitude deficit, leading to underachievement in reading by children of otherwise normal intelligence. These findings therefore provide support for a fundamental revision in the concept of dyslexia; rather than existing as a discrete entity, dyslexia, like hypertension and obesity, occurs along a continuum and varies in severity.

**Prevalence:** Dyslexia affects 1 pupil in 25, affecting about 350,000 pupils in the U.K. Dyslexia is believed to affect 4 - 5 % of the population, or some 12 million in America.

**Sex prevalence:** Boys are affected with greater severity than girls.

**Classification:** Learning disabilities, including dyslexia, are divided into two types: **primary** (inherited) and **secondary** (caused by a physical factor that interferes with learning).

#### *Aetiological Factors:*

Reading is a complex function that involves integrating multiple factors related to an individual's experience, ability, and constitution. Although it is obvious some children do not read well because they have visual problems, research has shown that the majority of children and adults with reading difficulties experience a variety of language defects that stem from complex, altered brain morphology and function, and that the reading difficulty is not due to altered visual function per se. Furthermore, no scientific evidence supports claims that the academic abilities of dyslexic or learning - disabled children can be improved with treatment based on visual training, neurological organizational training, or tinted or coloured lenses.

The exact cause of learning disabilities is not yet known. Basic scientific research into the role that brain structure and function play in learning disabilities has demonstrated that the basis of dyslexia and other specific learning disabilities is within the central nervous system and is multifactorial and complex.

There is now substantial evidence to suggest that dyslexia is a disorder of neurobiological origin. In addition to the well - known deficit in phonological processing<sup>10</sup>, dyslexic individuals have altered lateral cerebral symmetry<sup>11</sup>, impaired visual<sup>12</sup> and auditory processing<sup>13</sup>, disordered magnocells<sup>14</sup>, and altered patterns of cerebral activation on verbal, visual, and auditory tasks<sup>15</sup>. The area of the brain most frequently implicated is the temporo - parietal cortex and, more recently, the cerebellum<sup>16</sup>.

#### *Factors associated with the origin of dyslexia:*

- (i) A family history of difficulty with written language or speech is present in the majority of cases.
- (ii) A history of placental dysfunction, resulting in a small - for - dates baby, can be significant.
- (iii) Acquired dyslexia - secondary to a difficult birth with anoxia, can manifest as dyslexia.
- (iv) Abnormal migration of the grey cells in the cortical layer, towards the end of the second trimester of pregnancy.
- (v) Abnormal sequence of function of the magna and parvo cellular systems in the visual and / or auditory, and / or kinaesthetic pathways.
- (vi) Possible effect of allergies and genetic factors on

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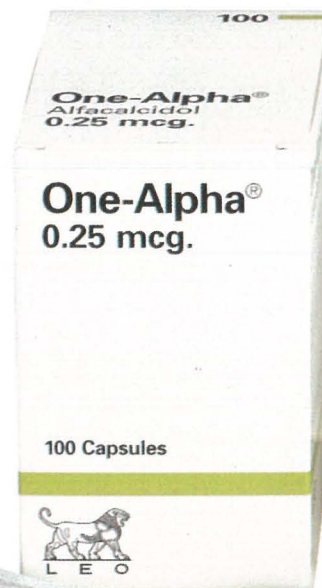
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neurotransmitters - research topic. (Genes which may be responsible for dyslexia have been identified).

(vii) Variation in the size of the right temporal area and corpus callosum detected on recent anatomical studies on post mortem specimens and on MRI / CAT images.

(viii) Research led by Dr. Albert Galaburda and Glenn Rosen of Harvard and Beth Israel Hospital in Boston, and written in the Proceedings of the National Academy of Sciences,<sup>17</sup> present evidence that may pinpoint a spot in the cortex where dyslexia originates. It is an area of tissue called the medial geniculate nucleus (MGN), which affects hearing by acting as a relay station for auditory signals. It was found that the size of the neurons in the MGN of dyslexics is smaller in the left hemisphere than it is in the right hemisphere, by a size differential of 10 - 15%. This may therefore be enough to throw off the brain's timing and disrupt its crucial word - processing skills.

