

## Disability/ Dyslexia

**This article examines the nature and possible causes of developmental dyslexia. The development of reading and spelling skills is considered, and implications for the teaching of dyslexic students discussed.**

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“And so, in short, it seems to me  
That sounds and letter disagree”.  
(anonymous)

Thus spoke an anonymous dyslexic on the frustrations of his struggle with the English language. Western society today assumes literacy in its citizens. Literacy skills are needed for day to day living. In addition, as language development contributes to cognitive development and the generation of ideas, literacy ensures the continued evolution of society. But what happens when the process breaks down, when there is an unexpected, persistent failure to acquire the skills of reading, spelling, and writing, which defies remediation?

### Defining Dyslexia

While dyslexia is “a common diagnosable condition that is estimated to affect at least one child in ten” (Hornsby, 1997, p.2), a precise and satisfactory definition continues to prove elusive. The problem is that dyslexia is not a single entity with clear boundaries. It is a web of unexpected weaknesses whose structure varies from individual to individual. Thus, although they share a common label, dyslexics are not a homogenous group. Each dyslexic is a unique mosaic of cognitive, organisational, behavioural, emotional and social elements. Thus, Pumfrey & Reason’s (1998) suggestion that dyslexia is really “a variety of dyslexias” (p.6) would seem to be a realistic one.

Within this medley of dyslexias lies specific developmental dyslexia. This is the dyslexia which is familiar to us in schools. It presents itself in childhood, persists throughout adulthood, and can be managed but never cured. It differs from the acquired dyslexias which develop from trauma to the central nervous system arising from, for example, road accidents.

Many aspects of dyslexia, such as problems with phonological processing, manifest as delays, rather than defects. It is as if the student experiences a maturational lag in these skills and that, in these areas, their functioning mirrors that of a much younger individual. Dyslexia changes over time, and with interventions. Reading is usually the major challenge during school years but, by adulthood, most dyslexics have mastered this. However, they may have persistent difficulties with phonological awareness, verbal memory, and spelling,

### Some Characteristics of Dyslexia.

Psychologists and teachers are often loath to label a young student as dyslexic. Many features of dyslexia (e.g., spoonerisms) are present in the non-dyslexic at this age due to immaturity, and will resolve with time. However, this reluctance to label the student, while admirable in motive,

may be detrimental according to the critical age hypothesis (Bishop & Adams, 1990). This suggests that young students with persistent speech problems are at risk for specific literacy problems. However, if early identification and intervention take place, and the difficulty is resolved by age 5, “reading and spelling can progress normally” (p. 17).

So what are the signs and symptoms of dyslexia? As it is a language disorder, speech and language impairments are strong predictors of developmental dyslexia. Children with a family history of dyslexia are more likely to develop reading and spelling problems – 88% of children who attended Dr. Beve Hornsby’s London clinic had a positive family history of dyslexia. She says that this is not surprising since dyslexia is associated with an idiosyncratic arrangement of brain cells which would be inherited like any other physical characteristic (Hornsby, 1997).

Phonological processing dysfunction (i.e., problems manipulating the sound-forms of words) is one of the core causes of dyslexia. Associated skills would include segmentation and synthesis of sounds, syllabification, alliteration, rhyme, organisation and sequencing of phonemes (all necessary for reading and spelling). Through twin studies, Olson et al. (1989) showed that phonological processing ability is highly heritable. Interestingly, it is the language area least associated with intelligence. This explains the frustrating enigma of the dyslexic – that they can be highly intelligent and still have horrendous problems with reading and writing. The answer is that the two events are not highly correlated. (Ellis & Large, 1987). A significant discrepancy between expected and actual performance in written language skills remains one of the cardinal markers for developmental dyslexia or specific learning disability, the official term used by the Department of Education and Science in Ireland.

Therefore, although a high IQ is very desirable, it does not, on its own, make life easy. In fact, memory has been cited as more important than IQ in predicting exam success (Wilding & Valentine, 1999). Unfortunately for dyslexics, memory is another of their areas of weakness – they have particular problems with short-term memory and with working memory. Short-term memory is where information, both auditory and visual, goes immediately after input. Weakness in short-term memory means that dyslexics have problems remembering sound-symbol correspondences and letter patterns. They have difficulty retaining sound/letter series long enough to recognise them as words in reading, or to identify their sounds for spelling purposes. Surprisingly it is their phonological deficiencies which may underlie their poor memory. Items to be memorised, even if visual, are first phonologically coded (labelled) and then somehow filed away in relation to that label. Therefore, even visual memory is a verbally mediated process. So a child’s phonological ability will determine the quality of that memory. When items need to be retrieved from long-term memory, the same difficulty arises for the dyslexic. They have to access the stored item via a phonological code and this is problematic. It accounts for the ‘naming’ difficulties which many dyslexics display.

