

Fact Sheet 19

UNDERSTANDING DYSLEXIA

Introductory Notes

Introduction: what is dyslexia?

Dyslexia is typically characterised by ‘an unusual balance of skills’. Dyslexia is a *syndrome*: a collection of associated characteristics that vary in degree and from person to person. These characteristics encompass not only distinctive clusters of *problems* but sometimes also distinctive *talents*. The syndrome of dyslexia is now widely recognised as being a *specific learning disability* of neurological origin that does not imply low intelligence or poor educational potential, and which is independent of race and social background. Dyslexia may overlap with related conditions such as dyspraxia, attention deficit disorder (with or without hyperactivity) and dysphasia. In childhood, its effects can be mis-attributed to emotional or behavioural disorder. By adulthood, many dyslexics will have developed sophisticated compensating strategies that may mask their difficulties.

Although dyslexia seems to be more prevalent amongst males than females, the exact ratio is unknown: the most commonly quoted figures are between 3:1 and 5:1. The evidence suggests that in at least two-thirds of cases, dyslexia has a genetic cause, but in some cases birth difficulties may play an aetiological role. The majority of experts concur that about 4% of the population are affected to a significant extent. This figure is based on the incidence of pupils who have received normal schooling and who do not have significant emotional, social or medical aetiology, but whose literacy development by the end of the primary school is more than 2 years behind levels which would be expected on the basis of chronological age and intelligence. However, perhaps as many as a further 6% of the population may be more mildly affected (e.g. in spelling).

The neurological bases of dyslexia

The neurological bases of dyslexia are now well established and reflected in current definitions of the condition. For example, the International Dyslexia Association (formerly the Orton Dyslexia Society) published the following definition of dyslexia:

"Dyslexia is a neurologically-based, often familial disorder which interferes with the acquisition of language. Varying in degrees of severity, it is manifested by difficulties in receptive and expressive language, including phonological processing, in reading, writing, spelling, handwriting and sometimes arithmetic. Dyslexia is not the result of lack of motivation, sensory impairment, inadequate instructional or environmental opportunities, but may occur together with these conditions. Although dyslexia is life-long, individuals with dyslexia frequently respond successfully to timely and appropriate intervention" (Orton Dyslexia Society, 1994).

The Research Committee of the International Dyslexia Association also produced the following definition of dyslexia, couched in more scientific terminology:

"Dyslexia is one of several distinct learning disabilities. It is a specific language-based disorder of constitutional origin characterised by difficulties in single-word decoding, usually reflecting insufficient phonological processing abilities. These difficulties in single word decoding are often unexpected in relation to age and other cognitive and academic abilities: they are not the result of generalised developmental disability or sensory impairment. Dyslexia is manifest by variable difficulty with different forms of language, often including, in addition to problems of reading, a conspicuous problem with acquiring proficiency in writing and spelling." (Orton Dyslexia Society, 1994)

The British Dyslexia Association has also published a definition of dyslexia that reflects the neurological bases of the condition:

“Dyslexia is a complex neurological condition which is constitutional in origin. The symptoms may affect many areas of learning and function, and may be described as a specific difficulty in reading, spelling and written language.” (British Dyslexia Association, 1995).

The biology of dyslexia has been investigated in a range of studies that have confirmed a difference in brain anatomy, organisation and functioning. The latest brain imaging techniques, as well as encephalographic recording of the electrical activity of the brain, and even post-mortem examination, all reveal a range of functional and structural cerebral anomalies of persons with dyslexia.

Although dyslexia is legally recognised as a ‘disability’, it is not a ‘disease’ nor can it be ‘cured’. Indeed, the neurological differences found in dyslexia may confer advantages for some individuals (e.g. in visual or perceptual skills), which may to some extent explain the apparent paradox that some individuals who have problems with elementary skills such as reading and writing can nevertheless be highly gifted in other areas.

The deficit model of dyslexia is now steadily giving way to one in which dyslexia is increasingly recognised as a difference in cognition and learning.

Although most definitions of dyslexia found in the scientific and educational literature take this ‘neurological approach’, not all do. For example, the British Psychological Society’s Working Group on ‘*Dyslexia, Literacy and Psychological Assessment*’ published the following working definition:

‘Dyslexia is evident when accurate and fluent word reading and/or spelling develops very incompletely or with great difficulty.’ (BPS, 1999).

This focuses on literacy learning at the ‘word level’ and implies that the problem is severe and persistent despite appropriate learning opportunities. The authors believe that this definition provides the basis for a staged process of assessment through teaching (see later under ‘*Identifying children with dyslexia*’). It must be pointed out that this definition has been criticised by several authorities on various grounds, including being too wide.

The cognitive characteristics of dyslexia

Dyslexia is a variable condition and not all people with dyslexia will display the same range of difficulties or characteristics. Nevertheless, the following characteristics have been widely noted in connection with dyslexia.