(ix) Biochemical asymmetry of the cerebellum indicates altered development of the organ and direct evidence of its involvement in dyslexic dysfunction.<sup>18</sup>

#### **Clinical Picture:**

- Dyslexia is a specific learning difficulty which results in a significant and persistent difficulty with reading, spelling, written prose and sometimes arithmetic.
- The child shows a marked discrepancy between his literacy skills and his achievements in other spheres.
- It occurs in spite of adequate teaching and is independent of socio - cultural background.
- Boys seem to be affected more severely than girls.
- In addition to difficulties with written language, the individual may also have difficulties with orientation, time, short term memory (auditory or visual), sequencing, auditory or visual perception and motor skills. Each individual will present a different pattern of difficulties, according to which areas are chiefly affected.
- Behavioural manifestations:  
Shy and withdrawn.  
Overactivity, with poor attention span.  
Severe attention deficit, with or without hyperactivity.  
Signs of emotional stress in persistently undiagnosed cases, which may take the form of disruptive behaviour or psychosomatic symptoms, loss of self - confidence and very low self - image.  
Development of school phobia.
- Motor manifestations:
  - (a) *Gross motor*: 'clumsiness' - present with signs of an awkward gait or difficulty in kicking a ball, skipping or riding a bicycle.
  - (b) *Fine motor*: poor fine motor control with poor handwriting (dysgraphia), and difficulty with buttons and shoelaces.
- Visual manifestations: poor visual perception and poor visual sequential memory will lead to difficulty with copying letters and words, reversal and inversion of letters and numbers and putting them in the wrong order, resulting in bizarre spelling.
- Problems with memory: poor sequential memory with difficulty in remembering the days of the week, months, alphabet and tables.
- Orientation difficulties: Difficulties with time, left / right orientation and numbers (dyscalculia).

#### **Diagnostic pointers towards the recognition of dyslexia:**

Early diagnosis is crucial to the treatment of dyslexia and other learning disabilities. It is difficult to recognise with certainty a learning disability before the age of 6 or 7 years.

#### *All ages:*

- Bright in some ways with a 'block' in others;
- Family history of similar difficulties;
- Difficulty in carrying out three instructions in sequence;
- Late in learning to talk, or speaking clearly.

#### *Children aged 7 - 11 years:*

- Continued mistakes in reading, and / or lack of reading comprehension;
- Strange spelling, perhaps with letters missed out or in the wrong order;
- Poor concentration span for reading and writing;
- Unusually clumsy and disorganised at home and at school;
- Difficulty in copying accurately from blackboard or textbook;
- Difficulty in remembering and processing oral instructions;
- Difficulty in understanding time and tense;

- Growing lack of self - confidence and increasing frustration;
- Trouble with sounds in words, e.g. poor sense of rhyme.

*Children aged 12 and over:*

- Tendency to read inaccurately, or without adequate comprehension;
- Inconsistent spelling;
- Difficulty with planning and writing essays;
- Tendency to confuse verbal instructions and telephone numbers;
- Severe difficulty in learning a foreign language;
- Low self- esteem;
- Difficulty with perception of language, e.g. following instructions, listening comprehension.

N.B. Not all dyslexic children will display all these characteristics.

**Treatment:**

The issue of learning disorders, including dyslexia, has become a matter of increasing personal and public concern. Inability to read and comprehend is a major obstacle to learning and may have far - reaching social and economic implications. Concern for the welfare of children with dyslexia and learning disabilities has led to a proliferation of diagnostic and remedial treatment procedures, many of which are controversial. This policy statement addresses these issues, which are of importance to affected individuals, their families, teachers, physicians, allied health personnel, and society.

A broad - based consensus of educators, psychologists, and medical specialists recommend that individuals with dyslexia or related learning disabilities should receive:

- (1) early comprehensive educational, psychological, and medical assessment; and
- (2) educational remediation combined with appropriate psychological and medical treatment.

Approximately 4% of school children are considered to suffer from dyslexia to a degree severe enough to warrant individual help. The main focus of treatment should be on the specific learning problems of affected individuals. The usual course is to modify teaching methods and the educational environment to meet the specific needs of the individual with dyslexia. Without appropriate help and teaching a

dyslexic child will fail to reach his / her intellectual potential, while the early recognition of the child's difficulty is vital to prevent complicated consequences such as in cases of secondary emotional problems, lack of confidence and disordered self-esteem.

