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Dyslexia in the Adult Years

Synopsis. *This chapter describes the characteristics of dyslexia in the adult years, and the current scientific and theoretical explanations for these. A pragmatic model based on interactions within the working memory system is proposed as a way of understanding dyslexia as it affects people during the adult years.*

Introduction

Dyslexic people seeking the advice, guidance and support of professionals usually want the answers to the fundamental questions, ‘Why do I find certain tasks difficult?’ and ‘What can I do about it?’ Alternatively, those referring people for evaluation and advice are asking, ‘Why is this person not learning or performing in the way we expect?’ and ‘What can be done about it?’ The subject of this book is the interventions that address these questions and enable dyslexic people to work towards becoming successful in education, employment and life generally.

In the first edition of this book we wrote that ‘the past decade has seen a greater interest in dyslexic adults’ (McLoughlin et al., 2002: 1). There has been an even greater interest in the subsequent decade. This has been prompted, at least in part, by disability discrimination legislation. Nevertheless, this still does not mean that adults have been recognised as a distinct population, with needs that are quite different from their younger counterparts. There has been more research, but the majority of studies focus on students in third tier education and the population ranging in age from 18 to 25 years of age, a period that has become known as ‘emerging adulthood’ (Arnett, 2004). In terms of practice there are many more individual professionals as well as organisations providing services for dyslexic adults, but a greater number of ‘experts’ does not necessarily mean that there is more expertise. Often the practices adopted when working with children are inappropriately generalised to work with adults, who as Patton and Polloway pointed out twenty years ago ‘are not and should not be regarded as children with a learning

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David McLoughlin and Carol Leather.

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disability grown up' (Patton & Polloway, 1992: 411). Nevertheless, most interventions from assessment through to tutoring and accommodation are directed to the adult population who are still in education, and methodologies based on models developed for work with children. Even dyslexic people themselves perceive it as an educational issue, this being advanced as one of the reasons for the failure to disclose it to employers (Martin & McLoughlin, 2012). There is still a need for a fundamental shift in thinking on behalf of professionals, researchers, and all the organisations concerned with providing for dyslexic people. That this is the case is reflected by two reports published in the United Kingdom within the last decade: Rice and Brooks (2004) and Rose (2009).

On its release the former, *Developmental dyslexia in adults: a research review*, proved sufficiently controversial for Advocacy and Self-Advocacy groups representing dyslexic adults to call for its withdrawal. Although undoubtedly pleased that this population was being regarded seriously enough to warrant the commissioning of a report of this kind, they were disappointed both by the conclusions and the foundations on which they were based. The authors failed to acknowledge that dyslexia is still an evolving concept, as is the case for all the specific learning difficulties, and that there has been a fundamental paradigm shift, dyslexia having come to mean much more than a reading problem to such groups, as well as practitioners. There is now a better understanding of dyslexia at a cognitive level, and this has broad implications for everyday performance. Reading and spelling difficulties are skill deficits that can occur for many reasons, including lack of education.

In the Executive Summary the authors write: 'dyslexia has been interpreted widely, to embrace most if not all of the ways in which the term has been used by scientists and educationalists' (Rice & Brooks, 2004: 11). It wasn't as Part One begins with the question 'Why do some people find it so difficult to learn how to read, write and spell?' They should have also asked: Why do some learn to read but continue to find spelling difficult? Why do some people achieve good accuracy, but find it hard to retain what they read? Why do people who master skills they found difficult to acquire, such as reading and spelling, report problems in domains such as organisation and time management? It is only by asking the right questions in the first place that we can evaluate definitions and explanations. Suggesting that if the word 'dyslexic' were to disappear 'science and the world of literacy teaching and learning might be no poorer' (Rice & Brooks, 2004: 87), is unhelpful and suggests a bias that undermines the credibility of the report.

Further, whilst the authors make much of the notion that poor readers and/or dyslexics do not constitute a homogeneous group they assume that adults do. Adulthood is the longest stage of human development. There is an enormous difference between the challenges faced by an 18-year-old and those facing a 45-year-old. Learning difficulties need to be understood in contexts, one of them being the stages of development. Dyslexic adults are more than 'grown up children' (Price & Patton, 2002: 38). In a review of the Rice Report, Siegel and Smythe (2006) comment that it 'fails to fulfil its intent by providing an incomplete literature review which ignores critical definitional issues and important studies of the basic cognitive processes, as well as failing to include much of the research on appropriate interventions and accommodations for adult dyslexics, pivotal in understanding the literacy needs of the adult dyslexic' (p. 69). One might add an understanding of all their needs.

In the Rose Report, *Identifying and Teaching Children and Young People with Dyslexia and Literacy Difficulties*, dyslexia is defined as follows:

- Dyslexia is a learning difficulty that primarily affects the skills involved in accurate and fluent word reading and spelling.
- Characteristic features of dyslexia are difficulties in phonological awareness, verbal memory and verbal processing speed.
- Co-occurring difficulties may be seen in aspects of language, motor co-ordination and mental calculation.

On the positive side, authors of the report accept that dyslexia exists and the definition goes beyond reading and spelling, acknowledging that there can be co-occurring difficulties in language, organisation and aspects of maths. The focus of the report was ‘children and young people’; but despite this the above is being promoted as a new definition of dyslexia that applies across the board.

It is always difficult to make international comparisons as there are differences in terminology. Nevertheless, in the *Learning to Achieve* report considering learning disabilities, including dyslexia, prepared by the American National Institute for Literacy (Taymans, 2009) it was concluded that:

1. The concept of specific learning disabilities is valid and is supported by strong converging evidence.
2. Learning disabilities are neurologically based and intrinsic to the individual.
3. Individuals with learning disabilities show intra-individual differences in skills and abilities.
4. Learning disabilities present across the life span, though manifestations and intensity may vary as a function of developmental stage and environmental demands.
5. Learning disabilities may occur in combination with other disabling conditions, but they are not due to other conditions such as mental retardation, behavioural disturbance, lack of opportunities to learn, primary sensory deficits or multilingualism.
6. Learning disabilities are evidenced across ethnic, cultural, language and economic groups.

In summary, this report is to be commended as it clearly acknowledges that ‘specific’ in specific learning disabilities such as dyslexia refers to neurological and, therefore, cognitively based causes that are independent of general intelligence and other potential causal factors, and have an impact on performance throughout the life span. It addresses homogeneity, heterogeneity and co-occurrence, but acknowledges the influence of environmental factors, including transitions, on outcomes for people who have a specific learning difficulty.

Although there have been more studies considering the problems facing and the needs of adults, there is no real research agenda, small projects being undertaken by particular individuals or groups. Conducting empirical studies with adults where they are not a captive audience is difficult, finding samples that represent specific populations being

a particular problem, as is establishing control groups. Volunteers are likely to be the ‘most needy’, others being reluctant to participate, sometimes because they want to be left alone to get on with their lives. From a research perspective and for whatever reason, in the main dyslexia has remained an educational issue, rather than one which affects daily living, including employment. Outcome research on the effects of interventions during the adult years, including the impact of disability legislation, is much needed but is in short supply (Gerber et al., 2011).

In Western society the majority of the population is over 16 years of age, and ‘the majority of the dyslexic population are adults’ (Eden et al., 2004: 412). Nevertheless, the needs of this group have been given far less attention than those of children still at school. Whilst this makes sense if one assumes that early intervention will minimise the impact of dyslexia on people’s lives, it is unfortunate. Considering the nature of dyslexia as it is manifested across the life span should lead to a greater understanding of the needs of dyslexic children. It is only by taking a long-term view that we will develop a complete understanding of the nature of dyslexia and how it affects people, and provide appropriately. Furthermore, the persistence of dyslexia in the adult years raises important issues about definition, with consequent implications for practice. It demonstrates more clearly than anything else that the focus should be underlying processing abilities rather than observable behaviours (Vellutino et al., 2004).

To take advantage of the provisions of disability discrimination legislation both in the United Kingdom and in the United States, for example, a dyslexic person must establish that their difficulties constitute a mental impairment that has significant day to day effects (UK) or substantially limits one or more major life functions (USA). A narrow view based on the experiences of children and focused on literacy or education will not protect dyslexic people from discrimination, nor will it allow them to access important resources. This is best illustrated by a United Kingdom Employment Tribunal decision in which it was determined that an individual should not be considered to be disabled within the meaning of the Disability Discrimination Act, 1995. The decision was based in part on the claimant’s educational background. He was educated to degree level, and had received positive appraisals about his report writing at work. This was, however, someone whose processing abilities were within the bottom 1 per cent of the population, and who had significant problems with silent reading speed and comprehension, as well as writing speed. He had allowed himself four hours travelling time to keep an appointment, a journey that would take most people an hour. There was reference to his ability to drive, but not to the fact that he had taken the test more than ten times before passing, and that he no longer drove because, having informed companies of his difficulties, the insurance premiums he was quoted were prohibitive. The ‘day-to-day effects’ or ‘substantial limitations’ were patent, but the Tribunal could not see beyond dyslexia being a reading and spelling issue. In commenting on a young dyslexic woman’s personal account of the difficulties she experienced Wehman (1996) wrote ‘that “dyslexia” does not do justice to the complexity of the experience, the effort required to compensate and cope, or the many other aspects of life that are affected’ (p. 347).

Establishing a large body of quantitative data might be an unachievable goal so we must rely on the small scale studies which exist, as well as the individual experiences of dyslexic people and those working with them to underpin interventions. The latter

provides only qualitative data, but it can contribute to understanding, as well as inform theory and practice (Everatt, 2007). There are also several factors that should influence good practice in assessment, coaching, teaching, training and employment, including:

- i. the nature of dyslexia in adulthood
- ii. psychological development across the life span
- iii. the principles underlying education and training in the adult years
- iv. the factors research has shown to contribute to the success of dyslexic people
- v. the educational and legal context.

The first of these is described in this chapter. Chapter 2 describes ii to iv and the last is discussed in Chapter 10.

