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Adult Dyslexia

2.1   Introduction

The perspective taken in this book is that dyslexia in adults develops from the same core elements that also characterise dyslexia in children (see Chapter 1). However, in addition to these, experiential differences lead to a range of consequences that are likely to differ across individuals and impact on performance to varying degrees based on the context in which an individual is learning and working. The core elements are still difficulties with certain aspects of reading and writing, along with some related weaknesses in certain aspects of language, and these can impact on any job where good literacy skills are essential as well as other areas of performance. However, experiential effects may help to overcome some of these difficulties (good teaching/intervention support or the development of effective compensatory strategies) and/or lead to additional difficulties (such as negative emotional consequences that might mean high

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levels of anxiety, creating problems in many facets of day-to-day life). These also interact with the type of job (or educational course) undertaken by the adult dyslexic.

In some cases, the effects of dyslexia, and these individual dyslexia-related consequences, are minimal owing to the nature of the work required. In other situations, both may impact on performance. For some, the impact is negative; for example, making it difficult to progress in a chosen profession owing to the need to take written assessments in order to be promoted, or having low self-esteem meaning that an individual never puts themselves up for promotion. Alternatively, for some the impact may be positive; for example, when an individual has had to find creative solutions to dyslexia-related barriers, leading to improving creativity-related skills that can be a bonus in certain kinds of employment. Hence, advice for adults with dyslexia should be individualised.

Given that it may be difficult for an advisor to cover all the potential changes that work-life may bring, the focus in this book is the development of self-understanding and the use of metacognitive strategies. These are covered in Part II, along with examples from personal experiences of dyslexic individuals themselves. Before we look at these ideas, though, this chapter focuses on explaining the framework of adult dyslexia envisaged in the book so that the ideas presented within Part II can be interpreted through our framework. Furthermore, although self-awareness is core to the argument presented, support from external sources can also be helpful, such as the challenges and success stories of others. Equally, support from external sources may come via an assessment that should provide a basis on which self-understanding can develop. Therefore, we discuss assessment further, with a focus on what we feel would be most useful in these assessments and for the dyslexic adult to take from assessment reports. This chapter, therefore, has two subsections,

one discussing the framework we have for thinking about adult dys-lexia, the second focusing on assessment practices and how these might help with self-understanding.

2.2   Framework of Adult Dyslexia

There have been several frameworks aimed at developing an under-standing of dyslexia in adults. One of the most useful (in the view of the authors of this book) is provided by Frith (1999). This was devel-oped to help understand key features of a range of learning diffi-culties, and to allow theories about these learning difficulties to be judged against the framework. Figure 2.1 presents our framework based on the original proposed by Frith (1999). In it, the middle col-umn is that which most researchers in the field of dyslexia would focus on, and it is the closest part of the figure to Frith's original idea. The middle column is a simple representation of the view that dys-lexia is related to difficulties in phonological processing. As discussed in Chapter 1, this theory proposes that dyslexia is primarily based on deficits in processing sounds within words (the phonological process-ing deficit in the centre of the figure). This is based on a multitude of research evidence, along with some consistent experiences reported by practitioners (see discussions in Gillon, 2018; Snowling, 2000).

Phonological processing is a theorised cognitive process. It is something that we cannot 'see' directly. We assume/infer that the brain performs such processes based on the behaviours that we see when individuals perform language tasks that require the pro-cessing of phonological information. For example, if we ask what the first sound in 'book' is, most say a sound that is represented by 'b'. Similarly, if asked what is left when you take the 'b' sound from 'bad', most individuals say something like 'add'. These sort of tasks

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environment	brain/biology	consequences
Learning experiences → ↘	Genetic factors : multiple chromosomes ↓ Brain differences: left hemisphere areas	Emotional & Behavioral reactions & Self-concept →
English alphabet →	**cognition** ↓ Phonological processing deficit ↙ Poor understanding of grapheme-phoneme correspondences	Impacts on certain aspects of Language, Memory & Cognition →
↗ Support & Intervention →	**behavior** ↓ Difficulty learning to read and write Poor scores in phonological tasks	Access to learning materials ↓ Qualifications & Opportunities →

Figure 2.1 Framework for understanding adult dyslexia

suggests that we can process sounds within words – if we could not process such sounds, then we would not be able to do these tasks. These tasks can also show differences between those with dyslexia and those without. Such differences suggest that those with dyslexia struggle with many such phonological tasks. Hence, measures of phonological processing are often included in assessment procedures aimed at identifying dyslexia.

Additionally, there is biological evidence consistent with the concept of phonological processing, as well as its association with dyslexia. When we perform phonological tasks, differences occur in activations in certain parts of the brain, and these activations can be found to vary between those with dyslexia and those without (see discussions in Shaywitz & Shaywitz, 2020). Similarly, the reason why these phonological processes impact on reading an alphabet

is because they play a key role in linking letters and sounds (as discussed in Chapter 1), which may also be related to variations in activations within the brain. Hence, these cognitive level features related to dyslexia have a biological basis. As suggested in the middle column of Figure 2.1, there is also some evidence that characteristics associated with dyslexia may be based on certain combinations of genes, though the precise genetic combinations are complex (e.g., see Thompson et al., 2015). Although there are still some aspects that we do not understand, the phonological explanation of dyslexia has a biological basis, it fits with predictions about cognitive processes, and there are links with behavioural outcomes of dyslexia, in terms of reading and writing difficulties, as well as poor performance in phonological tasks. Hence, the middle column of Figure 2.1 provides a basis to understand how dyslexia happens.

Despite the middle column of Figure 2.1 being the key focus for most researchers, the left-hand 'environment' column of Frith's framework may be even more important for understanding how we can influence the impact of dyslexia. This shows that things can change based on what the individual is experiencing and the efforts made by educationalists to support the learning of those with dyslexia. If support procedures work, then the impact of dyslexia on day-to-day experiences should be lessened. These environmental experiences impact all three of the elements in the middle column. Experience changes how the brain processes information (again, see discussions in Shaywitz & Shaywitz, 2020), and increased practice forms more durable links between parts of the brain. Practice also impacts on the cognitive processes that are dominant when performing a task. A child taught successful decoding strategies is more likely to use those strategies and practise them so that they become more efficient. Similarly, although support and intervention are

usually targeted at behaviours (improving reading performance, for example), a positive and motivating intervention has the potential to impact on the way we think about something, and so can impact on cognition and influence brain activity. We know that improving literacy can enhance language processes, so interventions that improve reading development may well support other areas of development during childhood. Hence, these are interactive systems.