Structured 'multisensory' (or 'intersensory') teaching is usually recommended. Teaching through all the combinations of sensory and motor channels facilitates integration along the relevant neurological pathways. This encourages and reinforces efficient processing and integration of visual and auditory symbols, resulting in improved learning and linguistic skills.

**The Medical Role in the management of Dyslexia:**

1. Liaison, with appropriate referral at each stage: An important and useful role for the doctor or health visitor is to act as co - ordinator between the parents and the various people concerned.
2. Early recognition of the **Pre - School Child** 'at risk' of developing Specific Learning Difficulties:

Doctors and health visitors doing regular developmental screening are in the unique position of seeing all pre - school children. They should be aware that there are certain early pointers in the development of the child who may be 'at risk' of experiencing subsequent specific learning difficulties. The screening would normally cover development in four major areas - gross motor, hearing speech and language, vision and fine motor, and social behaviour and play.

- (a) The child with Speech and Language delay: The child who presents with delayed development of speech and language will require a multi - disciplinary assessment to exclude causes such as hearing loss, global retardation and social and emotional factors. The child diagnosed with specific language delay is seen by the speech therapist who not only helps the child with expressive speech, but also includes work on concentration and listening skills, sound - symbol relationship and sequencing, etc. This should help to alleviate some of the difficulties experienced during the early school years.

It has been found that many children with specific language delay, who speak normally by the time they go to school, subsequently have difficulty in learning to read and write.

Information regarding the pre - school language difficulty should be passed on to the school by the speech therapist or doctor. The teacher should be alerted to the possibility that the child might need early individualized teaching, if the child does not seem to be benefiting from the general classroom teaching.

(b) The child with Poor Hand / Eye Co - ordination and Visual Perceptual Problems:

Such a child seems to be developing normally in most areas but has marked difficulty in copying shapes with a pencil or brick patterns, etc. Such problems with eye / hand co - ordination and visual perception suspected by the doctor / health visitor, should be discussed with the educational psychologist, who in turn may suggest activities and games that the parents can play with their child in order to help to strengthen the areas of weakness before school entry. The child's subsequent progress can then be followed up, and further assessment conducted if necessary.

The importance of early recognition of the child 'at risk' is not to make the parents anxious, but rather that the speech therapist or teacher, health visitor or psychologist can recommend ways in which the parents can reduce the areas of developmental delay, before the child goes to school.

3. Early Recognition of the Child 'At Risk' at **School Entry (5 1/2 years)**: The developmental screening test done as part of the routine medical school entry examination includes tests of fine and gross motor development, speech and language (including auditory discrimination and auditory sequential memory), behaviour and emotional development. This examination should pick out both the slow - learning child missed by the pre - school screening, and the seemingly bright child who shows signs of possible specific learning difficulty.

It is helpful for the doctor to discuss the child's weakness with the teacher, who in turn will give a little extra time and thought to such a child. If the child fails to make the expected progress, early referral and discussion between the appropriate professionals should be encouraged.

4. The **Older Child** Failing at School: The presence of psychosomatic symptoms, resulting from anxieties about school, together with unexpected failing in school work, should arouse the suspicion of the school doctor with regard to dyslexia, and the child should therefore be referred to the educational psychologist for assessment and diagnosis.

**The Medical Assessment:**

A proper history should be taken in which special attention is given to:

- any family history of dyslexia,
- a history suggestive of hypoxia or low apgar score at birth;

- a post mature low birth weight baby,
- the developmental history (noting especially delay in speech or hand / eye development),
- emotional / behavioural problems (noting whether these started before or after beginning to fail at school).

The medical examination should reveal any treatable conditions such as glue ear, allergies etc. Auditory discrimination and verbal hearing tests should be included as well as tests for poor gross and fine motor coordination.

**Referrals:**

With the increasing recognition of dyslexia as a genuine handicap, more of these children are being referred for assessment by psychologists, teachers and parents. Earlier referral and provision are now strongly recommended and a multidisciplinary approach to diagnosis and treatment involving educators, psychologists, and physicians, coordinated by paediatricians, is required.

All these children should be referred to an optician or optometrist for detection of refractive errors. Those between the ages of 7 and 12 years should also be referred to the ophthalmologist for the attention of the orthoptist who in turn will include reference eye and ocular fusion.

An audiological or ENT consultation would be appropriate in cases with a suspicion of recurrent hearing loss.