History

The notion that people can have specific difficulties with reading despite being able to perform effectively in other areas has been around for a very long time (see Miles & Miles, 1999). Nevertheless, dyslexia is one of the specific learning difficulties and the real thrust in understanding these came in the 1960s. In particular, Kirk (1992) proposed a causal model that assumed the concept applied to individuals with average or better than average intelligence, but who experience difficulties at one of four levels:

- Input – from the senses.
- Integration – the brain interpreting this information.
- Memory – the information being stored and retrieved.
- Output – behaviour including reading, writing and language.

The last of these is the result of difficulties at one or more of the first three, although the emphasis in understanding specific learning difficulties is now on integration and memory process, rather than perception. Letter reversals, for example, were originally interpreted as being associated with the latter, but would now be attributed to cognitive/linguistic processes. This model is still relevant today, but too much of the literature still focuses on output or observable behaviour. Historically, the notion that we are addressing a population with average or better than average intelligence has been central to the concept of specific learning difficulties. Even those definitions that focus on specific deficits in the cognitive processes related to reading, such as phonological processing, refer to them as being ‘unexpected in relation to other cognitive abilities’ (Lyon, 2003: 2). The American Individuals with Learning Disabilities Act (IDEA), 2004 defines a specific learning disability as ‘a disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in the imperfect ability to listen, think, speak, read, spell or do mathematical calculations’ (Flanagan & Alfonso, 2011: 5). It excludes general learning disabilities.

There has been considerable academic debate about the relevance of intelligence and IQ in particular to the definition and identification of dyslexia, as well as specific learning difficulties generally (Siegel, 2003). Much of this is spurious, as it is the content of tests

that make up IQ scales that is important rather than the Intelligence Quotient itself. In its historical context and in our view statements such as ‘dyslexia occurs across the range of intellectual abilities’ (Rose, 2009: 10) contradict the original conceptual understanding of specific learning difficulties and are unhelpful. They raise false expectations amongst individuals who have trouble with literacy, but whose difficulties are much more complex than this. Telling someone whose cognitive abilities are consistently at the sixteenth percentile that they are dyslexic, implying that their difficulties are specific rather than general, leads them to attempt educational programmes and seek occupations that will only cause them frustration. Having a general learning disability and being dyslexic are mutually exclusive, even though there might be similar behavioural characteristics.

Terminology

As dyslexia has been and continues to be regarded as an educational issue, much of the language surrounding it belongs to the world of education, particularly special education, and we find it very hard to get away from it. Viewed from the adult perspective a good deal of the terminology is inappropriate. One should not, for example, suggest that the manager seeking to improve his report writing skills is in need of ‘remedial help’. Many professionals prefer the term ‘specific learning difficulty’, using the term synonymously with dyslexia. The latter is a specific learning difficulty but only one of a number, including dyspraxia, dyscalculia and attention deficit disorder, sometimes referred to as ‘hidden disabilities’.

The generic term ‘learning difficulty’ is inappropriate for many dyslexic adults. It places the emphasis on education and many have learned very well, albeit differently, but continue to have a ‘performance or life skill difficulty’. We are using the word ‘dyslexia’ here in its very broadest sense, that is as ‘a family of lifelong manifestations that show themselves in many other ways than poor reading’ (Miles, Haslum & Wheeler, 1998). Dyslexic people can find learning difficult, but in the adult years their ability to ‘perform’ in social, family and work settings is of greater concern. The term ‘compensated dyslexic’ is often used to describe those individuals who have mastered reading and writing. Literate dyslexics is better, as it implies that people are still dyslexic even if they can read and write.

Further, it has been suggested that it is preferable to refer to ‘people with’ or ‘people who have’ dyslexia. We continue to use phrases such as ‘dyslexic people’ or the word ‘dyslexic’, having met few, if any, who have described themselves as ‘an adult with dyslexia’. Some of our clients have specifically disregarded phrases such as ‘a person with dyslexia’ because of their medical connotations.

Defining Dyslexia

Defining dyslexia has remained an elusive business. There are many definitions formulated by advocacy groups, practitioners and researchers (see Rice & Brooks, 2004).

Gigorenko (2001) has written that the ‘quilt of definitions covering the body of developmental dyslexia is a subject for research on its own’ (p. 93). The discrepancy between ability and attainment in literacy, particularly reading, has been the focus but should now be considered unsatisfactory for a variety of reasons (Siegel & Smythe, 2008). Discrepancy definitions are entirely behavioural (Ramus et al., 2003), and there have been suggestions for some years that we need to move away from them (Frith, 1999). There are those, however, who still maintain that we should focus on symptoms rather than causes (Uppstad & Tønnessen, 2007). Definitions should reflect knowledge at a particular time. We now know a great deal about the cognitive abilities that correlate with learning and performance, including the development of literacy and numeracy skills. The focus should be on cognitive processes rather than observable behaviour.

Nevertheless discrepancy definitions persist and the proposed revision to the American Psychiatric Association’s Diagnostic and Statistical Manual (DSM 5) will include dyslexia rather than just reading disorder, but the suggested criteria for diagnosis are similar to those in DSM IV. That is:

- (A) Difficulties in accuracy or fluency of reading that are not consistent with the person’s chronological age, educational opportunities, or intellectual abilities.
- (B) The disturbance in criterion A, without accommodations, significantly interferes with academic achievement or activities of daily living that require these reading skills.

Discrepancy definitions are particularly inappropriate for adults who have been able to develop their literacy skills to a level at which the discrepancy is no longer obvious. Some individuals can ‘achieve typical and even superior levels of reading performance in adulthood’ (Grigorenko, 2001: 84). According to a discrepancy definition, such people would no longer be dyslexic, despite clearly continuing to experience difficulties that stem from the same cognitive deficit responsible for their slower acquisition of literacy skills. Attempting to apply a discrepancy definition to adults who are no longer in formal education illustrates both the flaw in such a definition, and the failure to address dyslexia in the context of adulthood. As adults we need the skills we need, not those reflected by test norms.

In a critique of the British Psychological Society’s Division of Educational and Child Psychology (DECP) working definition, ‘Dyslexia is evident when accurate and fluent word reading and/or spelling develops very incompletely or with great difficulty’ (BPS, 1999: 5), Cooke (2001) quite correctly wrote that the definition ‘will cause serious concern to dyslexic adults – particularly those who are sometimes (inappropriately) called ‘compensated’ dyslexics – those who have few problems with reading but have all kinds of other problems’ (Cooke, 2001: 49). The emphasis on observable accuracy and fluency, whilst occurring in many definitions, fails to take into account the purpose of reading: that is, being able to access and understand information. What is needed is a definition that addresses dyslexia as it impacts on people across the life span, or at the very least one that is specific to the adult years.

Evidence-based Practice

Much practice with dyslexic adults remains what has been termed ‘nomothetic’: that is, a ‘one size fits all’ approach that assumes dyslexic people form a homogeneous group and interventions involve the best approach for an average person. Dyslexic people form a heterogeneous group; they have things in common but their needs vary considerably. What is required is an ‘idiographic’ approach where decision making and solutions are for individuals.

In the health and allied professions there has been an international move towards evidence-based practice, described as the ‘conscientious, explicit and judicious use of current best evidence in making decisions’ (Bauer, 2007: 685). ‘Evidence-based practice in psychology is the integration of the best available research with clinical expertise in the context of patient characteristics, culture and preferences’ (APA, 2009; cited in Spring, 2007).

What have been described as the three pillars of evidence-based practice are shown in Figure 1.1.

Given that the concept has evolved in the health professions, the terminology surrounding evidence-based practice has a medical connotation but the three pillars are:

- (a) The best evidence guiding a decision – research.
- (b) The expertise of the healthcare professional to diagnose and treat the Client’s problems – clinical judgment.
- (c) The unique preferences, concerns and expectations that the individual brings to the health care setting.

(Spring, 2007: 613)

A simple example of how this might apply when working with dyslexic adults is making recommendations about accommodations or adjustments in a test setting. It

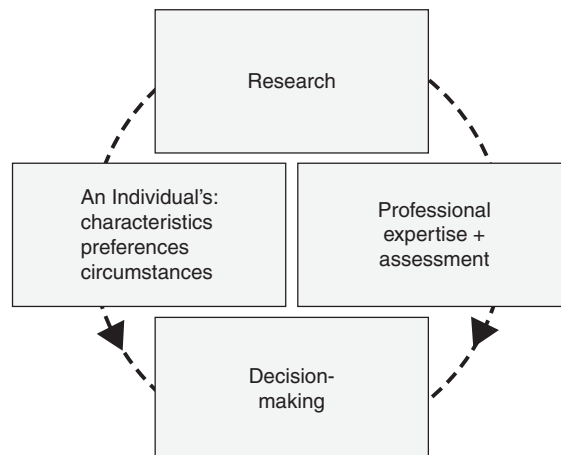


Figure 1.1 The Three Pillars of Evidence

has become standard practice to recommend a 25 per cent extra time in test settings. Allowing extra time has been shown to ‘level the playing field’ (see Chapter 10), but the figure of 25 per cent is entirely arbitrary and not research based. The adjustment is, therefore, nomothetic. An idiographic approach would be:

- (a) Research – there is evidence to show that allowing extra time to complete examinations ensures that dyslexic people are less disadvantaged by their reading disability, but non-dyslexic people are not advantaged (Lesaux, Lipka & Siegel, 2006).
- (b) Assessment expertise – proper assessment will demonstrate the extent to which the individual is disadvantaged, so a specific recommendation can be made about the amount of time needed.
- (c) Individual preference – the individual should be comfortable with the recommendations made. They might, for example, wish to compete on exactly the same basis as others, or find excessive amounts of time taxing.

An idiographic evidence-based approach is essential if specific needs are to be met and ‘the effectiveness of an accommodation in enhancing an individual’s performance is dependent upon a professional’s knowledge of the specific cognitive, affective and language processes that influence different types of learning demands’ (Gregg, 2009: 19).