Other environmental factors can influence outcomes. As stated earlier in this chapter and in Chapter 1, the alphabetic link between letters (or graphemes) and sounds (or phonemes) is not the only type of link between a writing system and a spoken language. If decoding graphemes into phonemes is not the main way to connect written text with spoken language, then other levels of phonological processing may become more developed. Hence, the precise relationship between language and reading/writing can vary to some extent, but the links need to be there for text understanding to be supported. Also as stated before, this association between language and reading/writing occurs in both directions, so that language processes support reading development, and reading practice can improve language skills.

Furthermore, given that language can play a role in many things that humans do, it may also influence how we think about things and/ or how we remember things. For example, one theorised memory system is called working memory, which is a system that has been discussed in relation to dyslexia for many years (e.g., McLoughlin et al., 2002), and one which may help us understand some of the more consequential difficulties that may derive from a lifetime of dyslexia.

Although there are differing models of working memory, the main feature is the involvement in the processing of information into, and from, longer term memory systems. This requires making sense of the information for storage to be logical and efficient. For example,

if information is meaningful, then storage of the meaning would be useful. In terms of written text, determining meaning typically requires the integration of already known information with details in the text, as well as connecting different parts of text. So it would be useful to store pieces of textual information while additional information is being processed from the text and while information is obtained from background knowledge about the subject of the text. Theories typically propose that this is what working memory does. It has short-term storage roles (language information might be stored in a working memory phonological system, for example) while integration with additional information is happening (which the executive system of working memory is hypothesised to support). Hence, working memory has been proposed to play a part in language development – linking new words with past words and meanings, which is a key function of a developing vocabulary system. It has also been argued to be involved in making inferences from text; that is, connecting different parts of text that provide meaning, inferring the meaning of a word from the text around the word, and going beyond the text to determine meaning via general knowledge stored in long-term memory.

Some elements of working memory are considered fairly fixed – that is, the amount of information that can be stored in working memory is limited both in terms of the amount that can be stored and the time it can be retained. However, strategies can be learnt that may support the way that working memory is hypothesised to process information. For example, chunking information can help: remembering 'two, seven, five, nine, one, eight, three, six' in order can be difficult, but 'twenty-seven, fifty-nine, eighteen, thirty-six' is easier. Similarly, asking questions about text while reading can lead to inferencing and integration processing; and using source materials efficiently without distraction can overcome weaknesses

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in vocabulary- or language-related long-term memory. These need to be practised to be efficient, though. Hence, many of the features associated with working memory can provide the basis for understanding the consequences that may occur owing to lack of reading practice and weaknesses in certain elements of language processing and storage.

Therefore, in the shaded consequences column of Figure 2.1, we have included the potential for consequences on a range of factors. These include the emotional, self-concept (self-esteem or self-efficacy) and behavioural factors that may be influenced by our personality as well as our experiences: as discussed earlier, difficulties with learning may have a negative impact on some, whereas others are able to shrug them off or even use them as a reason to try harder. They also include societal success-related outcomes in terms of good educational qualifications and job opportunities (again discussed in Chapter 1). The level of dyslexia (biological and cognitive) and the support provided (environmental or experiential) both influence such educational, and prospective employment, outcomes. However, we have also included a box to indicate that both the middle and left-hand columns can also impact on the development of language and memory, and hence thinking processes. These can also impact on elements of success. However, they need not be all negative. Phonological-related problems with storing information in working memory create challenges, but learning strategies to reduce these challenges should lead to self-knowledge and a set of skills that can be valuable in many contexts, including work environments: if you are the one who can think around a challenge, how much more valuable you will be as a colleague in a modern workplace.

Clearly, though, self-understanding and the learning of what we refer to as metacognitive strategies is an important part of the right-hand shaded column of Figure 2.1 being more positive than negative.

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In Part II, we look at self-understanding and strategy use further. In the second part of this chapter, though, we consider another source of self-awareness that can be developed via a dyslexia assessment. The procedures and tasks used in such assessments should provide further information that can be useful in self-understanding, and lead to an awareness of areas of strength and weakness.

2.3   Assessment of Adults with Dyslexia

The purpose of an assessment for dyslexia is both to determine if the individual has dyslexia or not, and to provide information on which to make recommendations for support. In the case of children, this is mainly to provide support at school, such as in an education plan or an intervention programme targeting reading. For an adult, support in tertiary or higher education may be the purpose, and may involve recommendations about accommodations in class or during assignments, such as providing materials in computer-format for using text-to-speech software or providing extra time in examinations. Finally, the aim may be to provide understanding and hence support within a work context – the main focus of subsequent chapters. It could also simply be for awareness; that the identification of dyslexia explains something important to the adult. This could explain why they have struggled with some elements of day-to-day activities in the past, or why their school-life was not as successful or enjoyable as it was for others.

Dyslexia in children is usually determined via the assessment of reading and writing (often spelling), along with measures that may inform the assessor about the cause of the reading/writing difficulty (such as phonological processing). Such assessment procedures are often also used with older individuals (those over sixteen years of age). However, one difficulty faced by those assessing dyslexia in adults is

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that most tests of literacy have been developed for those younger than sixteen and for those in compulsory education contexts where levels of expected literacy skills can be determined against a curriculum. There are assessment tools for older individuals (e.g., see Brooks et al., 2016; Warmington et al., 2013), but there are additional challenges with assessing older individuals. For example, an adult may have experienced many years of additional difficulties that are associated with dyslexia, such as emotional consequences that can stem from reading/writing difficulties. This may mean that poor performance on assessment measures may be more because of negative emotion related to being tested, rather than the dyslexia itself. Furthermore, the adult may develop strategies for reducing the effects of their dyslexia – compensatory strategies such as slowing down reading to focus on supporting understanding. These may mask difficulties and lead to conclusions that reading comprehension is not a problem. However, such conclusions may be over-simplistic if such compensatory strategies are not taken into account. For example, a compensatory strategy may work under some circumstances and not others. Unless the assessment process considers these alternatives, then the difficulties may not be identified. Therefore, procedures for assessing dyslexia in adults should be qualitatively different from those used in schools to assess children. Both the range of assessment tools and the aims of the assessment need to be considered carefully. Reports following assessment also need to be detailed appropriately for others to understand the assessment process and its recommendations and be relevant regarding the context in which the person is working.