- *Inadequate phonological processing abilities*, which affects the acquisition of phonic skills in reading and spelling so that unfamiliar words are frequently misread, which may in turn affect comprehension. Not only has it been clearly established that phonological processing difficulties are seen in the majority of children with dyslexia, but recent research has also indicated that this occurs in many adults with dyslexia.
- *A marked inefficiency in the working or short-term memory system*, which can affect many aspects of speaking, reading and writing. These difficulties can include problems in retaining letter-sound associations (which will affect acquisition of phonic skills), errors in the processes of accessing the mental lexicon (which will result in incorrect words being used or read – ‘lexical access errors’) and/or delays in access to the mental lexicon (which will tend to slow down the rate of reading and writing). Memory problems may also cause problems in retaining the meaning of text (especially when reading at speed), failure to organise learned facts effectively in examinations, disjointed written work or in omission of words and phrases in written examinations, because the individual has lost track of what s/he is trying to express.
- *Difficulties with automatising skills*. It has been found that dyslexics do not tend to automatise skills very well, with the result that a high degree of mental effort has to be expended by the dyslexic when carrying out skilled tasks that non-dyslexic individuals generally find requires little effort. This is particularly the case when the skill is composed of several subskills (e.g. reading, writing, driving). In the classroom situation this might mean that the dyslexic child cannot concentrate on *both* the

mechanics (spelling, grammar, punctuation) *and* the content of written work. The dyslexic individuals is likely to experience difficulties in listening to the teacher with understanding whilst making notes.

- *Problems connected with visual processing*, which can affect reading generally, but especially when dealing with large amounts of text. Problems can include *binocular instability* and susceptibility to *visual discomfort*. Visual discomfort is a generic term for the effects of hypersensitivity to the irritating effect of strong visual contrast or rapid flicker (e.g. where parallel lines of text create the appearance of a black-and-white grating or consciously or subconsciously perceived flicker of fluorescent lighting or some computer monitors). Movement and colour illusions can be perceived, or the text may appear unstable or obscured. Reading for any length of time may cause headaches and eyestrain, and so can be done only in short bursts, which can disrupt the comprehension process. In some medical conditions (e.g. epilepsy and migraine) susceptibility to visual discomfort is generally more extreme than is usually seen in cases of dyslexia. This syndrome is also known by other names, e.g. ‘Irlen Syndrome’, ‘Scotopic Sensitivity Syndrome’ (a misnomer), ‘Pattern Glare’. Although there appears to be a statistical association between dyslexia and visual discomfort, *not all* persons with dyslexia are highly susceptible to visual discomfort and *not all* persons who suffer from visual discomfort will necessarily exhibit the typical characteristics of dyslexia outlined above. Use of coloured overlays or filters (e.g. by use of acetate sheets or tinted lenses) can be beneficial in alleviating the symptoms of visual discomfort in a fair proportion of cases.

Theories of dyslexia

The term ‘specific learning difficulty’ (which for a generation or more has been preferred by many educational psychologists to the term ‘dyslexia’) means little more than a discrepancy between ability and attainment. The principal difference between ‘dyslexia’ and ‘specific learning difficulty’ is that dyslexia presupposes the existence of certain cognitive deficits that are believed to underpin the condition. Such cognitive deficits (e.g. in phonological processing, memory, visual processing, or motor co-ordination) are believed to be either inherited or due to neurological anomalies which have arisen before (or during) birth or in early childhood.

There are several theories of dyslexia, which space precludes a detailed discussion of here. There is little disagreement that the condition is a neurological one, and that it has genetic causes in most cases. However, the exact neurological and cognitive mechanisms are still the subject of widespread research and theoretical debate. The predominant theory is that dyslexia is due to a fundamental deficiency in the processing of phonological information — this is usually referred to as the Phonological Deficit. This theory is supported by a wealth of research evidence but is complicated by it does not explain *all* the phenomena associated with the condition (see previous section). The ‘Double Deficit’ Theory proposes that in addition to phonological deficits, dyslexic individuals have inherent problems in processing information at speed, which interferes with many cognitive activities, including reading and writing. Prominent alternative theories include the Magnocellular Deficit Theory, the Cerebellar Deficit Theory, both of which have less evidence in support, but which address particular aspects of the condition that demand further research. Of course, it may turn out that there are distinct subtypes of dyslexia, for which different causal theories may be applicable. For further information on theories of dyslexia, see Snowling (2000), Miles and Miles (1999), Fawcett (2001), or Snowling and Hulme (1997); details of these publications are given in ‘Further Reading’ at the end of these notes.

Main educational effects of dyslexia

Reading and perceptual difficulties

These can include:

- early difficulties in acquiring phonic skills
- a high proportion of errors in oral reading

- difficulty in extracting the sense from written material without substantial re-reading
- slow reading speed
- inaccurate reading, omission of words
- frequent loss of the place when reading
- an inability to skim through or scan over reading matter
- a high degree of distractibility when reading
- perceived distortion of text (words may seem to float off the page or run together)
- a visually irritating glare from white paper or white-boards.

Writing problems

These can include:

- an intractable spelling problem
- confusion of small words such as which/with
- omission of words, especially when the writer is under pressure
- awkward handwriting and/or slow writing speed
- an unexpected difference between oral and written expression, with oral contributions being typically of a much higher quality than written accounts of the same subject matter in terms of structure, self expression and correct use of words.