Evidence-based practice can also contribute to establishing equity, both real and perceived. Media attention has been given to suggestions that dyslexic people are advantaged by adjustments such as being allowed extra time to complete examinations, and research has demonstrated that adjustments such as giving more time to a person with a disability, particularly where the disability is dyslexia, lead to perceptions of unfairness (Paetzold et al., 2008).

Evidence is provided by a variety of different approaches to research, some considered to be much better than others. There are several schemas that allow the grading of the strength of evidence based on research design (see West et al., 2002). There are four levels, summarised in Table 1.1.

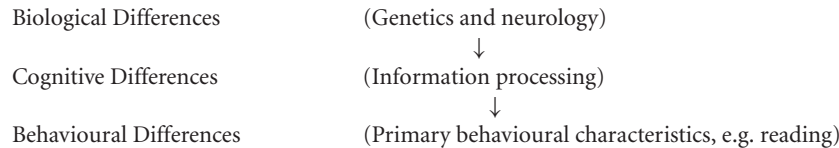
The research evidence for dyslexia is provided by all of the above, but a great deal of the literature on adults is based on Grade IV evidence. There are, however, studies that consider cognitive differences which would meet Grade I criteria. We would have preferred to only rely on the research that has been based on adult populations but,

Table 1.1 Schema for Grading Strength of Evidence in Research

<i>Grade</i>	<i>Criteria</i>
I	Evidence from studies of strong design; results are free from serious doubts about generalisability, bias, and flaws in research design.
II	Evidence from studies of strong design but there is some uncertainty about generalisability, bias, research design flaws, or sample size.
III	Evidence from a limited number of studies of weaker design.
IV	Support solely from informed commentators based on practical experience.

as there is evidence from longitudinal studies that suggests that ‘deficits in underlying cognitive processes’ persist well into adulthood (Maughan et al., 2009: 898) reference to some of the studies of child populations is legitimate.

Frith (1995, 1999) described a framework that provides a useful way of organising what we do know, as follows:



These differences interact with each other, as well as the environment. The latter can include very particular factors such as orthography. There is a substantial literature on the impact of the same cognitive processes on particular languages and writing systems when individuals are learning to read. More general factors include educational and life experience, language and culture. In order to understand dyslexia in its broadest context as it can be manifested and is reported during the adult years we begin with the last.

The Nature of Dyslexia: Behavioural Characteristics

Although in many countries dyslexia is still viewed as a reading difficulty, there does seem to be some agreement that the problems experienced by dyslexic people extend beyond literacy skills. In countries where the term ‘learning disability’ is used to include dyslexia there is greater recognition of this. There has yet to be a large scale systematic survey of dyslexia in the adult population that attempts to identify the incidence, and more specifically its nature.

The understanding we have of dyslexia is based in our professional training and background, but has been influenced enormously by what we learn from the dyslexic people we work with on a daily basis. Our experience is their experience, and this will have been shared by other practitioners. Reiff et al. (1993) wrote that:

First hand experience is vital for helping professionals in the field of learning disabilities to understand and appreciate the realities of living with learning disabilities. Such information provides a useful yardstick for measuring current conceptualisations, for one criterion of a definition’s validity must be the ability to reflect or correlate with the experiences of those who receive a label based on that definition. Furthermore, those insider’s perspectives may provide a foundation for formulating a new definition that blends current theoretical constructs with first hand experience. (Reiff et al., 1993: 116)

The insider perspective is only level IV evidence but ‘the relationship between science and practice should be a two way street, with each informing the other’ (Pennington, 2009: 39). Often practice is well ahead of science, the latter providing a post-hoc rationale for the former, and scientists sometimes have insufficient exposure to those they are

researching and writing about. We cannot say how often they occur exclusively amongst the population of dyslexic adults but, in our experience, those seeking advice and support manifest a number of observable behavioural and affective characteristics. These are listed below, and illustrated by comments from dyslexic people.

Observable Behavioural Characteristics

The primary behavioural characteristics that constitute dyslexia include:

Organisation – including personal organisation, as well as organisation for work and learning. Included here is time management and time keeping.

Organising my life is an arduous task.

Literacy – including word recognition, reading fluency and comprehension, spelling, written expression and writing fluency.

Spelling and numeracy problems are still predominant but I now have strategies to cope with them – on the whole. Knowing left from right and reading the time prove to be problematic (because they tend to have to be performed quickly, removing the opportunity for using strategies). I am incapable of reading aloud and this is a problem when I try to read to my daughter.

Numeracy – this is not a conceptual difficulty but a problem with the procedural aspects, including symbol recognition, calculations and remembering the order in which operations should be undertaken. There can also be a problem with the language of maths. Some dyslexic people become very good mathematicians, but continue to experience problems in areas such as mental arithmetic and have never been able to learn times tables. Poor reading comprehension can also be an issue when maths is presented in written problem form.

Spoken language skills – some dyslexic people do seem to experience problems with spoken language, such as word finding and word order. These are often not well understood in adulthood but, as well as undermining performance in educational and work contexts, they can contribute to social difficulties by interfering with communication and being the source of embarrassment.

You open your mouth to say something and then silence – only a blank space in your head.

Memory – Dyslexic people will often refer to problems they experience with memory, particularly short-term memory, without realising that this is a core issue. They perceive it as a separate problem, complaining of difficulty recalling instructions, people's names, telephone numbers and general information.

Affective Characteristics

The observed and reported affective characteristics are:

Lack of confidence – although many dyslexic people are very able, they do not perceive themselves in this way. Their achievements have often been below their own expectations and this has undermined their confidence in their abilities.

Dyslexia affects people in different ways, personally it affected my self-confidence I was always made to feel lazy, stupid, ugly and sometimes even worthless. When I was diagnosed as dyslexic it was more a relief than anything else, so this is why my handwriting is like this and that's why I have problems with essays (putting information under the right section), that's why my maths is so bad that's why I always have problems with numbers, I remember once when I was at school someone asked me for my telephone number but I just got more confused and frustrated and couldn't remember it so I felt stupid.

Low self-esteem – dyslexic people often have a low opinion of themselves generally. They do not value their abilities or their achievements and can be inclined to apologise too much, having become used to getting things wrong.

It's never being sure you are right.

Anger and frustration – this can include anger about the way they have been treated in the past, as well as their current situation.

I have a lot of anger still about all the failed tasks and why none of the professionals who taught me stopped to ask what was wrong with this child who couldn't produce the written work equal to her other skills. I wish they had.

Anxiety – including general anxiety, as well as a particular reaction to learning, including learning how to use IT, as well as examinations and testing.

I feel completely out of control and unable to function. Others may tell me that I am not out of control, but that does not alter how I feel: I feel disorientated, I keep forgetting things – my short-term and working memories are terrible, I mislay things all the time – I can't concentrate for more than a few seconds – I can't make even the simplest decision about anything – silly little decisions hold me up for hours – I feel worn out and as if on another planet much of the time – terribly stressed and at the point of collapse – only I never do collapse! I just carry on laughing it off and covering it up – trying even harder to cope when I can't.

Can you imagine the feeling of anxiety building up every time you pick up a pencil, the feeling of despair every time someone asks you to read something with them present; or even worse the dreaded 'reading out loud'. The annoyance and embarrassment every time someone corrects your pronunciation or spelling. The feeling of frustration at being unable to read or write at the same speed as others. The thought that although you might have spent enormous time and effort in completing a piece of work, the chance is that it still has mistakes. The fear that you are always wrong, and pure frustration that what is in your head leaves your hands and mouth distorted.

Social interaction – academic, learning and performance difficulties can lead to poor self-concept, rejection or isolation from peers, or other negative consequences that interfere with the development of social skills.

Being dyslexic obviously creates problems with study within 'normal' systems, as the majority of schooling and higher education is based entirely on the written word. So this alone leads to stress and frustration, but for me the secondary factors of being dyslexic, anxiety and lack of self confidence have had more of an impact on me. It was not until I started to research dyslexia for this learning profile, that I realised how closely related they are.

Affective characteristics are no less important than the primary ones, and are often more difficult to resolve. It can be easier to teach someone to read than it is to improve their confidence. Even highly successful dyslexic people express doubts about their ability. Their confidence always remains fragile and setbacks can be enormous. There is often an incorrect assumption that success in some areas of life will generalise to all aspects. Wolf (2008) quotes from a speech made by former world champion racing driver Sir Jackie Stewart in which he said 'you will never understand what it feels like to be dyslexic. No matter how long you have worked in this area, no matter if your own children are dyslexic, you will never understand what it feels like to be humiliated your entire childhood and taught every day to believe that you will never succeed at anything' (Wolf, 2008: 166). Further, there is a two-way interaction between behavioural and affective factors, and this influences performance from day to day.

On a good day, I imagine that I am a highly creative and intelligent (an original thinker), with amusing and endearing quirks. Work goes better than ever, I feel I'm moving forward in strides and that I am appreciated!

On a bad day, however, I feel overwhelmed, confused and worried about my ability to cope. If I have a lot of work or something I find difficult to do, trying to organise a plan or schedule can send me into a panic. Just the mental act of keeping numerous dates, names and important information in my head is tricky. I feel I'm moving at a snail's pace and at times like these my workroom can begin to resemble the chaos in my mind, with papers spread higgledy piggledy. If I am cold calling people for work/research, I have to do several mini rehearsals first, otherwise I risk sounding tongue tied.

Often I am unable to hold on to the thoughts for long enough for me to form a sentence – either written or spoken. Using a computer helps, in that I can wipe out bits as I go along and keep the text neat and tidy. Handwritten notes always end up in a terrible mess these days – although it used not to be so. But even when using a computer, it is still difficult and of course my eyes feel strained.

Positive Characteristics

The problem with labels is that they refer to only one aspect of a person's life. Dyslexia refers to what people can't do, the risk being that what dyslexic people can do is overlooked.