In the following pages, we look at some of these issues. Many follow on from the ideas discussed in Chapter 1, where we discuss the four key elements that we see as associated with dyslexia, and the first part of this chapter, where we discuss an overview of dyslexia in adulthood. These features or characteristics of adult dyslexia are the starting point

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to consider how to identify it and the sort of challenges and solutions we may need to consider when implementing adult dyslexia assessment procedures. Note that the following comprises the views of the authors based on our current understanding. There are alternative positions within the field, and hence not all assessors will consider the points here as important. These alternative positions often focus on differing causal theories of dyslexia that may be accepted by different practitioners: for example, if a practitioner believes dyslexia is caused by visual processing problems associated with colour, then this may be the focus of their assessment practice. The focus in this book is based on research and practice involving adults with dyslexia, and takes as a starting point the view that dyslexia can be subsumed into the four key elements that we discuss in Chapter 1.

The first element proposes that accurate and/or fluent reading and writing/spelling develop incompletely or with great difficulty. Therefore, we need to assess a range of reading and writing skills in order to understand the challenges facing the individual and in order to identify, and target, effective support. As an example, the Adult Reading Test (Brooks et al., 2016) assesses reading accuracy, speed, and comprehension while reading aloud, and then also assesses reading speed and comprehension during silent reading to give a picture of the range of skills associated with the adult's current level of reading performance. These individual elements of reading are all compared with expected levels of performance based on the average and range of performance produced by a large number of adults within further and higher educational contexts (such as those retaking school-level examinations, and those studying for degree-level qualifications).

The second element proposes that challenges are persistent despite access to effective learning opportunities. This means that an assessor needs to understand aspects of the individual's past learning experiences. This includes information on any past support

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or intervention that the individual has experienced and how successful these may have been. It may also consider how successful the individual felt they were in different areas of the curriculum: feelings of success can be as important as actual educational qualifications, though both should be considered. If the individual is from another educational system than the assessor (e.g., as a child, they were educated in China but they are being assessed as an adult in the UK), then the assessor may need to know more about the education systems experienced to have a better picture of the challenges experienced by, and support provided to, the individual in the past.

A further element that we have discussed as associated with dyslexia proposes deficits in processing certain aspects of language. Given this, we would expect assessments of spoken language in addition to assessments of written language. Most adults with dyslexia struggle with phonological tasks to some extent compared with those without dyslexia, though the tasks used to assess adults need to be more complex than those developed for children: for example, removing sounds from the middle of a word is harder than from the beginning or end – and reducing the time allowed to complete a phonological task can also test the efficiency of phonological processes developed into adulthood. If we accept that phonological deficits are the likely cause of the primary difficulties faced by dyslexics when learning to read/write, then identification through assessment of such deficits would be sensible. This does not mean that reading and writing difficulties are *not* caused by other things (poor educational experience, psychological problems, etc.), but many assessors take the most likely cause into consideration as part of their assessment procedures.

This link with language processes may also help us to identify additional areas where difficulties may be experienced. As discussed earlier, the reciprocal relationship between literacy and language means that processing words at the level of the phoneme (the basic

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unit of sound – 'cat' has three phonemes, for example) is supported by reading acquisition, and that vocabulary growth can be supported by reading experience. Hence, an assessor often uses a range of language tasks, from phonological to vocabulary to verbal reasoning skills. Each provides a picture on how challenges and experiences related to dyslexia may have impacted on language development, and hence increase awareness and provide clues to better solutions.

At least initially, literacy difficulties are unexpected in relation to typical development in non-literacy areas. Hence, a child with dyslexia can still excel in other areas of a school curriculum. However, the central role of literacy in most areas of education means that impacts on other areas of education may occur unless appropriate intervention or accommodation is implemented. Again, some interview about past learning experiences may be warranted. However, this may go further in the case of an adult and involve assessment of other areas of processing. The previous element suggested the need to assess language functioning. However, aspects of word processing (verbal or written) can also support memory functions, either in terms of the way language is stored efficiently or in the systems that working memory can rely on when processing language-related information.

An assessor, therefore, may consider a range of skills to see how these have developed. What these additional areas of assessment are often depends on the perspective taken by the assessor (what they see as the cause and consequences of dyslexia) and the context of the assessment: if in an educational context, then a focus on processes related to study skills may be important; if in an employment context, then the requirements of the job may influence the assessor's procedures.

In terms of adult assessments, this may involve measures from the Wechsler Adult Intelligence Scale (WAIS; see the fourth edition, the latest when writing this book: www.pearsonassessments.com/store/usassessments/en/Store/Professional-Assessments/Cognition-%26-Neuro/

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Wechsler-Adult-Intelligence-Scale-%7C-Fourth-Edition/p/100000392 .html). This reference provides general information on the tests, if of interest. Note, though, that these tests are what are called 'closed' tests, so they can only be accessed by someone with the appropriate qualifications required to use the tests. The actual tests are therefore not available at the link, just general information about them.