Other difficulties

Further important factors in dyslexia include the following:

- *Early speech and language problems.* Many dyslexic children have received speech therapy, usually for phonological difficulties, especially between the ages of 3 and 7.
- Glue ear (*Otitis media*) is common in children with dyslexia and usually affects the acquisition of auditory discrimination skills, which in turn impacts on development of phonics in reading.
- There is a high incidence of *immune system disorders* (e.g. asthma, eczema) amongst children with dyslexia. The reason for this is not understood at present.
- *Oral skills.* Although many dyslexic children are fairly articulate, others demonstrate a lack of logical structure in speech as well as in writing. Oral skills can be further compromised by difficulties in word retrieval or by mispronunciation and spoonerisms. A delay in producing a response may actually be due to a slight lapse between hearing what is said and understanding it – an inefficiency in aural processing possibly connected with the working memory system.
- *Numeracy.* In about 60% of cases, dyslexia affects numeracy skills. This can take the form of unexpected inaccuracy in calculation or copying of digits, failure to remember calculation procedures, difficulties with remembering multiplication tables. Gifted dyslexic mathematicians and scientists are sometimes found to have unusually weak computational skills.
- *Co-morbidity with other developmental disorders, e.g. AD/HD or dyspraxia.* A range of characteristics, under the general heading of attentional dysfunction (i.e. attention deficit disorder with or without hyperactivity – ADD, AD/HD), can have a significant overlap with dyslexia. A short attention span and/or a high level of distractibility can undermine the whole educational process. Associated characteristics are an inability to get started when faced with certain mental activities and also trouble switching from one type of activity to another. Additionally, or alternatively, dyslexic problems can overlap with *dyspraxia* (sometimes referred to as the ‘clumsy child syndrome’, or ‘developmental co-ordination disorder’).

- *Social and emotional factors.* High levels of anxiety and stress have been identified as the most indicative behavioural correlates of dyslexia; these are bound to affect performance. A ‘panic’ reaction is experienced by some dyslexic people when placed in situations where they cannot cope. The cumulative effect of tiredness, necessitated by additional effort at every educational level, should not be underestimated.
- *Organisation.* Disorganisation, a poor sense of clock time (often associated with underlying memory problems) and/or a poor awareness of space (often associated with dyspraxia) tend to make effective time management very difficult for many people with dyslexia.
- *The secondary effects of dyslexia.* Although significant discrepancies between obvious ability and unexpectedly poor academic performance should alert teachers to the presence of dyslexia at an early age, the problem may go unnoticed for several years. Under-achievement in literacy despite normal schooling and satisfactory oral and intellectual skills may persist through childhood. This gives rise to the secondary affects of dyslexia, which include loss of confidence, low self-esteem and frustration. Older students find that years of humiliation in the classroom and constant fear of being ‘shown up’ take their toll.
- *Compensatory strategies.* Because of the development of compensatory strategies, by adulthood, literacy skills of many dyslexics can appear superficially adequate, especially if the person is very bright. However, these strategies are likely to break down when the individual is confronted with tasks that are more challenging than previously experienced (e.g. when going to college). This has been referred to as the ‘dyslexia fuse effect’: i.e. the dyslexia ‘fuse’ blowing as a function of the educational and/or information processing load placed upon it (Martin Turner).

Identifying children with dyslexia

The conventional approach

Conventional methods for diagnosing dyslexia in the child who is failing in literacy development have remained largely unchanged for the past 30 years. Essentially, these involve establishing that:

- *The child’s reading and/or spelling age is significantly behind his chronological age (usually 2 or more years behind).*
- *The child’s intelligence is not significantly below average.*
- *There are no social, emotional or educational causes for the reading difficulty.*
- *The child is not suffering any sight defect, hearing loss, frank brain damage or serious problems of general health.*
- *The child exhibits some ‘positive signs’ of the disorder, such as phonological difficulties or memory problems.*

The first three of these points comprise the *discrepancy criterion* and the *exclusionary criterion*. Together, these imply that dyslexia can only be identified when there is a significant discrepancy between intelligence and attainment and when all other potential causes of reading disability are excluded. Unfortunately, this has unwittingly had the effect of making dyslexia a condition observed mainly in bright, middle-class children, which has in turn given cause for some professional disparagement of the condition over many years. It also results in diagnosis being delayed until a ‘significant’ discrepancy between intelligence and attainment can be demonstrated. In some areas, resourcing policy may force educators and psychologist to ignore a child’s problem until that child has slipped below some arbitrary threshold (e.g. two years behind expected literacy skill level). Despite the fact that the child may clearly be falling progressively behind, remediation is not offered until the predetermined threshold is exceeded, with the explanation being given to the parents to the effect that their child’s difficulties are not serious enough at the moment for help to be provided.

There are many children with reading difficulties who do not satisfy these criteria (e.g. they may also come from disadvantaged home backgrounds and/or have emotional problems) and yet *may* nevertheless

have some brain anomaly. In such cases, however, we would be unable to give a proper diagnosis were we to rely upon traditional diagnostic criteria. It is clear, therefore, that we have to move to a much more satisfactory definition and more reliable diagnostic criteria if we are to be able to identify dyslexics accurately.