Working memory has been described as “immediate mental workspace” (Pumfrey & Reason, 1998, p.74). In other words, it is the amount of ‘headspace’ the student is using to interpret new items and integrate them with previously stored information. The dyslexic student’s most common difficulty is overload in working memory arising from poor automaticity of the skills for literacy. For example, instead of automatically recognising the word ‘carpark’ as one unit (or at most two – ‘car’ and ‘park’), the child may have to decode its seven letters every time. Thus, it is taking up seven units of memory rather than one or two.

These defective memory skills may also cause comprehension difficulties in some dyslexic students. Long, complex sentences with multiple clauses make obvious demands. By the time the student has decoded his way to the end of the sentence, he may have forgotten the beginning. Long paragraphs will pose a similar challenge. This helps in part to explain another of the classic hallmarks of the dyslexic student – the greater amount of time needed for them to complete a task in comparison to their fellow students. The slower rate at which they extract meaning added to a painfully slow decoding process means that there must be positive discrimination in their favour if they are to have any experience of success.

In addition to the signs and symptoms already mentioned, other problem conditions may co-exist which mask, or are masked by, developmental dyslexia. These include Attention Deficit Disorder (ADD), Attention Deficit and Hyperactivity Disorder (ADHD), Social Cognition Deficit, and Dyspraxia ( Selikowitz 1998). These give rise to symptoms such as poor concentration, distractibility, forgetfulness, disorganisation, erratic performance, and, of course, challenging behaviours.

### The Development of Reading and Spelling

A variety of models of the development of reading and spelling exists. One of the most transparent is that of Frith who outlines a three stage model (Frith, 1985).

The first stage, known as the ‘logographic’ stage, is characterised by the student’s learning to read a few words by the “Look and Say” method. This is a crude visual process, probably a function of the right brain’s spatial processing, rather than the left brain’s verbal processing, system. It is an inefficient strategy (as the student is easily confused by visually similar words), and is a passive form of learning which does not promote generalisations.

The second ‘alphabetic’ stage follows when the student wants to express him/herself in writing. S/he gradually realises that each sound can consistently be represented by a certain written symbol, and starts to learn these. The pupil is now on the road to phonemic awareness, i.e. mastery of grapheme/phoneme correspondence. S/he learns that

A	Says	a
	Can be Written	

- and begins to make the link between reading and spelling. Alphabetic stage skills allow the student to attack previously unseen words due to a new-found understanding of what is happening. This further promotes their reading skills and moves the student on into Frith’s third and final orthographic stage.

This phase is where we find the skilled reader characterised by automatic processing and uses of metacognitive strategies. Solid schemata of words have been laid down in memory and are accessed without the use of alphabetic strategies. The child is aware of the orthographic rules of English, such as which letters ‘go’ together and which do not, e.g., ‘wh’ is a valid digraph in English while ‘bh’ is not. Reading is fluent and accurate, and orthographic knowledge from

reading is easily transferred across for use in spelling.

### Frith's (1985) Stages in Reading and Spelling Development

Reading:	Spelling:
Logographic reading stage *****	*****
Alphabetic reading stage	Alphabetic spelling stage *****
Orthographic reading stage *****	*****
	Orthographic spelling stage

In terms of spelling development, Frith proposed a 2 stage process unfolding simultaneously, but not in perfect parallel, with reading maturation (see diagram above). Her first spelling stage is the alphabetic stage when the student begins to want to write things down. The knowledge gained in this alphabetic spelling process propels the student into an alphabetic reading stage as s/he realises the connection between symbols and sounds. Frith's second spelling stage – the orthographic stage – begins subsequent to the orthographic reading stage as rules and conventions observed during reading are generalised to spelling.

In terms of the stages of literacy development, the process breaks down for most dyslexic students somewhere in the alphabetic phase, and some of them will never move beyond this. They may fail to acquire reliable sound-symbol correspondence skills, or may acquire these in a rudimentary fashion but be unable to hold longer letter-strings/sound-strings in memory long enough to manipulate them. Others may learn to decode even long words but never achieve automaticity.

### Types of Dyslexia

Two primary forms of developmental dyslexia have been identified – phonological dyslexia, and developmental surface (or visual) dyslexia. Children with developmental phonological dyslexia have no letter-sound correspondence skills and must rely entirely on logographic reading. If a word is not present in their sight vocabulary store, the child is unable to read it as s/he has no phonic breakdown skills.

In contrast, students with surface/visual dyslexia have no problem with the phonetic route. However, they rely on it absolutely as their sight vocabulary is defective. They find it hard to bring a visual representation of words to mind and tend to spell phonetically. They have trouble reading and spelling irregular words, and have particular difficulty with homophones. However, there is no neat phonological dyslexia versus surface dyslexia divide. Rather they form two ends of a continuum, with a small number of children at either end, but with most appearing somewhere along the spectrum in between.