These WAIS measures provide information on verbal ability (measures of vocabulary and verbal reasoning) and non-verbal ability (such as building three-dimensional shapes based on a two-dimension plan – sometimes referred to as block design). They also provide information on memory, such as in tests of general knowledge and measures of working memory processes. Some measures are accuracy based, but others require the completion of tasks as quickly as possible, which can give an indication of speeded processing levels. This may be the most familiar scale for most of those assessed in the UK, but there are alternatives, such as the Woodcock-Johnson scales (for details, see www .riversideinsights.com/woodcock_johnson_iv) or the Stanford-Binet scales (for information, see https://stanfordbinettest.com/ all-about-stanford-binet-test/what-does-stanford-binet-test-measure). These alternatives are likely familiar in different parts of the world, with their choice by assessors often depending on where they have been standardised (i.e., a scale that has been standardised in the UK may not have been in another part of the world, whereas the Stanford-Binet scale may have been) or the training available to assessors (training on one scale may be available within a country, but not on another). Each of these scales covers similar skills or processes, though the precise measure may vary; for example, all have measures of verbal and non-verbal processing. Hence, the points outlined here should be relevant to assessments using any of these batteries.

2.3.1 Reading and Writing Skills

Most assessments involve measures of reading and writing. When assessing a child in the early period of learning, this likely focuses on word-level reading and decoding, along with spelling as the word-level feature of writing. However, the older the individual, the more likely that these sort of assessments may be less dependable (owing to learning experience and compensatory strategies) and the more likely they will not be seen as useful by the individual being assessed. This is not something 'new' about adult dyslexia – it has been discussed for thirty or more years. For example, Miles (1993) suggests that reading ability may not be as accurate an indicator of dyslexia in an adult as spelling performance. Consequently, poor spelling, in contrast to reading difficulties, may more easily identify adult dyslexia. This does not mean that some dyslexic adults will not continue to show poor word reading accuracy; it is just that not all will. The skill of accurate single word reading may have been slow to develop, but it may show good levels compared with those shown by average non-dyslexics because of the effort of the individual with dyslexia or the support provided during childhood. Spelling can be more challenging a skill, and so it may be slower to develop without extensive practice or intervention. Hence, assessments of spelling may be as important as reading accuracy when dealing with adults.

Additionally, the imperfect correlation between isolated word reading and the skills required to understand written text means that some individuals with good single word reading skills may struggle with text comprehension (see discussions of why this might happen in Cain, 2010, and Cornoldi & Oakhill, 1996). This may mean that poor reading can be classified based on word-level versus comprehension level differences: some will show word reading difficulties, whereas others will show text comprehension weaknesses

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(see Sleeman et al., 2022). Consistent with this partial dissociation, adult dyslexics can show single-word reading performance comparable with their non-dyslexic peers but still struggle when required to comprehend text. In dyslexia, this dissociation between good word reading and poor text comprehension may be best explained by a lack of text reading practice or teaching emphasising word decoding without extending this to text reading. However, these explanations mean that any effects of dyslexia on reading comprehension are not inevitable. Some of those with a history of dyslexia may show fairly good levels of performance on measures of reading comprehension (see Brooks et al., 2016), but still struggle with word reading and spelling.

A further issue may be the type of reading comprehension task, which can influence whether those with dyslexia show worse performance than their peers. Limiting the time allowed to read and comprehend text can have a major effect on adult students with dyslexia. It is only when extra time is allowed, or reading time is self-determined, that difference between dyslexic and non-dyslexics disappears (see discussions in Fidler & Everatt, 2012; Jackson & Doelinger, 2002; Lesaux et al., 2006). This is one of the arguments for the use of extra time in assignments/examinations, and it has been identified as a strategy by many dyslexics who show good reading comprehension scores when allowed the time to use strategies. Often the reported strategy is to re-read a text several times in order to work out the gist of the text, which can then be used to fill in any gaps in word recognition during re-reading.

Furthermore, some dyslexics may struggle with factual questions in a text (the name of someone or a date) but show good levels of performance on inference questions (working out information not explicitly stated in the text), whereas others may show the opposite disparity in performance (consider Fidler & Everatt, 2012, versus Simmons & Singleton, 2000). Consistent with the argument

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presented in this book, the reasons for these differences may be due to the experiences of the adult, as well as their areas of strength and weakness. Those who work out the re-reading and deriving the gist strategy may develop good inferring skills over time, whereas others may use memorisation strategies to support recall of key terms in a text. Equally, given that inference making has been linked to working memory processes (see discussions in Cain, 2010), those with weaker working memory may show lower levels of use of the inferring gist strategy. Similarly, those with good long-term memories may be able to store factual information from text better than those with less reliable long-term memory processes.

Therefore, an assessment may include a range of literacy measures in order to determine whether there are continued difficulties with reading and writing, consistent with dyslexia, and also to determine what aspects of literacy are still showing weaknesses and where there are areas of reasonable development of skills. This helps with recommendations for accommodations, as well as providing a basis for best support practices.

2.3.2   Educational History or the Background to Learning

The second element suggests that assessments include discussion of the history of difficulties and learning experiences. The adult's own description of their challenges during literacy acquisition may indicate the types of reading/writing problems that the individual may have experienced and give clues to current needs. Equally, this may highlight strategies that they have used to support achievement or avoid failure. Again, these give the assessor an idea of what may be useful and what might have to be overcome prior to learning being successful. Consistent with the first element, as the individual gets

older, a wider range of literacy-related skills may be impacted, hence assessments looking at literacy beyond the word level are useful. This needs to be taken into account in support procedures. A basic phonological decoding intervention may not be useful, or appealing, for many adults. Few adults will want to practise isolated word reading, but interventions that embed decoding strategies within procedures that can be shown to benefit comprehension should increase the chance that an adult will practise and use such strategies.

