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ADMINISTRATOR'S MANUAL

LADSplus

Digitised Dyslexia Screening for adults and children aged 15+ years

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1 Introduction

1.1 What is LADS Plus?

LADS Plus is a computerised test designed to screen for dyslexia in persons of 15 years and older. LADS Plus comprises five assessment modules, which measure:

1) **Nonverbal Reasoning**
2) **Verbal Reasoning**
3) **Word Recognition** (Lexical decoding involving speeded recognition of real words from non-words).[1]
4) **Word Construction** (Speeded lexical encoding of non-words from syllables)
5) **Working Memory** (Backwards digit span)

The last three of these are *dyslexia sensitive* measures: it is well established in the research literature that all these tasks are difficult for most people with dyslexia. The two reasoning tests have been included in order to increase the accuracy of detection of dyslexia. These also enable the Administrator to reach a rough estimate of the person's intellectual ability, which may be important when making decisions about further action after screening.

The tests in LADS Plus are adaptive; that is, the program varies the items given according to the performance of the individual taking the test. This means that the assessment is swift and efficient. Each of the five modules in LADS Plus takes about five minutes, so the whole screening can usually be completed in about 25 minutes. Results can be viewed on screen or printed out immediately. For further information on administering LADS Plus, see Chapter 3.

Administration of LADS Plus does not require professional training in education or psychology. The tests are self-administered and results very easy to interpret. The program assists interpretation by stating the probability that the person has dyslexia: 'high probability', 'moderate probability', 'borderline', and 'low probability'. However, because all the results of any LADS Plus screening are available to Administrators they are not forced to accept the recommendations of the program; instead, they are free to use their own professional judgment when interpreting results and in making decisions about what to do next. For further information on interpreting results of LADS Plus, see Chapter 4. Caution should be exercised when presenting results of LADS Plus to adults, as counselling may be required in cases where an indication of dyslexia may come as a shock to a person. This important issue is discussed in more detail in Chapters 3 and 4. Persons taking LADS Plus who are found to be 'possibly dyslexic' or 'probably dyslexic' will welcome information about how their difficulties can be supported and where they can turn to for advice. This responsibility of the Administrator should not be taken lightly. For further information on support for adults with dyslexia, see Chapter 5.

[1] A nonword is a sequence of letters that is not a real word but which nevertheless conforms to the orthographic rules of the language (e.g. 'sploff', 'blust', 'goster'). Hence nonwords can be decoded and pronounced as though they were real words. Since any given nonword will not have been encountered by the reader previously, the person cannot rely on visual, semantic, or contextual strategies but can only use phonological rules in order to decode it. Nonwords thus provide a pure test of a person's competence in phonological decoding or what is often referred to in education as 'phonics'.

1.2 Uses of LADS Plus

LADS Plus is designed to be used for:

(a) routine group screening for dyslexia; and
(b) individual screening for dyslexia in adults referred because of literacy difficulties or other learning problems.

LADS Plus can be used in any adult setting whether educational or employment-related, e.g. universities or higher education colleges, further education colleges, 6th form colleges, adult literacy centres, dyslexia centres, basic skills centres, learning support units, prison and youth offender education units, careers centres, employment centres and workplaces.

Where the aim is routine group screening it is strongly recommended that the network version of LADS Plus is used. This enables up to 40 persons to be screened simultaneously using a computer network, and gives greater efficiencies of both time and cost than using the single user version. Another advantage of using the test for group screening on entry to the institution is that it provides early warning of those individuals who are likely to have dyslexia, rather than waiting until difficulties emerge, which may in some cases be too late for effective action to be taken (e.g. because a student's course has almost come to an end).

Many institutions and individuals prefer to have confirmation of dyslexia provided by a report from an educational psychologist. This is an expensive service: at the time of going to press, average fees for psychological assessments in the UK are generally between £600 and £800. Whoever bears the cost – the institution, employer, or the test-taker personally – this is a considerable expense. By carrying out a screening assessment beforehand the chances of this money being wasted (because the subsequent psychological assessment turns out to be negative) is reduced. In higher education, a psychologist's report may be necessary if a student with dyslexia wishes to apply for a Disabled Students Allowance. In many cases, however, an adult will not need to go to the lengths of obtaining a psychologist's report, but the results of LADS Plus will be sufficient for their requirements.