It has long been believed that sub-test profiles of individual intelligence scales can reveal the cognitive deficits of dyslexics, although the subject has not been without its controversies. In the so-called 'ACID profile' on the WISC-R (Wechsler Intelligence Scale for Children, Revised) the letters A-C-I-D refer to those sub-tests which are often found to be depressed in the dyslexic, i.e. Arithmetic, Coding, Information and Digit span. However, the ACID profile is not a reliable or unique identifier of dyslexia and recent inquiries have tended to reject it (see the BPS report '*Dyslexia, Literacy and Psychological Assessment*', 1999).

The disadvantages of conventional assessment and diagnostic procedures may therefore be summarised as follows:

- They rely on waiting for the child to fail.
- They often come too late in the child's educational career.
- The use of exclusion criteria tends to confine identification artificially to relatively bright, middle-class children.
- They are relatively expensive and time-consuming: it generally takes four or more hours of an educational psychologist's time to carry out and analyse the necessary tests and compile a report.
- They are not widely accessible: the assessment instruments used are mainly restricted psychological tests and there is a general lack of availability of educational psychologists.
- They do not always give detailed information on the child's underlying cognitive difficulties which could help the specialist dyslexia teacher or learning support teacher to formulate an appropriate package of learning activities for the child.
- There are scientific doubts about the accuracy of psychological approaches based on looking for an ACID profile on the WISC.

Developmental precursors of dyslexia

At the pre-school stage many dyslexic children are already showing early signs of their disorder. The key is usually an *uneven developmental profile*, particularly in cases where there is a family history of speech or literacy difficulties, or where there is evidence of significant birth difficulties. Characteristic difficulties include one or more of the following:

- Delays in the development of speech and language.
- Difficulties in learning simple patterns of sequential activity, such as remembering the order of simple instructions or reproducing a pattern of coloured beads or bricks.
- Difficulties of fine or gross motor co-ordination.
- High distractibility and poor concentration.

The emphasis here is on detecting an uneven developmental profile where there is no evidence of primary medical, social or emotional causes for the child's difficulties. A similar approach needs to be taken on school entry. The dyslexic child will usually be distinguished from children with general developmental delay by obvious abilities in other areas. A typical case would be the child who, at 5 years of age, appears bright, alert and who is able to converse intelligently but who nevertheless is unable to write his or her own name, copy simple letters or shapes, or cope with fine motor tasks. Alternatively, the child may be able to copy and draw well for his or her age, show skills in construction and modelling, but

be unable to repeat a short sequence of digits, have difficulty in learning nursery rhymes and have relatively immature language development.

These are characteristic types of dyslexic children that could often be identified much earlier than is typically the case at present. Unfortunately, there are no generally accepted objective procedures for identifying such children at an early age. Thus, even if a teacher is alert to these early signs and symptoms, this will still usually be insufficient to provide a case for specialist help for the dyslexic child. Education authorities require more *objective evidence* in order to make special provision. There is therefore a need for formal assessment procedures that are not inordinately costly or time consuming but which are sufficiently reliable to justify taking action.

Cognitive precursors of dyslexia

There is substantial evidence that both phonological processing and short-term memory are important factors in dyslexia. It is now well-established that phonological processing ability is very closely related to reading development. Children who, when they start school, show good phonological awareness (i.e. are aware of *syllables* and can detect *rhyme and alliteration*) are the ones who are most likely to make good progress in learning to read. On the other hand, children with difficulty in carrying out these types of phonological tasks when they begin school are the ones who are most likely to have difficulties with learning to read even though they may overcome their difficulties with speech sounds as such. In general, it is argued (a) that phonological processes underpin the development of a phonological decoding strategy in reading, and (b) that working memory plays a significant role in this strategy, enabling constituent sounds and/or phonological codes to be held in short-term store until these can be recognised as a word and its meaning accessed in long-term memory. Dyslexics, who tend to have weaknesses in phonological processing and short-term memory, will thus tend to have

Whilst researchers have generally agreed on the importance of the roles of phonological processes and memory in dyslexia, for some years the issue of *subtypes* of dyslexia has been the subject of controversy. Many discussions in the literature refer to two broad subtypes: auditory dyslexia and visual dyslexia. The visual dyslexic tends to have problems with visual discrimination, visual memory, visual sequencing, left-right scanning and in rapid visual recognition of words. The auditory dyslexic tends to have problems with discriminating speech sounds, in sound blending, auditory sequencing and serial memory, and in phonological awareness. In a classic study, Boder (1973) reported that 63% of her dyslexic sample could be described as auditory dyslexics, while only 9% fell into visual dyslexia category, leaving about 22% with mixed difficulties (both visual and auditory problems), and 6% of her sample undetermined.

Psychological research on *acquired dyslexia* (i.e. the condition of impairment in literacy skills in adults as a result of a stroke or other neurological damage) has tended to confirm the existence of two broad sub-types. These involve (a) patients displaying difficulties with whole-word reading (variously referred to as 'surface dyslexia', 'morphographic dyslexia', or simply 'visual dyslexia'), and (b) patients displaying difficulties with phonological processing and non-word reading (variously referred to as 'deep dyslexia', 'phonographic dyslexia', or simply 'auditory dyslexia'). The question arises whether the same (or similar) subtypes also exist in developmental dyslexia, which would have important implications for assessment and teaching. However, research knowledge in this area is still sketchy and the concept of subtypes of developmental dyslexia remains in professional and academic dispute.