Asking adults about their educational background and experiences has formed an important component of work in the field of dyslexia for some time. Interviews can be highly informal and personal in terms of the questions asked. However, more formal questionnaires have also been developed, primarily with adults in mind. For example, a questionnaire could be distributed to adult students entering a higher education course in order to determine the likelihood that an individual student may experience problems related to dyslexia. The same could be done within a workforce; though this sort of questionnaire distribution is very rare. Such dyslexia-related questionnaires might be best referred to as a screening tool. They are likely to give relatively simple indications of the risk of dyslexia, with a higher risk meaning that further assessment may be advised. For example, Snowling et al. (2012) has developed an adult questionnaire that asks questions about levels of reading difficulties experienced by an individual. This questionnaire was developed in order to assess the potential level of family-related incidence of literacy learning problems (see also van Bergen et al., 2014). Other examples include the checklist developed by Smythe and Everatt (2009), which comprises questions related to dyslexia rather than specifically asking about reading difficulties in the past (see also Vinegrad, 1994). For example, some questions are related to reading (such as 'Do you confuse visually similar words when reading (e.g. tan, ton)?' and 'How easy do

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you find it to sound out words? (e.g. el-e-phant)'). Others focus more on language (e.g., 'Do you confuse the names of objects (e.g. table for chair)?'), and areas associated with skills that may require verbal memory (e.g., 'Did you learn your multiplication tables easily?') or even compensatory strategies ('How easy is it to think of unusual (creative) solutions?'). Using such a checklist as part of an interview that also includes questions about past difficulties may help the assessor determine whether a full assessment would be worthwhile.

How such interviews or questionnaire are used depends on the assessor's purpose and context. Again, a range of evidence from the adult and maybe past assessments should provide the basis on which to identify areas of continued difficulties, which may benefit from specific support. However, it can also provide ideas for strategies that can support learning: if the adult has relied on technology to access materials for learning in the past, then this may be the best area for continued support, for example.

2.3.3 Cognitive-Linguistic Factors

Assessments are also likely to focus on language skills, particularly phonological areas given that this may be the most likely source of dyslexia-related literacy difficulties. We have discussed such tasks earlier: those that require the person being assessed to identify and manipulate sounds within words. As also discussed earlier, we know that there are reciprocal relationships between reading/writing and language. Therefore, most assessments not only look at the language areas that are likely to lead to literacy difficulties, but also those areas that may be impacted by poor learning experiences: literacy difficulties can lead to a lack of reading practice, which can lead to less experience of certain types of vocabulary, and this in turn will impact reading comprehension skills.

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The reason why phonological skills have been considered useful in reading development is that they allow the linkage between language and writing. Being able to recognise sounds in words helps in the linking of those sounds to letters. In reading, this is sometimes referred to as decoding – that is, decoding the spoken word from its written form by linking each letter or combination of letters to their corresponding sound or sounds. This is the reason why many assessment practices also include measures of non-word (sometimes referred to as pseudo-word) reading. These are word-like in that they can be pronounced by the decoding process; that is, by translating each letter or group of letters into an appropriate sound (or to put it in technical jargon, using grapheme–phoneme correspondence rules). But they are not real words as they have no meaning, so they are unlikely to have been experienced before. For example, the non-word 'sploob' can be pronounced but it has no meaning: it is not a real word in the English language. It is unlikely that you will have seen this set of letters together in this order before, which means that you will not be able to name it from memory. Therefore, naming can only be achieved by relating letters or groups of letters with sounds – by decoding the made-up word. Such a task, therefore, can be used to determine the efficiency of the decoding processes that are used when new words are experienced – which will be most words for the beginning reader. Consistent with the view that phonological processing supports decoding, and that dyslexics have problems in this area of processing, those with dyslexia typically perform worse at such tasks than those without dyslexia (see Rack et al., 1992). This dyslexia-related weakness can be found in adults as well as children, and so may be useful in assessment practices across the lifespan.

Additionally, even when adults with dyslexia have developed good decoding accuracy, there can still be a slowness to their decoding indicative of dyslexia. Hence, speeded naming of real words or

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non-words can be a useful additional tool in assessment practices (see Fawcett & Nicolson, 1994; Hulme & Snowling, 1997). Similarly, compared with non-dyslexics, many with dyslexia can perform poorly in tasks requiring the rapid naming of familiar objects, digits, or colours. Note that this is not a problem finding the name since these are usually highly familiar names. Rather, the problem seems to be in accurately producing the names at speed, which may be consistent with difficulties in terms of making phonological access efficient. However, the extent to which these speeded naming deficits persist into adulthood for all those with dyslexia is debatable. Whether such weaknesses persist may depend on learning experience as much as the primary cause of dyslexia. Hence, rapid naming tasks may need to be considered as part of a range of phonological tasks, rather than as the only indicator of phonological weaknesses.

Another phonology-related measure that has been used in the diagnosis of dyslexia is memory span. This requires the individual to repeat, in order, sequences of (usually) digits. These sequences increase in length, say from repeating two digits in order (a relatively easy task) to repeating nine digits (a much harder task). The items are usually verbally presented and verbally repeated. Hence, the measure assesses the ability to distinguish, store, and produce verbal (phonological) material. The length at which the individual cannot repeat all the items in the correct order is considered indicative of memory span size and related to working memory capacity, both of which have been argued to be related to problems associated with dyslexia (see McLoughlin et al., 2002; Thomson, 2009). Although there are equivocal findings for and against differences between dyslexics and non-dyslexics on memory span measures (Everatt, 1999), this is also an area that is likely to be assessed to inform further support recommendations and provide evidence for the range of phonological-related weaknesses experienced by the individual.

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It may also provide evidence linked to assessments of working memory (discussed in Section 2.3.4).

2.3.4   Additional Areas of Assessment

For adults, and for many of the reasons we have discussed, assessing more than reading and writing may be of greater importance than when assessing children. Therefore, many assessors emphasise the assessment of cognitive abilities and individual differences, rather than simply focusing on a deficit in literacy (McLoughlin & Leather, 2013; Thomson, 2009). This can help to identify the range of the impact of literacy learning difficulties, and it can also help explain literacy assessment findings if there are areas of skill that may be used as compensatory strategies (e.g., identifying morphological units, such as prefixes, may support decoding when phonological processing is still weak – we cover additional examples in Chapter 5). We have looked at issues related to the need to assess language skills, such as vocabulary, since lower reading experience may be associated with lower vocabulary. Equally, the challenges with language and literacy faced by an individual may lead to better development of the processing of the meaning of words, such as in strategies used to determine the gist of a passage – discussed earlier. Better links between concepts and more practised inferencing skills may show in higher scores on certain verbal reasoning tasks used by assessors. Hence, assessments may identify areas of skill as much as weakness.