Gross Motor Development problems presenting with 'clumsiness' are recommended to the paediatric physiotherapist.

Fine Motor Co - ordination difficulties are seen by the Occupational Therapist or physiotherapist.

Speech and language development problems are dealt with the speech therapist.

A child with a history of extreme distractibility and over - activity possibly due to food allergies or sensitivities can be referred to a dietician, as it is often the food or drink which the child craves that causes the problem.

Cases of A.D.D. with or without hyperactivity should be referred to the paediatrician or psychiatrist with a special interest in this field.

The information from all the specialists should be collated and shared with the psychologists and all the teachers concerned with the child. A plan of action can then be drawn up.

## **Counselling:**

It is very important that once the child is diagnosed as dyslexic, a proper and simple explanation should be given to both parents and child. They should be told that the child is of normal intelligence and that he has a genuine difficulty. They should also know that if the child is of good intelligence, has motivation and drive, has been diagnosed early, and has had support from school and at home, then, provided he can obtain appropriate specialised teaching, he should make good progress over a period of time.

The parents can be advised to:

- help the child to keep up his self- image;
- encourage hobbies and activities in which the child can succeed;
- keep up his interest in books and read him books of his own choosing;
- remember that the child will have to work twice as hard at school to achieve half as much as his peers, so he will be tired after school; there appropriate help with home work should be given;
- keep up regular contact and good relationship with his teachers;
- help the child select interesting and educational TV programmes;
- check that the child is receiving appropriate teaching and technology.

The doctor can recommend the national voluntary association which the parents can contact if they wish, ie: the Malta Dyslexia Association.

## ***Dyslexia - Hopes for the future:***

The present awareness of dyslexia as a major disability in the process of learning in an increasing number of children, creates an ever difficult task in that the number of teachers available locally with appropriate training is still below the number required to make provision for the special educational needs of these children. It is time however to realise that these children should be taught by dyslexia - trained teachers.. Private tuition by qualified specialist teachers may also be available. On the other hand, units for children with dyslexia which are attached to ordinary schools, enable a child to receive appropriate help more sensibly, in the sense that the child can spend most of the day in the classroom with his peers and is only withdrawn for part of the day for specialised teaching in the unit. The unit teacher is able to advise the class and subject - teachers in the school, while the children benefit from meeting other children with the same difficulties, which helps relieve their frustration and feeling of isolation.

The unit acts as a teaching and resource centre for teachers from other schools. The unit also acts as a multi - disciplinary assessment centre where teachers, psychologists, doctors and other professionals in the Child Health Services can assess and share information on the children. Any subsequent therapies agreed upon can take place within the unit and be fitted into the child' s timetable, without his/her having to make visits outside school, thus avoiding time-loss or non - attendance. The unit should have a 'nominated' school doctor to whom and the teacher in charge can have access discuss any concerns about the child's health and also to simplify any medical referrals.

It is also hoped that the Health Authorities increase the recognition of the very important part played in the early recognition, assessment and management of these children by health care personnel.

It is also suggested that the future sees the development of '**Middle Tier Clinics**' where pre - school children showing only mild developmental or specific delays are assessed, after being referred by a G.P., health visitor, or speech therapist. These are children in the 'grey area', who would not seem to warrant a full multi - disciplinary assessment at a Child Development Assessment Unit (C.D.A.U.).

A Middle Tier Clinic would be run by an experienced clinical medical officer, who would carry out a full assessment, and make immediate referrals to a speech therapist, audiologist, psychologist, paediatrician, dietician, home teaching team etc., as appropriate. The aim of this is to strengthen any specific weakness even before the child starts attending school. The child will therefore be seen and referred quickly and the waiting list for the C.D.A.U. would be shortened. These clinics would hopefully identify children who may be 'at risk' of specific learning difficulties but who may well have otherwise been missed. Such an arrangement should enable a close liaison with the receiving nursery school and ensure a close follow up of the child's progress.

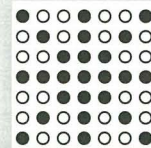
The child whose problem is recognised early and who receives appropriate teaching and support, both at home and at school, has every chance of overcoming his disability and should grow to adulthood without additional emotional traumas. Many of these children have considerable skills and talents in other spheres. These should be encouraged to the full. In addition, many develop qualities of determination and persistence which will serve them well throughout their lives.

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