### Neurological Aspects of Dyslexia

A satisfactory explanation for dyslexia continues to elude. However, “the evidence for a neuro-pathological aetiology of SpLD is ... very persuasive” (Pumfrey & Reason, 1998, p.158). The fact that the biological associations of dyslexia – gender, family history, phonological problems, – are all neurologically based suggests that it arises from defective, or at least different, neural

development. Neuro-pathological aberrations (brain warts, infoldings, etc.) have been found during post-mortems on the brains of known dyslexics. The frontal speech areas, and the visual and auditory association areas, were most affected. Abnormalities were also noted in the main language processing areas. These neurological irregularities affect the student in terms of speed of information processing, ability to organise ideas, and ability to interact with symbols and words. All these are essential aspects of reading and writing.

Given the huge possible individual variation in the incidence and sites of cerebral anomalies, each student's actual performance may be unique in character. Hence the hugely varied nature of the dyslexic population.

### Vision and Hearing Issues

Problems with vision and hearing may also add to the dyslexic's difficulties. The reference eye (i.e. the eye with which we usually take in visual information) is unfixed in a large number of dyslexics. This prevents them from reliably associating visual items with their correct position in space. It causes the typical dyslexic confusion of b/d, p/q, saw/was, dog/god, etc., and is also the reason that they often lose their place in text when reading. For accurate reading, the spatial information must come reliably from one eye only. Students with good phonological skills may compensate for this defect but few dyslexic children are able to do so. In addition, unstable binocular vergence in some dyslexic students can cause letters/words to appear to move around which leads to reading problems and difficulty with visual memory.

With regard to hearing, conditions such as otitis media ("glue ear") can lead to frequent temporary hearing losses which means that the student loses out on participation in normal language interactions for substantial periods. Poor hearing hinders development of the phonic skills which are already challenging for the dyslexic student. Mishearing can lead to mispronunciation, which leads to faulty memorisation and flawed spelling.

### Implications for Teaching

An informed understanding of developmental dyslexia has far-reaching implications for teaching. One of the primary insights afforded is the realisation that dyslexics are not a homogenous group in terms of educational need, and that it would be inappropriate to use interventions which treat them all the same. As each dyslexic has a unique pattern of difficulties, the use of Individual Education Plans (IEPs) is essential for good practice. The first step in this process is an investigation of the learner's strengths and weaknesses. Awareness of the different types of dyslexia and the various cognitive profiles which go with them will be of obvious benefit at this stage.

With the individual's profile drawn up, the teacher can then set realistic goals and teach to identified needs. Tod (2000) advocates the use of SMART targets – Specific, Measurable, Achievable, Relevant, and Time-related. A multi-sensory approach is essential as it plays to all aspects of the pupil and all learning styles.

Concepts and skills should be taught explicitly with continual re-visitation of material already covered. The program needs to be closely monitored and the effectiveness of remediation evaluated regularly. Material should have meaningfulness as this aids memory, and metacognitive strategies of how to handle information need to be taught. Students should play a very active role in the process and should ideally participate in decision-making. Positive

parental support make a huge difference to the student.

The teacher, particularly of older dyslexic students, needs to be constantly alert to the emotional damage caused by a long struggle with literacy. Developmental dyslexia, particularly in a family or school which is unfamiliar with it, can exact a high cost from the child in terms of constant negative feedback, ever-increasing failure, destruction of self-esteem, anger, anxiety and frustration. Unfortunately, these emotions further compound the learning problems as, for example, anxiety has been found to reduce the capacity of working memory (Darke, 1988). The teacher must attempt to compensate for any history of humiliation by providing a warm, accepting learning environment for the child. S/he should constantly create occasions where the student experiences success and affirmation. Advantage should be taken of opportunities to re-educate parents and significant others. Lawrence showed that students receiving help with reading did best if "this help [was] supplemented by a therapeutic approach aimed at enhancing self-esteem" (Lawrence, 1985, p. 72). Stress inhibits learning and should be avoided at all times.

## Conclusion

This paper has looked at what specific developmental dyslexia means and found it to be a learning disability of constitutional origin which results in impaired ability to manipulate written language (reading, writing, spelling). There have been numerous attempts to define dyslexia succinctly but no single suggestion has yet managed to encompass the complexity of this phenomenon. Signs and symptoms include family history, speech and language impairments, phonological processing deficits, memory problems, and notably, a significant discrepancy between potential and attainment. Conditions which commonly co-exist with dyslexia include ADD, ADHD, and dyspraxia.

Stage models of the development of reading and writing were discussed, and different types of dyslexias were outlined. We observed that dyslexia manifests itself neuro-biologically and that there can be associated contributory visual and auditory dysfunctions. It was noted that, in addition to the obvious difficulties dyslexia causes on a daily basis for the student, there are also 'hidden costs' in terms of emotional and social damage. Implications for teaching include the provision of a structured, individually-focussed, multi-sensory learning environment. It is essential to combine this approach with a nurturing, accepting, emotional climate which fosters self-esteem and allows earlier hurts to heal.

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