Despite the view of dyslexia as leading to difficulties and weaknesses, many within the field of dyslexia have also referred to its possible positive features (see West, 1991). For example, Miles (1993, p. 189) suggests that dyslexic individuals show 'an unusual balance of skills'. West (1991) refers to many adult dyslexics' creativity and visual skills, suggesting that they will excel in fields where

these skills are useful, such as the arts, architecture or engineering, and the sciences. It has also been argued that measures of visual arts skills, often related to visuo-spatial processing, should be useful as a 'positive' diagnostic indicator of dyslexia (see ideas in Davis, 1997). Rather than focusing on deficiencies, these could be used as evidence for dyslexia based upon superior performance. One problem with finding consistency in these suggestions is the paucity of empirical research. There is some evidence that at least some dyslexics show better than average performance in some non-verbal areas (consider Winner et al., 2001), including those focused on creative solutions to problems (see Everatt et al., 1999); however, this is rare and sometimes inconsistent. Despite the lack of reliable evidence, such skills may be useful in the workplace. Evidence for increased creativity may be associated with individuals finding their own solutions to difficulties related to dyslexia. Although creativity is rarely assessed in formal dyslexia assessments, looking at a range of skills that might influence performance should inform recommendations and self-understanding for the adult with dyslexia.

For many assessors, therefore, assessment batteries that include a range of measures are used. As mentioned earlier, these batteries were often developed to assess intelligence, and the history of dyslexia assessments has been linked to measures of general intelligence (often referred to as an Intelligence Quotient or IQ). One of the advantages of such batteries is that they have a long development history and therefore are among some of the more reliable assessments of human abilities. This can be very important to an assessor who needs to be able to argue for consistency in their practice. However, the use of intelligence-related batteries has some controversy attached to it. This mainly relates to past perspectives of dyslexia that argued for the need to identify a discrepancy between IQ and reading levels for dyslexia to be recognised. This discrepancy

practice has a lot of problems (see discussions in Ferrer et al., 2010; Kaufman, 2009; Siegel, 1988), and therefore many use these batteries more to determine areas of skill and areas of weakness across a range of cognitive factors. For example, many such batteries assess vocabulary and verbal reason – two areas discussed earlier. They also assess non-verbal areas, so that non-verbal reasoning and visual processing skills may inform statements about areas of ability. If these relate to a specific job profile, then those skills may be a positive factor in a work context. The opposite might be the case if the job profile links more to areas of weakness in the cognitive profile of the individual. Hence, recommendations about challenges and support in a work context may be derived from the range of measures used.

Such cognitive batteries also typically assess skills related to working memory. Again, the level of ability determined by these measures should provide information on which to develop support procedures: high levels of executive functioning should provide the basis on which to develop metacognitive strategies, while lower levels may require additional training support prior to strategy recommendations (see also Doyle and McDowell, 2015; Hock, 2012). For example, Smith-Spark and his colleagues (e.g., Smith-Spark et al., 2016, 2017) identify areas of executive functioning deficits in dyslexic students and conclude that these are likely to impact on performance at work. However, at the time of writing this book, we could find no research into the influence of executive function deficits in relation to dyslexia in the workplace. If we take a reasonably referenced view of executive functioning, that of Miyake and colleagues (Miyake et al., 2000; though see also Diamond, 2013; and further discussions in Miyake & Friedman, 2012), this includes processes of 'updating', 'inhibitory control', and 'shifting'.

The updating component is closest to working memory, as discussed earlier, and allows new information to be incorporated with old. This may be an important component of understanding

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language, and one where a short-term phonological store (potentially measured by the memory span assessments discussed in Subsection 2.3.3) may be a useful part of the processing system. The inhibitory control component allows an individual to inhibit unwanted interpretations of information and focus on a desired interpretation. This can be vital in strategy use and hence be an important part of metacognitive strategies; it may have some relationship with what Gerber et al. (1992) referred to as internal control when discussing successful adults with learning difficulties. The shifting component means that an individual has the ability to shift between ways of thinking about something in order to identify more effective ways to deal with something. Often, tasks measuring this aspect of executive functioning expect the shifting to occur quickly, and rapid processing may be an area of difficulty for some with dyslexia. Equally, though, some of the aspects of thinking of creative solutions to problems, particularly thinking between alternative solutions, may be associated with this element of executive functioning. Hence, consideration of a range of tasks associated with working memory functioning may be another area in which to look for skills and weaknesses that can then best inform support. We discuss strategy use, particularly in Part II of this book, but again the point here is that there will be a range of individual differences that means one strategy may not fit all.

Equally, non-cognitive areas have been found to be important in considering how to support those with dyslexia. A number of studies have found evidence for dyslexics demonstrating higher levels of frustration and anxiety, lower self-esteem, and lack of confidence than their non-dyslexic peers (see discussions in Everatt & Denston, 2020). Increased emotionality can be associated with task performance decrements, potentially leading to inaccurate assessment measures. If an individual is over-anxious during assessment,

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then performance may not be consistent with that involving similar abilities but in a different (non-assessment) context. Taking assessments may be particularly worrying for those with dyslexia who have experienced years of academic 'failure' in school. This can lead to detrimental levels of anxiety in any situation perceived as related to achievement tests. An assessment for promotion may be a good example, and may lead to a very able individual not gaining promotion because of poor performance owing to negative levels of anxiety. Similarly, poor levels of self-concept may lead to an individual never putting themselves forward for promotion in the first place. An assessor may determine the potential impact of such feelings by asking the individual about current or past experiences, again providing a basis for advice about how to overcome such challenges. Although these may not be part of all assessment practices, they can again provide explanations of performance on tasks that the individual is required to complete, either as part of some educational qualification or job performance. High levels of emotionality can influence any task where stress and worry may be involved. For those with a history of such challenges, overcoming these may be as vital as overcoming literacy weaknesses. We also discuss some strategies for overcoming these factors later in the book (see Chapters 5 and 7).