It must be emphasised that LADS Plus is not a full diagnostic test and so does not purport to provide a definitive assessment of dyslexia. Rather, it is designed to provide a quick screen of unselected or selected adults in order to indicate which of them is most likely to have dyslexia. Each of the three modules in LADS Plus provides a categorisation of persons taking the test into the following three groups, which are represented by the colour of the bars on the LADS Plus reports screen and print-out:

- Green: No indication of dyslexia.
- Amber: Weak indication of dyslexia.
- Red: Strong indication of dyslexia.

Overall, LADS Plus provides a categorisation of persons taking the test into the following four groups:

1) Low probability of dyslexia
2) Borderline
3) Moderate probability of dyslexia
4) High probability of dyslexia

The LADS Plus reports screen and print-out also provides a brief description of the results. It should be stressed that these descriptions and the categories are not definitive and are provided merely to assist interpretation of results. LADS Plus gives full results, so Administrators are at liberty to use their professional judgement when interpreting findings and in making decisions on outcome. Guidelines on interpretation of LADS Plus results are provided in Chapter 4. Advice about possible courses of action and forms of support for adults whose results suggest they have dyslexia are provided in Chapter 5.

1.3 Current scientific knowledge about dyslexia

In 2007, the British Dyslexia Association adopted the following definition of dyslexia:

> *"Dyslexia is a specific learning difficulty that mainly affects the development of literacy and language related skills. It is likely to be present at birth and to be life-long in its effects. It is characterised by difficulties with phonological processing, rapid naming, working memory, processing speed, and the automatic development of skills that may not match up to an individual's other cognitive abilities. It tends to be resistant to conventional teaching methods, but its effect can be mitigated by appropriately specific intervention, including the application of information technology and supportive counselling."*

Although we are far from a complete scientific understanding of dyslexia, and the field has its fair share of controversies and competing theories, nevertheless we know enough to be able to formulate with confidence a computerised test that will screen effectively for dyslexia in adults.

Current research evidence points very strongly to dyslexia being a constitutional disorder that is usually inherited genetically, and which arises largely because of weaknesses or differences in cognitive systems that subserve processes used in the perception and production of speech, including phonological processing, lexical access and working memory (McLoughlin, Fitzgibbon and Young, 1994; Beech, 1997; Rack, 1997; Miles and Miles, 1999; Snowling, 2000; Thomson, 2001; Ramus et al., 2003; Jeffries and Everatt, 2004; Catts et al., 2005; Gathercole et al., 2006). Phonological processing refers to the processing of information concerning the sounds of language, at the levels of phonemes, spoken words and syllables, and the integration of these with other cognitive representations, such as graphemes (letters) and written words. Lexical access is the process by which we locate stored representations of words in a mental lexicon held in long-term memory. Working memory is the process by which we can hold phonological information in a short-term memory store while we carry out some mental operation on it, such as recognising a word we have heard or read. All these processes are critical to reading, writing and spelling.

Dyslexia affects about 4% of the population fairly severely, while up to about another 6% may experience dyslexic difficulties of a less severe nature. In childhood, early difficulties with phonology are common in individuals with dyslexia, and at primary school problems with acquiring phonic decoding skills almost universal. The child with dyslexia is normally late in learning to read and rate of reading generally remains slow in comparison with peers. Written construction and spelling are among the most difficult activities for individuals with dyslexia, and typically these remain life-long weaknesses, although computers have enabled many people with dyslexia to write with greater confidence. In addition to slow reading speed and difficulties with writing, limitations in speeded processing tasks and recall of information learned by rote all combine to create major difficulties for people with dyslexia in examinations. To make assessment of learned skills fairer for people with dyslexia, it has become the norm to allow additional time in written examinations, such as GCSE, 'A' level and degree exams.