Dyslexics are usually very creative people they have to be to overcome some of the difficulties they are faced with. Because we think in pictures, dyslexics are usually artistic. They are

lateral thinkers and overcome problems by thinking laterally. I would also say that people with dyslexia are more articulate they say things verbally better than maybe in writing. Of course if you are speaking you don't need to bother with logical ordering or handwriting or spelling. To overcome dyslexia you need to be efficient and more organised than if it did not affect you.

Amongst positive characteristics reported are:

- entrepreneurship;
- strategic thinking;
- artistic ability, particularly where good visual-spatial skills are required;
- innovative thinking skills;
- a holistic approach to problem solving;
- empathy.

I think dyslexia forces one to have a more individual viewpoint on life because evidence suggests we think more holistically. Numerous artists, musicians and actors are / have been dyslexic, as well as famous scientists / inventors and so on. I would hope I am better able to empathise with people who experience difficulties in learning or life in general. I also hope I am more open to different learning approaches, even different philosophies, trends, and so on. Some think that dyslexia can 'give you the edge' on your chosen field because you have to be more thorough in your study / practice by necessity.

Much of the so called evidence for the above is based on anecdotes and speculation about an ever growing list of creative and gifted people, such as Einstein, but is sometimes reflected in simpler activities.

I can see the finished design of the cakes I produce before I even start. I can also assemble items very quickly. I also consider myself to be a good leader and others are happy to follow.

The talents of dyslexic people are promoted by advocacy and self-advocacy groups, as well as individuals themselves, although this is not always the case.

I'd like to say yes there are loads of positive things about being dyslexic, unfortunately, I just see it as a pain in the arse. The way I tend to look at my situation is: it could be worse I could be stupid and there is no way back from that. To the best of my knowledge there isn't an operation that cures stupid. I'm fortunate, I have 'brains', it was just not immediately apparent, to the education system, nor myself, how to utilise them.

In our experience dyslexic people can also be very:

- persistent;
- determined;
- hard working;
- resilient.

Not enough attention is paid to those dyslexic people who have demonstrated such qualities and worked effectively in fairly ordinary jobs. They have needed to be in order to be successful. The perseverance many dyslexic people have shown is impressive. This is supported by the risk and reliance research described in Chapter 2.

Behavioural Characteristics: Empirical Evidence

There are a number of systematic studies that have shown how some of the behavioural and affective characteristics described above persist into adult years. These include problems with all aspects of literacy, numeracy and academic performance generally. There are also studies that have considered occupational outcomes, as well as emotional development (see Gerber, 2012 for a review).

Not enough research has been conducted and many studies are based on samples of individuals in emerging adulthood. Nevertheless, Maughan et al. (2009) were able to follow up middle-aged individuals who had been identified as poor readers in childhood and found that on the basis of testing the majority continued to experience difficulties with all aspects of literacy including spelling, and they also reported difficulties in activities such as letter writing and filling in forms.

Few studies have addressed broader issues, but in an on-line study of graduates who had received accommodations whilst at university a significant number reported difficulties in areas such as time management and organisation. They also reported strengths in big picture thinking, empathy, persistence and determination (Martin & McLoughlin, 2012).

Explaining Characteristics

One of the underlying themes in this book is understanding. Philosopher of science Peter Lipton wrote that understanding ‘is not some sort of super-knowledge, but simply more knowledge: knowledge of causes’ (Lipton, 2004: 30). Most academic research is based in the logical positivist tradition and the focus is on the likeliest explanation: that is, the one most warranted by the evidence. Academic researchers, perhaps correctly, rarely go beyond this. Given the dearth of empirical studies dedicated to dyslexia in the adult years this would provide a very limited picture. We need to rely on the empirical evidence and the theory it has informed and draw inferences from the latter to provide what Lipton referred to as ‘the loveliest explanation’: that is, ‘the one which would provide the most understanding’ (Lipton, 2004: 207). This is best provided by combining all levels of evidence. We cannot just rely on anecdotal accounts and self-report, although these provide richness and reality.

Biology and Neurology

There is strong evidence for heritable factors being the initial cause of dyslexia and ‘it is well established that dyslexia is a neurological disorder with a genetic origin’ (Ramus, 2003: 841). This is derived from family studies, where the relatives of children with reading problems perform less well on reading tasks than those whose children do not have such difficulties, and more convincing evidence comes from twin studies (Pennington, 1990; De Fries, 1991; De Fries, Alarcon & Olson, 1997; Pennington & Olson, 2005). The process

of transmission is not fully understood, and multiple genetic factors are thought to be involved (see Pennington, 2009; Grigorenko, 2001; Wolf, 2008 for an overview). The experience of interviewing dyslexic people provides much evidence of a family history of dyslexic type difficulties, although this is by no means universal. Further, it is not the behavioural characteristics such as a reading or spelling difficulty that are inherited, but the neurological and cognitive difference.

It has been established that dyslexics show significant neural organisation differences to non-dyslexic people. These differences persist throughout the life span, and are regarded as the fundamental cause of the characteristics manifested by dyslexic people at a behavioural level (Bigler, 1996). That is, they are dyslexic essentially because of their neurological make-up. The evidence comes from structural neuro-anatomic and imaging studies, as well as functional imaging studies.

Neuro anatomic studies have shown that whereas non-dyslexic people have an asymmetrical brain, the left being larger than the right, dyslexic people show symmetry, particularly in the planum temporale (Best et al., 1999). Further, nests (or clusters) of neurones which reflect 'altered prenatal neuronal migration' to the cortex have been identified where they do not exist in non-dyslexic people. As these develop prenatally, they cannot be attributed to environmental influences. Galaburda et al. (1985) hypothesised that 'the affected cortex is different in terms of its cellular and connectational architecture, hence its functional architecture' (p. 127). Galaburda (1999) has described dyslexia as a multi-level syndrome with areas of the brain connected with perceptual processing, as well as those involved in meta-cognitive tasks being anatomically affected, inferring that dyslexia represents a complex interaction of both low level and high level processing deficits.

The emphasis on 'interaction' is important as too much is made of the left/right or verbal/visual brain dichotomy. 'The brain is made up of anatomically distinct regions, but these regions are not autonomous mini brains; rather they constitute a cohesive and integrated system' (Greenfield, 1997: 39). Skills such as reading rely on the interaction between visual, auditory and motor centres. Stein and Talcott (1999) have argued that the magnocellular pathways in the brain, particularly those which link the parts involved in reading and spelling, differ in dyslexic people. They suggest that dyslexia results from 'patchily abnormal development in magnocellular neurones' throughout the whole brain contributing to visual instability and, like Fawcett et al. (1999) who have identified differences in the cerebellum, associated this with reduced phonological skills and motor problems. The role of the cerebellum in dyslexia is not well understood, but increasingly it is thought to play a part in a range of cognitive processes, including language (Schmahmann & Caplan, 2006).

Brain imaging techniques such as magnetic resonance imaging (MRI) and positron emission tomography scans, combined with blood flow techniques, have allowed the further exploration of structural and functional differences in the brains of dyslexic people. The former have confirmed some of the structural differences, notably those relating to symmetry, identified by autopsy studies. PET and fMRI scans have provided support for functional differences (Hynd & Heimenz, 1997; Shaywitz, et al., 2003, Shaywitz & Shaywitz, 2004). Consistent with structural studies differences are mainly seen in areas

relating to language skills (Zeffiro & Eden, 2000; Paulesu et al., 2001; Shaywitz et al. 2003; Shaywitz & Shaywitz, 2005), dyslexic people experiencing more right hemisphere processing in reading. Nevertheless, this is not universal and it has also been suggested that several brain regions are involved.

Other neuroimaging studies have led to researchers describing the ‘asynchrony phenomenon’ which suggests that dyslexia, when understood in terms of reading accuracy, is caused by a speed of processing gap within and between the components of the brain involved in word decoding, particularly visual and auditory processes. Specifically, there is a timing delay when transferring information from one hemisphere to another through the corpus callosum. Studies conducted by Breznitz and her colleagues have shown initial activation in the right hemisphere amongst dyslexic people before left hemisphere activation, whereas the reverse is the case with non-dyslexic people. The former process has been shown to be slower (Breznitz & Misra, 2003; Breznitz, 2008). In general, poor connectivity amongst areas of the brain associated with reading considered to underlie dyslexia, and this is thought to be the case across different languages (Silani et al., 2005).

There are methodological concerns with functional imaging studies, the brain having been described as both a dependent and independent variable. That is, it provides access to learning but is also influenced by it (Beringer & Richards, 2002; Johansson, 2006). This raises the question of whether dyslexic people manifest problems with reading because of brain organisation, or whether the latter has been influenced by reading problems. Intervention research has suggested that the former is the case, targeted teaching leading to improved performance, correlating with normalisation of brain activation patterns (Shaywitz et al., 2004; Simos et al., 2002). This does, however, only seem to apply to the process underlying reading accuracy, not other aspects such as fluency and comprehension (Eden et al., 2004).

Cognition

To explain why the observed neurological differences are important in leading to behavioural differences, their effects on cognitive processing have been considered. Cognitive processes are hypothetical constructs that can be tested as possible explanations for the differences between dyslexic and non-dyslexic people. There have been three main scientific approaches:

1. Dyslexic people experience problems with phonological processing (Stanovich, 1996; Shaywitz, 1996; Snowling, 2001; Frith, 1999; Vellutino et al., 2004).
2. Dyslexia is a problem with visual processing, including orthographical dyslexia, where there are specific deficits in the visual system or visual memory (Goulandris & Snowling, 1991; Roberts & Mather, 1997; Skottun & Parke, 1999; Stein & Talcott, 1999; Stein, 2008).
3. Dyslexic people fail to develop a number of skills to an automatic level (Nicolson & Fawcett, 1995: 2001), now known as cerebellar theory.