The value and validity of early identification of dyslexia

Without early identification procedures the teacher may easily assume that the child is lazy or simply requires more time for reading skills to develop. When children are diagnosed as dyslexic late in the school career, a typical complaint made by parents is that they felt there was something wrong from their child's earliest years at school. However, when the parents expressed these misgivings to the teacher, the response was often: 'Don't worry, s/he will pick it (i.e. literacy) up in time'. In these particular cases the child did not 'pick it up' and consequently required specialist remediation some years later after the problem was

eventually diagnosed. By this time the child will often have lost motivation and even become difficult or disruptive in class. This state of affairs is often the focus of strong parental resentment and dissatisfaction with the education system.

The cognitive precursors of dyslexia, summarised above, can be assessed in young children before beginning to learn to read. In the particular case of the dyslexic the value of early identification is enormous. Instead of *waiting several years for children to fail*, with all the misery and frustration which that inevitably entails, and only then trying to remediate, proper educational provision for these children can be made right from the start. There is good evidence that when diagnosis of dyslexia was made early in school most children with dyslexia can be brought up to their normal classroom work, while identification delayed until late in the primary stage resulted in successful progress by less than half the children. If delayed until secondary school the percentage of successful remediation drops to 10–15%.

The pros and cons of the discrepancy approach

As explained above, the conventional approach to identifying dyslexia is based on the principle of cognitive discrepancy which maintains that a significant discrepancy between intelligence and literacy skills is *prima facie* evidence for specific learning difficulty; and where such discrepancy has been found, if there is also evidence of cognitive deficits in memory and/or phonological processing, this is *prima facie* evidence for dyslexia. Other evidence, such as a family history of similar difficulties, developmental history of speech or language problems, or particular difficulties — e.g. in acquiring phonics — would support such a conclusion. This model embodies the view that diagnosis of dyslexia is based on the notion of *discrepancy* between what the pupil *is* achieving in literacy and what they can reasonably be *expected* to achieve on the basis of age and intellectual ability. It is assumed that the pupil has experienced normal education and that the problems are not primarily due to any emotional or medical cause. This discrepancy accounts for the fact that dyslexia is typically characterised by serious and unremitting literacy problems in children who otherwise would be expected to make reasonable progress in the acquisition of literacy.

The discrepancy criterion has also come under attack in recent years. One problem is that it is difficult to establish that a significant discrepancy exists if the child is of below average intelligence. Yet, in principle, being a constitutional condition, dyslexia can affect children of *all* abilities. Furthermore, such an approach relies on waiting for the child to fail, often over many years, before action is taken. Another complication is that few, if any, real differences exist in the literacy difficulties manifested by children who do and do not display significant IQ–achievement discrepancies.

It is well accepted that the discrepancy criterion is problematic when it comes to *early* identification of dyslexia, which has led to the development of alternative systems such as *Lucid CoPS*, *DEST*, and *PhAB*. However, in the assessment of older pupils or adults, the abandonment of the discrepancy criterion is more controversial. A report of a working party on identification of dyslexic pupils, set up by the Division of Educational and Child Psychology of the British Psychological Society, noted that the discrepancy model is vulnerable to criticism on theoretical grounds and advocated a more global approach to assessment (see ‘Further Reading’ at the end of these notes). Nevertheless, in the classroom, it is often the case that *discrepancy* between a pupil’s expected levels of attainments (based on judgements of their overall ability) and their actual attainments (especially in reading, writing and spelling) which first draw a teacher’s attention to the possibility that the pupil may have dyslexia. It therefore seems premature to abandon altogether the notion of discrepancy. Rather, discrepancy can usefully be regarded as part of the overall evidence on which a teacher makes a judgement.

Dyslexia screening and assessment available for teachers

The *Aston Index* and the *Bangor Dyslexia Test* are screening tests for dyslexia that have both been available for several years. They embody a fairly eclectic but pragmatic approach that reflects the theoretical inclinations of their creators and the research knowledge available at the time of creation. More recent tests that have been developed (i.e. *DEST*, *DST*, *PhAB*, *CoPS*, *Lucid Rapid* and *LASS Junior and Secondary*) adhere more strongly to the current research emphasis on phonological processing and short-term memory as

key factors in dyslexia, although each have their particular emphasis. *DEST* and *DST* also include measures of fine motor skill and postural stability. *PhaB* is confined to phonological measures only. *CoPS* and *LASS Junior and Secondary* (all computer-based assessments), also contain assessment of visual memory, which does not feature in *DEST*, *DST* or *PhAB*. For further information on *CoPS* and *LASS Junior and Secondary*, please consult the website www.lucid-research.com