This issue is discussed more fully in Chapter 4.

As people with dyslexia grow up, they usually develop a variety of compensatory strategies, some of which are positive tactics to help them to meet the educational or occupational demands placed upon them, while others are simply means of concealing their difficulties (McLoughin, Fitzgibbon and Young, 1994; Singleton, Horne and Simmons, 2009; de Beer et al., 2014). But although dyslexia is a life-long condition, it is not an inevitable barrier to educational or occupational achievement. With improvements in the provision of appropriate support, the number and proportion of students with dyslexia entering higher education is steadily increasing. Support for adults with dyslexia in the workplace is also more forthcoming (Reid and Kirk, 2001; McLoughlin and Leather, 2009; Bartlett and Moody, 2010; McLoughlin and Leather, 2013; Beetham and Okhai, 2017). Nevertheless, one should not underestimate the difficulties of adults with dyslexia, struggling to cope in a literate world.

However, research indicates that dyslexia is three to four times more common amongst prisoners and offenders than in the general population (BDA, 2005; Dyslexia Institute, 2005; Alexander-Passe, 2015). Dyslexia increases the risks of people failing educationally, of leaving school without qualifications and consequently struggling to find employment – factors that are all associated with offending. When dyslexia remains undetected and unaddressed the person does not simply lack the ability to read and write. There can also be huge emotional burdens because the person does not understand their learning difficulties. Policy initiatives, such as the *The Offender's Learning Journey* (DfES, 2004), acknowledge that identifying dyslexia amongst offenders and providing appropriate educational support is important in strategies to reduce reoffending. The *Review of Offender Learning* (MoJ, 2011) reiterated the need to assess and address the needs of offenders with learning difficulties.

1.4 The advantages of computerised assessment

Computers provide more precise measurement, especially when complex cognitive skills are being assessed. Tests are administered in an entirely standardised manner for all persons taking the test, which enhances reliability of measurement. Timings and presentation speeds can be controlled precisely (Singleton, 2001; Horne, 2007; Singleton, Horne and Simmons, 2009).

The subjective judgement of the Administrator does not affect the test outcome as it can in conventional tests. LADS Plus is largely self-administered and results are available immediately; both of these factors help to reduce administrative load and avoid time delays.

Of particular importance in this context is the fact that people often prefer computerised assessment to conventional assessment (Horne, 2007; Singleton, Horne and Simmons, 2009). Research has shown that many adults – particularly those with reading or writing problems or who experienced difficulties at school – find conventional assessment by another person stressful and anxiety provoking, particularly when the assessor is viewed as being in the role of a teacher or some equivalent professional. By contrast, they are generally more relaxed and confident when taking computerised tests, and less worried about 'getting something wrong' (Singleton, 2001; BDA, 2005).

The tests in LADS Plus are adaptive, so that the performance of the individual taking the test is constantly monitored and the program varies the items given according to patterns of success or failure on previous items. Computerised adaptive psychological tests have been shown to be much more efficient than conventional tests because the person taking the test receives a smaller proportion of items that are too easy or too difficult, and a greater proportion of items that closely match the individual's ability level (Olsen, 1990; Carson, Gillon and Boustead, 2011; Senel and Kutlu, 2018). Adaptive tests require fewer items overall in order to achieve an equivalent level of accuracy and reliability of measurement, and so the cognitive load on the person taking the test is reduced. Test fatigue is lessened, and positive test motivation maintained (Singleton, 1997b).

2 The development of LADS Plus

2.1 Scientific rationale for LADS Plus

One might pose the question: since adults with dyslexia typically have problems with reading, writing and spelling, why nor simply measure those skills in order to identify the individuals who have dyslexia? The problems with this approach are (a) the differences in literacy skills between dyslexic and non-dyslexic persons are largely quantitative rather than qualitative, and (b) the development of compensatory strategies (especially by individuals with higher intelligence) often masks such differences. If one were to take a group of adults with dyslexia and a group of non-dyslexic adults, statistically significant differences between these groups in reading, writing and spelling would almost certainly be found. But if one took an individual adult with dyslexia, he or she may have literacy skills in the average range (although below that which might be reasonably expected from their intelligence and education), while an individual adult who does not have dyslexia may have below average literacy skills. A screening test has to be capable of identifying which individuals do, and do not, have dyslexia to a reasonable degree of accuracy, and for that task measures that are more reliable than literacy skills are required.