The first of these has been a dominant approach internationally and there is considerable evidence to support the notion that problems in phonological processing undermine the development of reading skills. These deficits are thought to persist into the adult years, even amongst people who have reached age appropriate levels in reading (Wilson & Lesaux, 2001). Although they can co-occur with other problems such as motor and visual deficits, the majority of dyslexic adults present with a phonological processing deficit (Ramus et al., 2003; Reid et al., 2006).

Phonological skills include:

- Phonological awareness – the ability to identify the sounds of a language and manipulate them.
- Phonological memory – the ability to remember sounds, including new words and their order.
- Rapid automatic naming – the ability to retrieve sounds and words from long-term memory.

Weaknesses in any of the above can contribute to reading and spelling difficulties, as well as with language processing generally. Individuals who have problems with all three are likely to find learning to read particularly challenging, but it has been suggested that poor rapid naming ability is one of the best predictors of reading performance across languages (Wolf, 2010). It has been associated with reading fluency and comprehension (Daniels, 2008). Phonological awareness and phonological memory are often subsumed under the heading of phonological deficit. The latter is combined with poor rapid automatic naming to form the double deficit hypothesis, although evidence supporting this in adults has been variable (Vukovic et al., 2004; Cirino et al., 2005; Fink, 2003). Poor rapid naming can often be the source of language problems, including ‘tip of the tongue memory’ (Faust, Dimitrovsky & Shact, 2003). Price et al. (2006) consider that, at a cognitive level, there are multiple and competing phonological codes involved in reading and speech production, and at a neuronal level this suggests there is a difference in the way in which areas of the brain interact. It has been suggested that there may be a common neurological basis for word reading and rapid naming deficits (McCrory et al., 2005), but studies of young children suggest that, unlike phonological processing, rapid naming is less amenable to intervention such as direct teaching. It influences reading accuracy, but improvement in the latter does not lead to better rapid naming ability (Lervag & Hulme, 2009). This is perhaps why fluency and comprehension do not improve through the direct teaching of phonological awareness in the adult years, rapid naming being associated with those skills (Eden et al., 2004).

This is not to say that the other approaches to understanding are irrelevant. Visual processing is clearly involved in reading (Stein, 2001; Stein, 2008; Mellard & Patterson, 2008), and it has been suggested that there is a ‘common linkage between reading comprehension, visual attention and magnocellular processing’ (Solan et al., 2007: 270). Nevertheless, the empirical evidence for the relationship between dyslexia and magnocellular deficits is not strong (Ramus et al., 2003; Skottun & Skoyles, 2007). Further, visual processing deficits are unlikely to be associated with the problems in broader areas of functioning noted earlier. Research into automaticity (Nicolson & Fawcett, 1994,

1995, Fawcett & Nicolson, 2008) has focused on the apparent failure of dyslexic people to develop a number of skills to an automatic level, including working memory, motor skills and literacy, thus taking a wider perspective. Whilst acknowledging its significance Nicolson and Fawcett suggest that dyslexia is more than a phonological processing difficulty. Again the role of the cerebellum in dyslexia is not well understood, but the concept of automaticity would seem relevant to many of the tasks dyslexic people seem to find difficult. Nevertheless, it has been suggested that both cerebellar and visual processing deficits might be correlational rather than causal (Daniels, 2008).

Dyslexia: A Working Memory Model

Enabling dyslexic people to deal effectively with the difficulties they face begins with promoting understanding, including self-understanding and that of tutors, coaches and employers. There is a need for a sensible and comprehensive model that:

- (a) explains all their primary difficulties;
- (b) allows them to anticipate what might be difficult in the future;
- (c) enables them to see the relevance of specific strategies.

Swanson and Siegel (2001) proposed that learning disabilities result from an impairment in working memory, and Demonet et al. (2004) have described most explanations for dyslexia as being placed within the context of multiple memory systems. Our practice in assessment, counselling teaching and training has for some years been based on the assumption that all the behavioural difficulties experienced by dyslexic people stem from an inefficiency in working memory (McLoughlin et al., 1994; McLoughlin et al., 2002). This view is based on the scientific literature, but also on our practical experience. It is reinforced by the feedback provided by our clients. We have refined the model we use according to the experiences dyslexic people report, both in terms of the problems they encounter and the solutions they find helpful. A number of studies have considered dyslexia within the context of working memory, including its involvement in literacy and numeracy as well as everyday functioning, dyslexic people reporting more 'cognitive failures' than non-dyslexic people (Swanson, 1999; Smith-Spark et al., 2004; Smith-Spark et al., 2007).

Most human activities involve working memory at some level (Logie, 1999), and most major information processing models of skill acquisition and learning include working memory as a component (Swanson, 1994). 'It is agreed by virtually all cognitive psychologists that the processes attributed to working memory are essential in human cognition. One must keep information in mind while processing it to function intellectually and socially' (Ricker et al., 2010: 573). In evolutionary terms working memory is considered to be a tool genetically adapted to cope with ever increasingly complex environments (Klingberg, 2009).

Working memory is a system fundamental to effective performance in learning and work settings. It is not identical with general intelligence but the two are highly related (Conway et al., 2003), and it has been found to be an important mechanism of general

cognitive ability (Baddeley, 2007, Cowan, 2005). There are essentially two different models of working memory: the Multiple Component Model (Baddeley, 1986, 2004) and the Embedded Process Model (Cowan, 2005). Here we elaborate on the former in which working memory is described as a dynamic system responsible for:

1. Holding on to information provided by the senses in the very short term.
2. Entering information for effective storage and retrieval in long-term memory.
3. Enabling the finding of information from long-term memory on demand.
4. Allowing all three of the above to happen at the same time.

In the original model of working memory proposed by Baddeley and Hitch (1974), and revised by Baddeley (1986; 2004), it was conceptualised as being made up of three subsystems:

1. The Central Executive: This controls what we attend to, and in this way determines what information is processed. It directs the ability to focus and switch attention, and combines information arriving via two temporary storage or 'slave' systems, which have larger memory capacities.
2. The Visual-spatial Sketchpad: This is responsible for remembering visual images and spatial position.
3. The Phonological Loop: This deals with words in the broadest sense, remembering letters, words and numbers.

Brain imaging studies have found that these three components 'are echoed precisely in the activity seen when people carry out cognitive tasks' (Carter, 1998: 189). Their approximate cortical location is shown in Figure 1.2. An overview of imaging studies of the components of working memory is provided by Baddeley (2007).

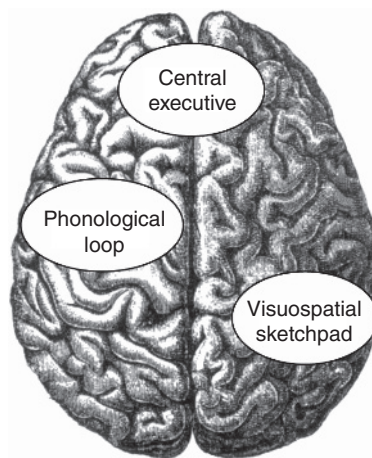


Figure 1.2 Approximate Cortical Location of Components of Working Memory

Research has also indicated that working memory capacity and its components are genetic in origin. Phonological storage has, for example, been shown to be heritable. (Rijsdijk et al., 2002; Ando et al., 2002), as has visual-spatial ability (Hansell et al., 2001) and executive functions (Ando et al., 2002; Coolidge et al., 2000).

The functions of the central executive have been described as ‘a set of behavioural competencies which include planning, sequencing, the ability to sustain attention, resistance to interference, utilisation of feedback, the ability to co-ordinate simultaneous activity, the ability to change set, and more generally the ability to deal with novelty’ (Crawford, 1998: 209). On the basis of our professional experience we are in no doubt that dyslexic adults manifest difficulties with aspects of executive functioning, including planning, attention and ‘changing set’. A good example of the last is the approaches to reading comprehension adopted by dyslexic people. Often, having developed good reading accuracy skills, they will use the same strategy, regardless of the purpose of reading. Ask them to read a poem and they will, appropriately, read all the words carefully. They will do the same with a novel, as well as with a reading comprehension task. In other words, they do not adopt a more suitable strategy. Likewise, they might well be organised in some aspects of their life but do not apply the techniques and strategies they use to other areas.

Executive functions is a highly complex concept, and an understanding of them is still emerging. The term is sometimes used interchangeably with meta-cognition. The former belongs to neuropsychology and the latter to developmental psychology. Meta-cognition has been defined as awareness over one’s own cognition, thinking and learning processes (Fernandez-Duque, Baird & Posner, 2000). Dyslexic people do not seem to develop meta-cognitive skills automatically. In particular, they have difficulty with the generalisation of newly acquired skills and strategies. It is not clear whether this reflects a specific deficit in the central executive, but there has been increasing interest in exploring this. Brosnan et al. (2002) found dyslexic individuals to show deficiencies in executive functions relating to inhibition of distractions and the sequencing of events. Smith-Spark et al., (2003) have also identified central executive deficits including those related to planning, problem solving and acting under novel situations. It seems, however, that it is only when there is a heavy task load that these are evident, and the central executive becomes involved in activities such as updating. There might, therefore, be an interactive rather than an intrinsic impairment in executive functioning.

The visual spatial sketchpad processes visual imagery and spatial information, receiving both from visual perception or retrieval from long-term memory in the form of images. It is less well understood than the phonological loop, but is thought to store images of the visual appearance of objects and scenes. It has been suggested that, like the phonological loop, it might contain two systems: a visual cache and a spatial scribe. Although a general deficit in visual spatial ability in dyslexia has been rejected (Brosnan et al., 2002; Bacon & Handley, 2010) this has been based on studies involving static tasks, and it has been suggested that there can be some impairment under taxing conditions (Smith-Spark et al., 2003).