- Aston Index** (1976; Revised edition, 1982). M Newton and M. Thomson. Cambridge: LDA. [*Individually administered; about 7 years to 16 years, now rather out-of-date, but still has some useful subtests, e.g. in memory. Not standardised*]
- Bangor Dyslexia Test** (1983; Second edition, 1997). T.R.Miles. Cambridge: LDA. [*Individually administered, several brief subtests that tap 'positive signs' of dyslexia; about 7 years to 18 years. If you are planning to use this test, you are strongly recommended also to obtain the book 'Dyslexia: The pattern of difficulties' by T.R. Miles (London, Collins Educational, 1983), which explains more fully how to use the test. Partly standardised*]
- CoPS – Cognitive Profiling System** (1996/97) C. H. Singleton, K.V. Thomas and Leedale, R.C. Beverley, East Yorks: Lucid Creative Ltd. [*Computer software and Teacher's Manual. Range 4 yrs 0 mos to 8 yrs 11 mos. Individually administered. Comprises 9 subtests of memory, phonological awareness and auditory discrimination. Standardised*]
- Dyslexia Early Screening Test (DEST-2; 4:6 –6:5 yrs) (2002) and Dyslexia Screening Test (DST; 6:6 – 16.5 yrs)** (1996) A. Fawcett and R. Nicolson and. London: Psychological Corporation. [*Each individually administered, 11 short subtests of phonological skills, memory, reading, spelling, postural stability, etc. Standardised*]
- LASS Junior** (2001) K.V. Thomas, C. H. Singleton and J. K. Horne. Beverley, East Yorks: Lucid Creative Ltd. [*Computer software and Teacher's Manual. Age range 8 yrs 0 mos – 11 yrs 11 mos. Comprises 8 subtests of visual and auditory memory, reasoning, single word reading, sentence reading and nonword reading, spelling and phonological processing. Individually administered but can be installed on a network for group administration. Standardised*].
- LASS Secondary** (1999) J. K. Horne, C. H. Singleton and K.V. Thomas. Beverley, East Yorks: Lucid Creative Ltd. [*Computer software and Teacher's Manual. Age range 11 yrs 0 mos – 15 yrs 11 mos. Comprises 8 subtests of visual and auditory memory, reasoning, single word reading, sentence reading and nonword reading, spelling and phonological processing. Individually administered but can be installed on a network for group administration. Standardised*].
- Lucid Rapid Dyslexia Screening** (2003) C. H. Singleton, J. K. Horne, R.C. Leedale and K.V. Thomas. [*Computer software and Administrator's Manual. A short 15 minute screening test for children aged 4 years 0-months to 15 years 11 months, comprising assessment of phonological processing, working memory and phonic skills. Individually administered. Standardised. Automatically interpreted reports*]
- Lucid Adult Dyslexia Screening (LADS)** (2002) C. H. Singleton, K.V. Thomas and J. K. Horne. Beverley, East Yorks: Lucid Research Ltd. [*Computer software and Administrator's Manual Computerised Screening test for age 16+. Comprises four 5-minute tests: Word Recognition, Word Construction, Working Memory, and Nonverbal Reasoning, of which the first three are dyslexia indicators. Individually administered but can be installed on a network for group administration. Standardised. Automatically interpreted reports.*].
- LADS Plus.** (2006). C. H. Singleton, K.V. Thomas and J. K. Horne. Beverley, East Yorks: Lucid Research Ltd. [*A new version of LADS that includes a measure of verbal reasoning and which has been recalibrated to increase accuracy of detection of dyslexia in individuals who may have had non-standard educational backgrounds and/or low verbal skills (e.g. prisoners, young offenders, immigrants, ethnic minorities).*]
- Phonological Assessment Battery [PhAB]** (1997) N. Frederickson, U. Frith and R. Reason. Windsor, Berks: NFER-Nelson. [*Individually administered, standardised test of key aspects of phonological*

processing skill that are indicative of dyslexia, including rhyming, alliteration, spoonerisms, phoneme deletion, etc.]

Teaching children with dyslexia

Multisensory methods of teaching for children with dyslexia are usually advocated. These integrate visual, aural, tactile and kinaesthetic modalities to consolidate the learning experience. Lessons must be very well structured, sequential and cumulative, on order to all skills and concepts must be thoroughly practised (overlearned) counteract the memory problems of the dyslexic. Content generally needs to concentrate on phonic skills, as these are usually the weakest aspect in dyslexia.

The range of available products and materials for teaching and supporting children with dyslexia is steadily growing. Well-structured phonics-based multisensory teaching is still the fundamental requirement, especially for primary-aged dyslexics, but the approaches are much more flexible and more fun than the older drill methods. The following are some recommended teaching methods and resources:

‘The Bangor Dyslexia Teaching System’ by Elaine Miles. 3rd edition, Whurr, 1997. *[Excellent strategies for teaching, plus details of accompanying resources]*

‘Dealing with dyslexia’ by Pat Heaton and Patrick Winterson. 2nd edition. Whurr, 1996. *[A revised edition of a popular classroom text]*

‘Teaching reading and spelling to dyslexic children’ by Margaret Walton. David Fulton, 1998. *[A new compendium of exercises based on sound practice]*

‘Day-to-day dyslexia in the classroom’ by Joy Pollock and Elizabeth Waller. Routledge, 1994. *[A very practical guide for teachers]*

‘Overcoming dyslexia: skills into action’ by Hilary Broomfield and Margaret Combley. Whurr, 1997. *[A highly practical book using multisensory teaching for dyslexics of all ages]*