2.4   Overall Profile

In Figure 2.2, there is a representation of an 'average' adult dyslexic against average non-dyslexics. The line at 0 (zero) represents the average non-dyslexic on all of the measures (or tests if you prefer) on the graph, whereas the points within the graph (shaped as solid black squares) represent the average dyslexic performance on each of the areas of assessment. Note that these averages are based on

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the results of testing large numbers of individuals. The average performance for adult non-dyslexics is based on the results provided by at least 100 non-dyslexic adults per test and was obtained primarily from the results presented by test authors: where test materials did not present such averages, they are derived from the book authors' own research. The black square points in the graph represent results produced by more than fifty adult dyslexics per measure, and are based on the book authors' own research.

As indicated, the black squares within the graph indicate the average performance of dyslexic adults and the 0 line represents the average performance of non-dyslexic adults. This means that a black square below the 0 line suggests that an average dyslexic would show relatively poorer performance on the measure compared with the average non-dyslexic. It is important to note, however, that these averages are indicative and most individuals (both dyslexic and non-dyslexic) vary from average. Therefore, the other values down the side of the graph represent this variability. On this specific graph, these values are z-scores. A z-score is simply a way of representing performance on different tests that have different scales: they allow us to compare a measure with scores from 0 to 10 with a measure that has scores from 100 to 1,000. As long as we know the mean and standard deviation for a measure, we can convert scores on the measure to z-scores and compare performance across measures. Note that the mean is the statistical term for average, and the standard deviation is the statistical calculation for how people vary on a measure. A z-score, therefore, is basically the number of standard deviations (a standard amount of varying) away from a mean (the average). These z-scores, therefore, provide an idea of average and spread: the mean has a z-score of zero, and a score of 1 is one standard deviation from the mean, with scores below the mean represented as minus figures; so two standard deviations below the

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mean has a z-score of -2. Hence, the average can tell us what to expect on average when comparing dyslexics and non-dyslexics. If the black square is on or near the 0 line, then the average dyslexic would be expected to perform like the average non-dyslexic. Equally, how far away from the 0 line the black square falls indicates levels of strength and weakness expected of the average dyslexic. Given the expected distribution of abilities on most tests, we would expect only 15 per cent of individuals to produce a score below the value of -1 on the graph; and less than 3 per cent of individuals to produce a score below -2 on the graph. Therefore, if the black squares fall around or below these negative z-scores, then we would expect the average adult dyslexic to have some weaknesses related to the assessment area. We would also expect individual differences such that some dyslexic adults will be worse than the average adult dyslexic, which may be indicative of more severe weaknesses in the skills. Likewise, we would expect some dyslexic adults would do better on some tests. But overall, the graph gives us a guide to what we would expect and to interpret assessment results.

If we look at Figure 2.2, on the left-hand side of the graph, we have performance on measures of non-verbal skills. Measures of non-verbal reasoning and non-verbal memory show good performance among the adult dyslexics tested: the black squares are at or just above the 0 line representing the average non-dyslexics. Therefore, these suggest few problems in these skills areas and many adult dyslexics can use these skills as an area of relatively strength. Measures of non-verbal reasoning would include the Block Design test used in the WAIS battery (as discussed earlier). Alternatively, it may involve the ability to see how patterns relate to each other in a logical way: Raven's matrices is a good example (www.pearsonassessments.com/store/usassessments/en/Store/Professional-Assessments/Cognition-%26-Neuro/Non-Verbal-Ability/Raven%27s-Standard-Progressive-Matrices-%28SPM%

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29-and-Raven%27s-Standard-Progressive-Matrices-Plus-%28SPM-Plus%29/p/100000504.html).

Overall, the graph illustrates many of the areas of processing that may be explored in an assessment. Assessments that have the aim to identify dyslexia look for those features characteristic of the problems associated with dyslexia. Hence, most measures are used to determine areas of weakness, which is why an average dyslexic profile shows most areas of assessment to fall in the lower part of this graph. However, as mentioned before, the points/squares on the graph represent averages derived from a large number of adults with dyslexia who have come from a range of backgrounds. Therefore, they should be treated as indicative of a general trend. Most people, both dyslexic and non-dyslexic, vary from the average, so an individual dyslexic adult may produce a different profile from that presented in the graph; their profile may indicate strengths in an area of processing where the average suggests weaknesses, for example. Note also that both verbal and non-verbal reasoning are near the average line for the general population, and we would expect the distribution among dyslexics to be as variable on such measures as they are for non-dyslexic people. This means that we would expect half of all dyslexics and non-dyslexics to be above the average, and half of both to be below the average line.

Non-verbal memory measures the ability to recall detailed abstract images – for example, to say which of two images you have seen a few seconds before. Alternatively, this might involve repeating a series of pointing movements in the same order as presented, which would require visual-spatial skills to follow the pointing movements as in the Corsi blocks test. (Both the Wechsler scales at www.pearsonclinical.co.uk/ForPsychologists/Wechslerrange.aspx, and the Woodcock-Johnson batteries at https://riversideinsights.com/woodcock_johnson_iv have a range of non-verbal ability measures.)
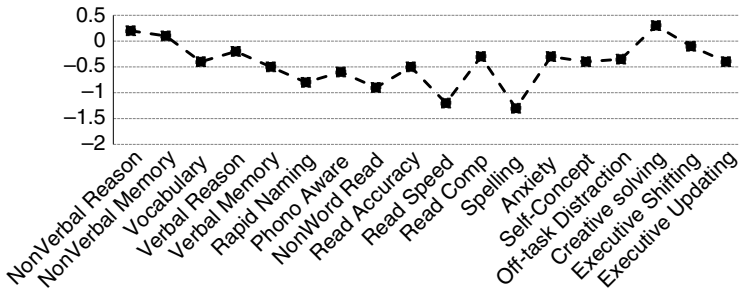
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Figure 2.2 Profile of the average performance of 100+ dyslexic adults