Although it is in the phonological loop component that dyslexic people manifest evidence of a weakness, it would be naive to assume that this will only impact on the

specific cognitive domains with which it has been associated. If, as Frith (1999) suggests, 'a phonological processing deficit is persistent and universal', we should be endeavouring to explain its impact on the areas of functioning other than literacy with which dyslexic people commonly report difficulties. That is, we should be asking whether such a deficit can account for the fact that dyslexic adults report difficulties with organisation, including planning and time keeping, concentration and dealing with distractions, as well as with all aspects of literacy and some features of numeracy.

The phonological loop has two components; the articulatory control system, which can hold information by articulating it sub-vocally; and the phonological store which holds speech-based information. Both components use phonological coding. The relationship between the phonological loop and the literacy difficulties experienced by dyslexic people has clearly been established, with Thomson (2001) suggesting that it is indistinguishable from 'phonological deficits'. Its function is not to remember familiar words, but to facilitate the acquisition of new words. It is also thought to be involved in syntax. A low capacity will undermine the formation of permanent representations. In an Italian study polyglots were shown to have a better phonological memory than monoglots, reflecting its importance in language learning. It is mainly in the phonological loop component that dyslexic people manifest a weakness (Ramus et al., 2003; Reid et al., 2006), and a phonological processing deficit is the dominant explanation for literacy difficulties. It is also thought to play a part in dealing with the procedural aspects of maths.

Research (Venneri, 2000; Vandierendonck et al., 2000) has also suggested a link between the phonological loop and temporal processing as well as time perception, which might explain why some dyslexic people have trouble with time management and time keeping. It would also account for some of the difficulties they have with social interaction, when word finding and word order are an issue. A problem with the phonological loop can therefore explain some but not all of the problems they have with organisation and planning.

The brain consists of about one hundred billion neurones which are connected together in 'circuits of almost baffling complexity' (Bentall, 2010: 75). Its efficiency is determined by these connections. It has been suggested that 'the components of memory interact either positively or competitively during learning processes' (Demonet et al., 2004: 1452) and that when storage demands exceed storage capacity in one of the specific store systems some central executive capacity must be devoted to storage with the result that fewer resources are available for alternative activities (Swanson et al., 1998; Pennington et al., 1996).

It has been hypothesised that the patterns of interaction in working memory are such that, because dyslexic people have a weakness with low order processing in the phonological loop, when there is a heavy demand on speech and language, higher level processing such as executive functioning is disrupted (McLoughlin et al., 2002). This is consistent with neuroanatomic studies (Galaburda, 1999) and the neuropsychological perspective that understands dyslexia in terms of 'constraints in multi-level internal and external systems that interact in a bidirectional way' (Beringer, 2004: 91). It would explain why dyslexic people do report problems with some of the behavioural competencies described as features of executive functions. This is thought to be bidirectional in that if

the central executive is overburdened, lower level processing is less efficient. One of the phenomena reported by dyslexic people is ‘good days/ bad days’, the latter reflected in an exacerbation of memory and literacy difficulties (Freeman, 2003). An overload on either the phonological loop or the central executive might account for this. When there are ‘too many words’ to deal with it is hard to organise and plan written work. When there is too much planning and organisation to be done it is hard to find the words. That is, working memory is compromised by task loads and central executive resources have to be shared. This might also apply to some visual tasks (Smith-Spark et al., 2003).

Further, it has been suggested ‘working memory system processes appear to be involved in a host of mechanisms that may promote successful self-regulation. Specifically, ‘working memory may be involved in directing and maintaining attention to goal directed processing, in flexibly updating goal representations in accordance with changing states of the environment, and the inhibition of interfering thoughts and emotions, as well as the inhibition of prepotent behavioural tendencies’ (Hofmann et al., 2011: 212). Self-determination and control of one’s actions have been described as *the* adult hallmarks of normal human development, and ‘the salient feature of this cognitive and behavioural control is the capacity to direct one’s thinking and action towards achieving future goals’ (Wolf & Kaplan, 2008: 220). Working memory is thought to be fundamental to people’s everyday attempts at self-regulation. The tasks involved include self-awareness, self-monitoring, choice of goals and prioritising.

The working memory system’s role in executive functions has been of particular interest in understanding self-regulation. These have been described as ‘aspects of cognition that can be key contributors to self-regulation of behaviour’ (Blair & Ursache, 2011: 304). The concept of executive functions has developed to include its association with social, emotional and self-orientated processes and overall mental regulation (Wolf & Kaplan, 2008). Research has suggested a specific link with temporal processing, as well as time perception (Barkley, 2006). As with cognition the relationship between executive functions and self-regulation, as well as emotion, is thought to be bidirectional, operating in an interactive manner. One component of the working memory being inefficient will have an impact on the central executive and all its functions can be affected.

Explaining Positive Characteristics

It has been argued that the neurological organisation of a dyslexic person’s brain leads to them having stronger functioning in some areas (Galaburda, 1993; Davis, 1997; West, 1997; Stein, 2001), and that dyslexic people have a different ‘cognitive style’ (Morgan & Klein, 2000). Much of the evidence for this is based on anecdotes, as well as speculation about creative and gifted people, many living and some deceased. The latter include Einstein, Leonardo da Vinci and Antonio Gaudi (Wolf, M., 2008). This practice, because it can raise false expectations, is considered by some to be undesirable, as there is little evidence for such claims (Adelman & Adelman, 1987; Thomas, 2000; Kihl et al., 2000). There are many living actors, writers and artists who have been identified as dyslexic, and there are disproportionate numbers of dyslexic students in art colleges (Wolff &

Lundberg, 2002). There are also a disproportionate number of entrepreneurs who are dyslexic (Logan, 2009). Whether this reflects innate abilities or a reaction to experience is open to question, and there is a false logic in assuming that the success of scientists, artists, architects and entrepreneurs is attributable to them being dyslexic. Studies of successful entrepreneurs, for example, have identified factors such as a high need for achievement, a strong inner locus of control and an ability to delegate (Rauch & Frese, 2000; Logan, 2009).

There are some systematic studies that have explored the notion that dyslexic people have visual strengths but these have 'met with limited success' (Alexander-Passe, 2010: 3) and the results have often been contradictory. Shaywitz (1996) has written that dyslexia is 'an encapsulated deficit, often surrounded by significant strengths in reasoning, problem solving, concept formation, critical thinking and vocabulary, an unexpected weakness in a sea of strengths' (p. 104). She identified more activity in the right hemisphere of the brain amongst dyslexic readers, particularly in areas associated with visual processing. Likewise, Von Karolyi et al. (2003) noted increased right hemisphere functioning associated with rapid holistic inspection amongst dyslexics, concluding that they have superior global visual spatial processing ability. There is, therefore, some evidence for the holistic thinking, strengths in visualisation and creative thinking observed amongst and reported by dyslexic people. The right hemisphere has also been associated with empathy (Baron-Cohen, 2003).

In contrast, Everatt et al. (1999) established evidence of stronger creative abilities consistent with anecdotal reports, but were not able to attribute this to enhanced right hemisphere functioning. Winner et al. (2000) found little support for the view of dyslexia as a deficit associated with 'compensatory visual-spatial talents', and suggested that the disproportionate number of dyslexic people in jobs requiring good spatial skills might be the result of them having chosen an occupation by default. That is, they have been channelled into it because of their difficulties with written language. It is perhaps inevitable that they thrive on courses and in jobs where there are fewer demands on language-based activities. It has also been suggested that dyslexics might deliberately choose creative courses and occupations as a way of avoiding reading and writing (Alexander-Passe, 2006; Wolf & Lundberg, 2002).

Having reviewed a number of studies Bacon and Handley (2010) concluded that the evidence for enhanced visual spatial ability amongst dyslexics is equivocal, but pointed out that there is also little evidence for a visual spatial deficit. This is consistent with other studies (Brosnan et al., 2002). Bacon and Handley suggest that the difference might be the way in which dyslexic people deploy the abilities they have. The dynamics of the working memory system might, therefore, provide an explanation as to why it seems some dyslexic people make a success of careers in occupations that rely on good visual spatial skills. If they do not have a deficit in the visual spatial sketchpad, perhaps when they are able to rely more on visual imagery than on verbal or written language, there is no interference with executive functioning, making tasks such as planning and organisation less arduous, particularly if they employ visual strategies. This interpretation would explain why dyslexic people sometimes thrive in occupations that tap visual abilities. It can also explain why in general, dyslexic people can recognise faces but not recall names, are effective at finding their way about using landmarks rather than verbal directions and use

strategies such as mind mapping to good effect. Those who gravitate towards careers in art and design, even if it is because they find others too difficult, will be less disadvantaged as training courses will include portfolio work rather than written examinations.

In summary, if we understand the core issue in dyslexia to be a problem with a component of working memory, its nature is such that dyslexic people, especially during the adult years, are likely to experience problems with literacy and language tasks. As higher order processing interferes with lower order processing and vice versa, multi-tasking with words will be particularly problematic and this can have an impact on the following:

- Social communication – word finding and word order.
- Writing – especially organising ideas.
- Spelling – particularly in context.
- Reading – including speed and comprehension.
- Proofreading – especially one's own work.
- Maths – the procedures, including mental arithmetic.

Other behaviours that are likely to be undermined include:

- Goal setting;
- Coping with distractions;
- Self-regulation;
- Prioritisation;
- Organisation;
- Time management and estimation.

Not only should this provide a better understanding of the nature of dyslexia, but when it is interpreted in this way it allows the anticipation of what might be difficult in the future. It also provides a rationale for intervention and strategy development. A working memory model can explain the difficulties but also underpins the strategies it is assumed work for dyslexic people. In a review of the theoretical and empirical support for the use of graphic organisers which include charts, graphs, diagrams and mind maps Dexter (2010) concludes that they:

- Reduce the load on working memory.
- Tap visual spatial abilities.
- Demonstrate relationships without overloading working memory.
- Can serve as memory aids.
- Guide thinking that facilitates problem solving.