‘The Phonics Handbook’ by Sue Lloyd. 2nd edition. Jolly Learning, 1994. *[Especially suitable for use with younger children; lots of photocopiable activity sheets. Makes learning fun and not just for dyslexics]*

‘Sound Linkage: an integrated programme for overcoming reading difficulties’ by Peter Hatcher. Whurr, 1994. *[Based on the author’s own research in Cumbria: a strongly phonological basis to reading development; also includes a system for phonological assessment.]*

‘Maths for the Dyslexic: a practical guide’ by Anne Henderson. David Fulton, 1998. *[A book of practical activities from an international expert on the subject of maths and dyslexia.]*

‘Dyslexia and effective learning in secondary and tertiary education’ by Morag Hunter-Carsch and Margaret Herrington. Whurr, 2002.

‘Dyslexia – Successful inclusion in secondary schools’ by Lindsay Peer and Gavin Reid. BDA, 2001.

Computer support

There are many excellent computer programs for learning and support of dyslexic children of all ages now available. The problem is to spot these amongst the hundreds advertised in the educational software catalogues. To assist busy teachers, the **British Dyslexia Association** produces a series of information packs that contain reviews of recommended software by experts in this field and give details of where these may be obtained and how the software can be used most effectively. The BDA also publishes a range of useful books and other literature on dyslexia, as well as a termly magazine called *Dyslexia Contact*. For information, contact the British Dyslexia Association, 98 London Road, Reading RG2 5AU. Tel: 0118 966 8271. Fax: 0118 966 2677. Website: www.bdadyslexia.org.uk

Memory Booster is a new program designed to help children who have memory difficulties, and is particularly useful for children who have dyslexia. It is designed for children aged 4–11+ and provides tutorial instruction in developing memory strategies and ample practice in applying these strategies in an

interactive adventure game that has attractive graphics and sound. The program is adaptive – this is, it adjusts the difficulty of the task to the ability and performance of the child. Memory Booster can be used in the classroom individually or in group activities ((e.g. using an interactive whiteboard), with or without teacher involvement. It can also be used at home. Website: www.memory-booster.com

The following books are highly recommended when using computers to support dyslexic people:

‘**Dyslexia and Information and Communication Technology**’ by Anita Keates (David Fulton, 2000).

‘**Catch ‘Em Young**’ by Judith Stansfield. (REM, in association with the BDA, 2000)

‘**Write to Read with ICT**’ by Victoria Crivelli (SEN Marketing, 2001).

‘**Count On Your Computer**’ by Di Hillage (SEN Marketing, 2001).

‘**A Parent’s Guide to Using Computers with Dyslexic Children**’ by Carol Kaufman and Barry Whiting. BDA/REM, 2002.

Computer programs for use in schools and at home are available from **REM**, Great Western House, Langport, Somerset TA10 9YU. Tel: 01458 253636 Fax: 01458 253646. Free catalogue available. Many programs can also be tried out by accessing their website: www.r-e-m.co.uk

Many computer programs for dyslexics to use in schools and at home are also available from **iANSYST**, which also offers sales and advice on computer hardware and software for students and other dyslexics: Free catalogue available. **iANSYST**, The White House, 72 Fen Road, Cambridge, CB4 1UN. Tel: 01223 420101. Fax: 01223 426644. Website: www.dyslexic.com

Recommended further reading

All the publications in this section are available from **SEN Marketing**, 618 Leeds Road, Outwood, Wakefield WF1 2LT. Tel/Fax: 01924 871697. Website: www.sen.uk.com

Dyslexia: a practitioner’s handbook by Gavin Reid. Third edition, Wiley, 2003. *[An accessible, up-to-date overview of knowledge, plus a very practical compendium of resources for teachers.]*

Dyslexia by Margaret J. Snowling (Second edition). Blackwell, 2000. *[A very clear up-to-date survey of research evidence on dyslexia, with a particular focus on the phonological deficit hypothesis of dyslexia.]*

Dyslexia and Literacy: Theory and Practice edited by Gavin Reid and Janice Wearmouth. Wiley, 2002. *[Reviews the different theoretical positions on dyslexia and examines a wide variety of applications in the classroom.]*

Dyslexia, Reading and the Brain by Alan Beaton. Psychology Press, 2004. *[Excellent up-to-date readable review of research on dyslexia, with an emphasis on psychological and biological approaches.]*

Dyslexia: a hundred years on by Tim Miles and Elaine Miles. Second edition, Open University Press, 1999. *[A well-written, up-to-date and pretty comprehensive review of the field, but with the emphasis on research knowledge rather than teaching approaches.]*

Dyslexia: Theory and Good Practice Edited by Angela Fawcett. Whurr, 2001. *[A compendium of some of the main papers and keynote addresses from the 5th International Conference of the British Dyslexia Association, by prominent international researchers. Includes particularly useful reviews on intervention studies, infancy, genetics and phonology.]*

Multilingualism, Literacy and Dyslexia: A challenge for educators. Edited by Lindsay Peer and Gavin Reid. Whurr, 2000. *[A selection of the best papers from the 1st International Conference on Multilingualism and Dyslexia, held in Manchester in 1999.]*

Dyslexia: biology, cognition and intervention (Eds. Charles Hulme and Maggie Snowling). Whurr, 1997. *[A fairly comprehensive survey of current research taken from papers delivered at the 4th*

International Conference of the British Dyslexia Association, with chapters written by many international experts.]