The following three areas of ability on Figure 2.2 relate to verbal skills. Vocabulary might involve pointing to one picture out of four that best represents a spoken word (e.g., www.pearsonassessments .com/store/usassessments/en/Store/Professional-Assessments/ Academic-Learning/Brief/Peabody-Picture-Vocabulary-Test-%7C-Fourth-Edition/p/100000501.html) or having to give a brief definition of a spoken word as in the WAIS (e.g., what does 'run' mean; what does 'democracy' mean). Note that the black square for vocabulary is below the 0 line and near the −0.5 line. This suggests that some adult dyslexics will show weaknesses compared with the average non-dyslexic in this area, which may be indicative of some of the consequences we have discussed earlier owing to lack of reading practice. In contrast, the verbal reasoning black square is closer to the average non-dyslexic line. This might assess the individual's ability to make connections between words (how are 'apple' and 'pear' related). Hence, the ability to use language may be fine, but experience of language may be more limiting. (For examples of ranges of measures of verbal ability, see the Wechsler scales at www.pearsonclinical.co.uk/ForPsychologists/Wechslerrange.aspx and the Woodcock-Johnson batteries at https://riversideinsights .com/woodcock_johnson_iv.)

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The third verbal area on the graph is verbal memory. This might involve repeating series of digits as discussed earlier (and used in WAIS), though it may also involve recalling a list of words. Because of its relationship with working memory, updating procedures, and the storage of phonological information, this may be an area of weakness for some adult dyslexics, consistent with the black square being around the −0.5 line. This may also be consistent with the following black squares that represent performance on measures of rapid naming and phonological awareness (the term 'Phono Aware' is used in the graph for space). Both of these assess aspects of phonological processing, which we discussed earlier. Rapid naming is naming familiar items as quickly as possible (pictures of objects such as a chair, horse, car, tree), and phonological awareness is completing tasks involving sounds within words (such as saying the middle sound in 'cat'). Consistent with the verbal memory average, these two areas fall below the −0.5 line, suggesting a range of weaknesses in phonological areas. These weaknesses are consistent with the non-word reading performance ('NonWord Read' on the graph) represented by the following black square. Weaknesses in phonological skills may lead to weaknesses in the ability to use decoding skills (grapheme–phoneme correspondences) to name non-words, as discussed earlier in terms of the main elements of dyslexia used in the current framework. Hence, measuring a range of phonological-related skills may be worthwhile to identify weaknesses and their impact. (For an example, see the Comprehensive Tests of Phonological Processing at www.pearsonclinical.co.uk/store/ukassessments/en/Store/ Professional-Assessments/Cognition-%26-Neuro/Memory/ Comprehensive-Test-of-Phonological-Processing-%7C-Second-Edition/p/P100009101.html.)

Following this, there are four areas of reading and spelling represented in the graph. In this representation, the four are variable, but

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all below the average non-dyslexic line. Reading speed and spelling show weak performance in these adult dyslexics, both below the −1 line. In contrast, reading comprehension is not so bad, which may be indicative of compensatory strategies. Reading accuracy shows some weaknesses, but for many adult dyslexics this may not be as bad as would be expected if assessed in childhood. Hence, the range of measures of literacy can support interpretation of the variability in performance across different areas of literacy. (See examples in the Woodcock-Johnson achievement tests at https://riversideinsights .com/woodcock_johnson_iv; or the Wechsler achievement scales at www.pearsonclinical.co.uk/ForPsychologists/Wechslerrange.aspx. Maybe also look at some examples of measures specifically for adults, such as the Adult Reading Test, https://adultreadingtest2.co.uk/.)

Following this, we have some measures that are rarely used in assessment, but which are presented to support the discussion of the framework of adult dyslexia in this chapter. For some adult dyslexics, there will be evidence of negative levels of anxiety and self-esteem, and there may be some evidence of being easily distracted from task performance. This may relate to experiences in educational contexts, as discussed earlier – feelings of failure in school can lead to negative emotional consequences. Again, these are below the average non-dyslexic line but above the −0.5 line, which suggests that some will show these negative consequences whereas others will not. The 'Off-task Distraction' assessment may represent some of the strategies used to avoid situations where literacy skills are required, but can also be indicative of feelings of worry about something. Again, some may show these difficulties, but others will not. Assessments of these sort of areas usually involve asking the individual about current or past experiences or feelings; see, for example, the Spielberger State-Trait Anxiety Scale (www.apa.org/pi/ about/publications/caregivers/practice-settings/assessment/tools/

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trait-state), the Goodman Strengths and Difficulties Questionnaire (www.sdqinfo.org/), and the Culture Free Self-esteem Inventories (www.proedinc.com/Products/10335/cfsei3-culture-free-selfesteem-inventoriesthird-edition.aspx). They may also be part of an interview with an individual – and some assessors may determine task worries during observations of performance in other tasks, particularly if time-limited.

The final three areas are related to some of the metacognitive ideas that are discussed in the rest of this book. The black squares here show that some of these areas can be good (the 'Creativity' point is above the average non-dyslexic line), some can be average (as in the 'Executive Shifting' assessments), and some can show slightly poorer performance (the 'Executive Updating' point). Ideas for creativity measures can be found in Everatt et al. (1999), but also see the Torrance Tests of Creative Thinking (www.ststesting.com/). For a range of measures of executive functioning try Leather (2018) and Miyake et al. (2000).

2.5   Conclusion

The framework presented in this chapter argues that core elements of dyslexia are to be found in adults, just as they can be identified in children. However, it also proposes a range of individual differences that further influence these core elements and the performance of individuals with dyslexia in their day-to-day performance, including at work. These develop owing to underlying biological and cognitive factors, but also the experiences of individuals during learning and in everyday life. The range of work that an adult may need to perform as part of their employment may also be very different from the requirements of school work in childhood. This means that a range

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of strategies is needed to support adults across this range of different circumstances. The dyslexia is still there, and will influence performance through a range of direct and indirect links. However, positive factors develop through experiences, as well as negative ones, and so support needs to be individualised. Self-awareness of these issues should be helpful, and leads to recognition of the potential of some of the ideas discussed in Part II. However, the key point in this chapter is that strategies to deal with adult dyslexia can build on success rather than needing to focus simply on remediation. They can, therefore, be based on what the individual does as well as the support of those around them.

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