Specifically a working memory model can explain why people adopt strategies such as:

1. Preferring to try recognising faces rather than remember names.
2. Relying on landmarks rather than labels such as north and south, or left and right.

3. Word finding difficulties and problems with verbal fluency, which lead to saying the wrong thing, for example, 'an Indian winter' and 'let's not beat the bush around', are addressed through planning, preparation and practice.
4. In general, 'seeing what one has to do', rather than remembering through the use of low-tech aids such as whiteboards. The link between an intact visual spatial sketchpad has implications for career and course choice.
5. The 'good days, bad days' phenomenon can be explained as a result of the impact of a 'heavily loaded' central executive. This allows for planning the use of time in appropriate ways. Knowing that, on days when there are many demands on the behaviours influenced by executive functioning it will be very difficult to write, allows them to consciously decide to leave the report or essay to another day.
6. Relying on past experience to find suitable strategies for dealing with tasks.
7. Planning what one might say in a telephone conversation and having notes.
8. Finding quiet places in which to work to control distractions.
9. Using structure and routine to help with organisation.
10. Endeavouring to make skills automatic by analysing the task and mastering each aspect one at a time.
11. Rehearsal for examinations and presentations.

In subsequent chapters we describe the process of meta-cognition and its relevance to learning and working. Essentially, a working memory model provides a rationale for the development of meta-cognitive skills.

Explaining Affective Characteristics

At a common sense level the origins of affective characteristics are easy to understand; being put down, misunderstood and years of under-achievement do little to enhance confidence or promote positive self-esteem. People whose parents and teachers have held low expectations of them or who have jumped to obvious conclusions about the reasons for their under-performance will have low expectations and jump to obvious conclusions about themselves. They will believe what they have been told, even when this is inconsistent with their achievements. Dyslexics whose academic and occupational status indicate that they are far from idle will, for example, describe themselves as 'lazy'. There are dyslexic people who are 'victims of a poor education'; those whose difficulties were obvious but who received little in the way of support, even if they were identified as dyslexic. There are also 'victims of a good education'; those who have been taught well, worked hard and whose problems were less obvious and were attributed to factors such as attitude, and who are left wondering why they are less efficient in learning and work settings than they would like to be.

We don't know how many dyslexic people experience social and emotional problems but there is a burgeoning literature supporting the existence of affective characteristics such as stress (Miles, 2004), low confidence and self-esteem (Riddick et al., 1999;

Burden, 2008a, 2008b; Tanner, 2009; Humphrey, 2002; Alexander-Passe, 2006), anxiety (Nelson, 2011; Nalavany et al., 2011), and depression (Alexander-Passe, 2008). One of the strongest arguments for early identification and appropriate intervention is the mitigating effect on socio-emotional development (Shaywitz & Shaywitz, 2006; Nalavany et al., 2011).

Affective factors are no less important than the literacy difficulties experienced by dyslexic people, and are often more difficult to resolve. We reiterate that it can be easier to teach someone to read or find a way around it by using text to speech software than it is to improve their confidence. Even highly successful dyslexic people express doubts about their ability. Their confidence always remains fragile and setbacks can be enormous. Problems at a behavioural level cause embarrassment, leading to anxiety, lack of confidence and low self-esteem. There is still a stigma associated with literacy difficulties. Further, cognitive failure makes a person vulnerable to the effects of stress, rather than the other way around (Mahoney et al., 1998).

Although in the past models of working memory have mainly been advanced to understand and explain problems with learning and performance, Baddeley (2007) has added components to his original model, including the episodic buffer which facilitates access to long-term memory and binds together the other components. It is thought to be controlled by the central executive and assumed to play a role in episodic retrieval. Access to long-term memory, including positive and negative episodes, might therefore be impaired when the central executive is overloaded.

Baddeley has also added the hedonic detector, a system that is capable of picking up positive or negative associations from an object or representation within the episodic component of working memory. He has considered the relationship between working memory, stress and depression. The hedonic detector is part of an evaluation system, its function being to evaluate the environment, including past experiences and future plans. When these are negative the signal is negative, leading to rumination and a search for a solution. Baddeley has suggested that, if a solution is not apparent, depressive passivity might develop, and that the detector system will look for an internal explanation, 'leading to self-blame and retrieval of negative rather than positive self-schemata leading to further depression' (Baddeley, 2007: 292). This is consistent with the attribution theory described in Chapter 4. As with cognition the relationship between executive functions and emotion is thought to be bidirectional, operating in an interactive manner. An imbalance in the working memory system and accessing negative episodes might, therefore, put dyslexic people more at risk of experiencing depression.

The elaboration of working memory as a system responsible for much more than effective learning and performance implies that dyslexic people could also be more at risk of experiencing emotional problems, including stress, anxiety and depression, because of their cognitive makeup. This does not mean that past experience will be insignificant and, if we follow Baddeley's argument, dyslexic people are more likely to access negative episodes. Further, difficulties with affect are not part of the common understanding of dyslexia and are more likely to be attributable to attitude and application. Nevertheless, it seems that there might be intrinsic factors which make dyslexic people even more vulnerable to these.

A Working Definition

As described above a working memory model can provide an explanation for all the difficulties experienced by dyslexic people. It can also allow them to anticipate what might be difficult in future and guide them to the best solutions.

Tonnessen (1997) has suggested that proposed definitions of dyslexia should all be formulated and treated as hypotheses. In the first edition of this book we proposed the following definition:

Developmental dyslexia is a genetically inherited and neurologically determined inefficiency in working memory, the information processing system fundamental to learning and performance in conventional educational and work settings. It has a particular impact on verbal and written communication as well as organisation, time management, planning and adaptation to change.

The developments in the understanding of dyslexia over the past decade would suggest that this is still appropriate. The working memory explanation we have outlined here should facilitate the process by providing the ‘most understanding’, and a rationale for the development of skills and strategies, alternative solutions as well as adjustments. On the basis of an integration of the existing evidence it is the ‘loveliest’ and forms the basis for the recommendations described in the ensuing chapters.

Dyslexia and Other Syndromes

Specific learning difficulties are not necessarily unitary and there is considerable overlap. Portwood (2010) has suggested that this is the rule rather than the exception. This is sometimes inappropriately known as comorbidity. The preferred term should be co-occurrence as the overlap is at a behavioural rather than an aetiological level. Descriptions of all the hidden disabilities include at least some of those listed earlier. Nicolson and Fawcett’s (1999) observation that whatever one’s interest in human behaviour and performance, dyslexics will show interesting abnormalities in that behaviour could be applied to all those who have specific learning difficulties. Interventions designed to assist dyslexic people will have much in common with those directed to people with other specific learning difficulties, and many of the skills, compensations and accommodations outlined in subsequent chapters of this book will be relevant to all the syndromes. ‘The label’ sometimes gets in the way, and it important to adopt an idiographic approach, focusing on specific needs and solutions. At the same time, professionals must recognise that labels allow people to identify with and learn from others through their shared experience. Individual professionals will have a particular expertise, and will often interpret behaviour and the results of an assessment within that, being susceptible to the availability heuristic. That is, they will be more likely to prefer diagnoses they most often encounter (Groopman, 2007).

It is possible to be dyslexic and dyspraxic and have Attention Deficit Disorder. We do, however, need to be cautious about over ascribing labels, particularly on the basis of scant evidence. One is often sufficient if it leads to appropriate skill development and adjustments. Nevertheless, it is important to understand that observable behavioural characteristics are the result of different neurological and cognitive processing problems. The verbal communication difficulties experienced by someone who is dyslexic might appear to be similar to those manifested by someone who has Asperger's Syndrome, but if their origin is not the same the intervention might need to be different. A multi-sensory approach to learning and working is recommended for dyslexic people but some dyspraxic people find this leads to sensory overload. Outlined below are some brief descriptions of the key features of other hidden disabilities.

Dyspraxia

Dyspraxia is a very good example of an evolving concept. Otherwise known as Developmental Coordination Disorder the criteria for diagnosis in schemata such as DSM IV and the revised DSM 5 focus on motor performance manifested as coordination problems, poor balance, clumsiness, dropping or bumping into things. Traditionally, it has been understood as being characterised by problems with the planning, coordination and execution of tasks involving visual-spatial and motor skills, but has come to mean much more to practitioners and advocacy groups.

Dyspraxia is less well understood at a neurological and cognitive level than is the case for dyslexia. It is thought to be heritable and neurological research has suggested that there is poor connectivity amongst neurones in brain regions associated with coordination and planning. Although originally thought of as a childhood disorder there is now greater recognition that it persists into adulthood (Kirby et al., 2008; Kirby et al., 2011), having an impact on academic and work performance, as well as daily living skills such as driving (Cousins & Smyth, 2003; Kirby et al., 2011). Dyspraxic individuals report difficulties with organisation, time estimation and time management, interpreted as evidence of a problem with executive functions (Kirby et al., 2011), although the question of whether there is an intrinsic deficit in frontal lobe functions has not been addressed.

To account for the latter a useful distinction has been drawn between Ideational and Ideomotor dyspraxia (Benich, 2010). Ideational relates to the conceptual organisation of actions and can affect planning, organisation, including personal organisation, time management and estimation, as well as the organisation of ideas both verbally and in writing. Ideational dyspraxia is likely to be reflected by poor performance in tests involving planning and spatial ability, not necessarily in tests involving motor skills.

Ideomotor dyspraxia relates to the execution of actions, and can have an impact on motor skills, both gross and fine, reflected in clumsiness and skills such as writing. The two can overlap but both will have a considerable impact on performance in educational settings. Ideomotor dyspraxia is likely to be reflected in slow and untidy handwriting, as well as poor performance on tests involving motor speed and coordination.

Dyscalculia

Dyscalculia has been described as an inability to conceptualise numbers, number relationships and the outcome of numerical operations. Diagnostic criteria focus on ‘difficulties in production or comprehension of quantities, numerical symbols, or basic arithmetic operations that are not consistent with the person’s chronological age, educational opportunities, or intellectual abilities . . . that significantly interferes with academic achievement or activities of daily living that require these numerical skills’ (DSM IV).