Dyslexia, Literacy and Psychological Assessment. Report of a Working Party of the Division on Educational and Child Psychology of the British Psychological Society, Chaired by Rea Reason. British Psychological Society, 1999. *[A useful and fairly concise survey of current knowledge, with specific reference to how educational psychologists should be assessing dyslexia. Some of the findings and conclusions of the Working Party are questionable.]*

The Psychological Assessment of Reading. Edited by John Beech and Chris Singleton. Routledge, 1997. *[A compendium of different approaches to assessing reading from both the teacher's and the psychologist's point of view, authored by national experts. Contains an appendix with reviews of many of the tests used in the field.]*

Research publications on dyslexia assessment

Beech, J. R. and Singleton, C. H. (1997) The psychological assessment of reading: theoretical issues and professional solutions. In J. R. Beech and C.H. Singleton (Eds.) *The Psychological Assessment of Reading*. London: Routledge, pp 1-26.

British Psychological Society (1999) *Guidelines for the development and use of computer-based assessments*.

British Psychological Society (1999) *Dyslexia, Literacy and Psychological Assessment*. (Report by a Working Party of the Division of Educational and Child Psychology).

Fawcett, A. J., Singleton, C. H. and Peer, L. (1998) Advances in early years screening for dyslexia in the UK. *Annals of Dyslexia*, 48, 57-88.

Simmons, F. R. and Singleton, C.H. (2000) Reading comprehension abilities of dyslexic students in higher education. *Dyslexia: An International Journal of Research and Practice*, 6, 178-192.

Singleton, C. H. (1997) Screening for early literacy. In J. R. Beech and C.H. Singleton (Eds.) *The Psychological Assessment of Reading*. London: Routledge, pp. 67-101.

Singleton, C. H. (1997) Computerised assessment of reading. In J. R. Beech and C.H. Singleton (Eds.) *The Psychological Assessment of Reading*. London: Routledge, 1997, pp. 257-278.

Singleton, C.H., Horne, J.K. and Thomas, K.V. (1999) Computerised baseline assessment of literacy. *Journal of Research in Reading*, 22, 65-78.

Singleton, C.H., Thomas, K.V. and Horne, J.K. (2000) Computerised cognitive profiling and the development of reading. *Journal of Research in Reading*, 23, 158-180.

Simmons, F. R. and Singleton, C.H. (2000) Reading comprehension abilities of dyslexic students in higher education. *Dyslexia: An International Journal of Research and Practice*. 6, 178-192.

Singleton, C.H. and Simmons, F. R. (2001) An evaluation of Wordshark in the classroom. *British Journal of Educational Technology*, 32, 317-330.

Singleton, C.H. (2001) Computer-based assessment in education. *Educational and Child Psychology*, 18, 58-74.

Singleton, C. H. (2002) Dyslexia: Cognitive factors and implications for literacy. In G. Reid and J. Wearmouth (Eds.) *Dyslexia and Literacy: Research and Practice*. London: Wiley, pp. 115-130.

Singleton, C.H. and Stuart, M. (2003) Measurement mischief: a critique of Reynolds, Nicolson and Hambly *Dyslexia: An International Journal of Research and Practice*, 9, 151-160.

Singleton, C.H. (2005) Dyslexia and oral reading errors. *Journal of Research in Reading*, 28(1), 4-14.

- Singleton, C. H. (2004) Using computer-based assessment to identify learning problems. In L. Florian and J. Hegarty (Eds.) *ICT and Special Educational Needs*. Milton Keynes: The Open University Press, pp. 46-63.
- Singleton, C.H. and Trotter, S. J. (2005) Visual stress in adults with and without dyslexia. *Journal of Research in Reading*, 28, 365-378.
- Singleton, C.H. and Henderson, L-M. (2006) Visual factors in reading. *London Review of Education*, 4, 89-98.

Examination arrangements for candidates with SEN

Backhouse, G. **Providing for candidates with special educational needs during GCE (A level) GCE, GCSE and GNVQ**. Patoss Publications. Second Edition, Price £7.50 plus P & P. Available from PATOSS, P.O. 10, Evesham, Worcs., WR11 1ZW. (See also the PATOSS website www.patoss-dyslexia.org)

Or from SEN Marketing, 618 Leeds Road, Outwood, Wakefield WF1 2LT. Tel/Fax: 01924 871697.
Website: www.sen.uk.com

The BDA (British Dyslexia Association) also produces information leaflets on exam arrangements for dyslexic students.

British Dyslexia Association, 98 London Road, Reading RG2 5AU. Tel: 0118 966 8271. Fax: 0118 966 2677. Website: www.bdadyslexia.org.uk

For more information about Lucid or the developments or research please visit the Lucid web site www.lucid-research.com. The Lucid staff can be contacted by email info@lucid-research.com, telephone +44 (0)1482 862121 or fax +44 (0)1482 882911.

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