There are many reasons as to why people find maths difficult. Chinn (2009) lists some of them as being problems with:

- mathematical memory;
- speed of working;
- reading and writing;
- thinking skills;
- short-term and working memory.

It should be clear from this list that it can be difficult to distinguish between the mathematical problems experienced by those who have dyscalculia and those who have dyslexia. As we have seen earlier dyslexic people will have trouble with the procedural aspects of maths, particularly those which are dependent upon working memory and, when maths is presented in written problem form their performance will be further impaired by literacy difficulties, particularly in reading comprehension.

Again, dyscalculia is thought to be heritable and neurological investigations using fMRI techniques have suggested that the fundamental cause of dyscalculia can be linked to the parietal lobe (Kadosh et al., 2007). It has been described as a lack of numerosity or a feeling for numbers (Butterworth, 1999), and Chinn (2006) suggests that a lack of understanding of maths is the key characteristic. Price (2010) draws a useful distinction between ‘dyslexia with mathematical difficulties’ and ‘dyscalculia’. She suggests that individuals who are dyscalculic only have trouble with maths, not with literacy. In adulthood, especially in the workplace, Price suggests that this will have an impact on:

- mental arithmetic and estimation
- sequences in mathematical operations
- making quotations for jobs
- accurate counting or calculating
- difficulty dealing with change when shopping

(Price, 2010: 97)

Distinguishing between those who have genuine dyscalculia and those who have mathematical difficulties because they are dyslexic is essential in determining appropriate

intervention. A 'lack of feeling for numbers' will not be addressed by improved reading strategies, memory techniques or the use of an electronic calculator.

Attention Deficit Disorder/Attention Deficit Hyperactivity Disorder

Diagnostic Criteria for Attention Disorders focus on inattention, hyperactivity and impulsivity. The former includes behaviours such as attention to detail, sustaining attention, not appearing to listen and follow through on instructions, as well as difficulty organizing tasks and activities. The latter includes restlessness, talking excessively, interrupting others and acting without thinking.

As with the other hidden disabilities it is thought to be genetic in origin and neurological studies have shown that, at a structural level, people with ADD/ADHD manifest differences in the prefrontal cortex which relates to attention and the caudate nucleus which relates to self-control. These have been reflected in fMRI studies showing different activation levels in a number of cortical areas. Klingberg (2009) wrote that 'most scientists agree that there is no one cause of ADHD – no one gene, no one neurotransmitter, no one brain area' (p. 108).

The overlap with other syndromes is best highlighted by the fact that some authors have suggested that many of the behavioural problems associated with ADD/ADHD can be attributed to deficiencies in working memory (Barkley, 1997). It would, however, appear that it is the central executive component that is impaired as adults with the syndrome have been shown not to have significant deficits in phonological processing. This is an important distinction as it is because of the latter and the impact on the central executive that dyslexic people have problems with attention, but they are task specific. Further, like dyslexic people those with ADD/ADHD experience problems with self-regulation, planning and organisation. Nevertheless, these are thought to be directly related to executive functioning deficits (Barkley, 2011).

Asperger's Syndrome

There is some debate as to whether disorders on the autistic spectrum such as Asperger's Syndrome should be included under the heading of specific learning difficulties. It is undoubtedly a disability that impairs social interaction, having an impact on eye contact, facial expression and gestures. Some people with Asperger's Syndrome also have verbal communication problems, interpreting and using language literally.

The syndrome is thought to be genetic in origin and that a prenatal abnormal migration of cells affects the structure and connectivity of the brain. This has an impact on the development of the mirror neurone system which allows for imitation. Cognitive theories have explained it in terms of poor theory of mind and empathising-systematising theory (Baron-Cohen, 2003).

It can be easy to misinterpret some of the characteristics of dyslexia as being due to Asperger's Syndrome. Dyslexic people, for example, sometimes avoid eye contact

but as a way of controlling information input. Pragmatic language impairment is often associated with Asperger's Syndrome, but this has also been correlated with dyslexia (Griffiths, 2007).

Visual Stress

There are also syndromes which are not usually regarded as specific cognitive difficulties but can affect skills such as reading. One example is the visual difficulties experienced by some people when reading (Wilkins, 1995), given much publicity as one of the solutions is the use of coloured glasses or overlays. It has been known by many names, including visual discomfort, scotopic sensitivity and Meares-Irlen Syndrome. Visual stress is the current preferred term, and it is thought to lead to distortions such as blurring, eyestrain and headaches. It has received both good and bad press, coloured lenses having been hailed as a cure for dyslexia but such claims have also undermined its credibility. It has, however, been investigated systematically in recent years, but results are contradictory. Some studies suggest that coloured lenses improve reading (Evans, 2001; Wilkins, 2002; Ray et al., 2005), others have indicated that they do not (Skottun & Skoyles, 2007). At an anecdotal level they do seem to make a difference to some people. Nevertheless, although more prevalent amongst dyslexic people (Kriss & Evans, 2005), visual stress should not be confused with dyslexia, as it is only concerned with reading, and can occur amongst people who do not manifest other characteristics such as poor spelling.

Degrees of Dyslexia

A common question asked by dyslexic people is, 'How dyslexic am I?'. In the Rose Report it is suggested that dyslexia should be thought of as a continuum, not a distinct category, and that there are no clear cut off points. This is not, however, as straightforward as it may seem despite the existence of much used schemata for ratings of 'degrees' (see Turner, 1997). Do we consider the difficulties with literacy or the processing problem? Further, adults only need the literacy skills that they need. Someone could have fairly basic literacy skills, but it does not present them with a significant problem in terms of their daily and working lives. Another person might have few problems with literacy and processing, but be struggling to cope with the considerable demands upon them. If we understand dyslexia at a cognitive level, the 'degree' should be based on the processing problem not the literacy difficulty, but we should really consider the extent of the disadvantage, especially as transitions in life are particularly challenging for dyslexic people. Adults 'must succeed in a range of new, and often more complex, settings and with new sets of criteria' (Price & Patton, 2001: 12). The emphasis in disability legislation is on day to day effects, but even then it is sometimes because people have been successful that they seek advice. They gain promotion, for example, and suddenly there are increased demands for which they need to learn new skills and strategies quickly. Changes in circumstances

at work can also have this effect. One man, for example, had resolved many of his difficulties with written expression by making good use of technological aids, such as a word processor. A new director of the firm he worked for was very keen on the use of information technology; inter- and intra-office communication came through email. The system in his office did not allow him to spell check documents easily, and despite it being good practice as most of us read what we think we have written, he was not allowed to delegate proof reading. He was also used to being able to read using a highlighter pen. Technology had provided him with solutions but had also created new difficulties. His dyslexia had not been a problem until it became a problem!

There are people who have been told they can't be dyslexic, or are not dyslexic enough to be covered by legislation, because they have been successful at degree level, but educational and professional achievement does not tell the whole story. The notion of degrees of dyslexia is a misnomer, as the extent to which being dyslexic affects a person is the result of a complex interaction between cognitive, behavioural and affective characteristics, as well as cultural factors. For some people dyslexia is just a *difference*; they learn to work with it and find solutions, although they sometimes hide the extent of their difficulties by doing so.

Being dyslexic can certainly be a *disadvantage*, particularly in situations when there is a heavy demand on the tasks that tap their cognitive inefficiency, but these can be accommodated and the purpose of the latter is to lessen the disadvantage. Sometimes, however, the problems experienced are such that an individual is unable to perform at an expected level without considerable adjustment being made and without a high level of support.

We work within the parameters of current policy and legislation and, if people are to be afforded equal opportunities and equity through this, dyslexia has to be regarded as a *disability*.

The Prevalence of Dyslexia

Estimates of the prevalence of dyslexia have varied enormously over the years, and are usually based on the child population. In a recent report it was estimated that dyslexia may significantly affect between 4 to 8 per cent of children (Snowling, 2008: cited in Rose, 2009). As people do not 'grow out of it', even if we compromise on a figure of around 5 per cent, it can be concluded that a significant minority of the adult population is affected to some extent.

For many years it was believed that dyslexia was more prevalent amongst males than females, and this is still advanced by the authors of some review studies (Liederman et al., 2005), but has been contradicted by others (Siegel & Smythe, 2005). Estimates of prevalence are often based on referred child samples and Pennington (2009) has argued that more boys are referred for assessment because they also manifest comorbid externalising disorders such as ADHD so their behaviour causes concern, whereas girls are more likely to internalise feelings and withdraw rather than act out. Further, gender differences have been noted during the early school years, but have been found to be

less evident in later years. It has also been suggested that fewer females are identified in childhood because they tend more often than men to compensate as a result of essential differences in the neurological processing of language, so that less observable difficulties in areas such as reading comprehension are not manifested until later in life (Shaywitz, 1996).

Summary

1. The study of and provision for dyslexic adults presents a number of challenges, including issues surrounding definition and terminology.
2. The characteristics manifested by dyslexics during the adult years are such that existing attempts to explain their difficulties have been too narrow to provide a complete understanding.
3. Neurological and cognitive studies point to a phonological deficit as being the primary cause of reading problems but, when phonological processing is interpreted as being a component of working memory, they also suggest that patterns of interaction within that system will have an impact on broader areas of functioning, both positive and negative, including affect. This can help dyslexic people understand their current difficulties, predict what might be difficult in the future, as well as see the relevance of the development of specific skills and strategies.
4. Dyslexia can overlap with other hidden disabilities, and interventions will have something in common. It is, however, important to adopt an idiographic approach, based on an understanding of the aetiology of different syndromes to ensure that skills, strategies and accommodations are the most effective.
5. Determining the impact of dyslexia in the adult years requires consideration of a complex interaction between neurological, cognitive, behavioural and affective factors, as well as the demands on the individual. The concept of degrees of dyslexia is a misnomer.