2.1.1 The requirements of an effective screening system

The term 'screening' may be used for any procedure that facilitates rapid and easy sorting into categories where there is the expectation that some categorisation errors may occur. A certain level of error is traded for increased speed and practicality. In education the purpose of screening is usually to identify children or adults who have special educational needs (e.g. because of dyslexia).

These individuals will require tuition or support over and above what is provided for other individuals, or may be entitled to special arrangements (reasonable adjustments, or accommodations) when being assessed or undergoing some selection process.

No screening system is 100% accurate since it is inherent within the technique of screening that a certain level of error or misclassification is inevitable. The accuracy of any screening system is indicated by the frequency of misclassifications that it makes. False positives and false negatives are the two types of screening misclassifications. A false positive is a 'false alarm', i.e. an instance in which a person has been classified as 'at risk' (in this case, possibly having dyslexia) when, in fact, this is not the case. A false negative is a 'miss', i.e. an instance in which a person has been classified as 'not at risk' (in this case, not having dyslexia) when, in fact, the opposite is the case (they do have dyslexia). The value of any screening test depends on having low frequencies of false positives and false negatives. A high frequency of false positives generally results in the diverting of resources to dealing with cases that do not actually require attention. A high frequency of false negatives results in critical cases being overlooked, possibly with serious consequences. However, reducing misclassifications to very low levels almost always entails increasing the complexity and sophistication of the measurement, which will tend to reduce the practicality of screening and increase administrative effort and costs. In general, levels of less than 25% for each of these is advocated for effective screening (Singleton, 1997a).

The sensitivity of a test refers to the degree that a measure correctly identifies individuals that do have dyslexia, and this is calculated by dividing the number of true positives by the sum of true positives and false negatives. Whereas specificity refers to how well a measure correctly identifies individuals who do not have dyslexia, and this is calculated by dividing the number of true negatives by the sum of true negatives and false positives. Whilst medical screening tests would require sensitivity and specificity rates of .9 and .8 respectively, acceptable levels for educational measures are somewhat lower, with expected rates being between .71 and .94 (Swets, 1988). For a test to be useful, sensitivity + specificity should be at least 1.5 (Power, Fell and Wright, 2013).

2.1.2 Key indicators of dyslexia in adults

The compensation strategies that adults with dyslexia often develop in order to cope with literacy tasks can mask their dyslexia and make it difficult to determine whether a person genuinely does have dyslexia. For this reason, the use of literacy tasks alone are unreliable in the identification of dyslexia (see Section 2.1). Furthermore, any task that relies strongly on acquired knowledge (e.g. vocabulary) would not be suitable as results would be likely to be masked by educational factors. However, the cognitive difficulties that underpin dyslexia – particularly in phonological processing, lexical access and working memory – are much more fundamental and difficult to compensate. They are also less likely to be masked by educational factors. These underlying cognitive features of dyslexia have already been outlined in section 1.3. There is extensive evidence that, in adulthood, persons with dyslexia (even those who are university students) still exhibit limitations in tasks involving these cognitive domains (McLoughlin, Fitzgibbon and Young, 1994; Gottardo et al., 1997; Snowling et al., 1997; Rack, 1997; Hanley, 1997; Snowling, 2000; Ramus et al., 2003). In designing LADS Plus it was decided to build a system that had a strong scientific research basis and therefore to centre this on in phonological processing, lexical access and working memory. Three tests were devised, called *Word Recognition, Word Construction* and *Working Memory*, all of which rely to a greater or lesser extent on the core cognitive abilities, as shown in Table 1.

In Table 1, the number of crosses shows the extent to which the three dyslexia-sensitive tests in LADS Plus — Word Recognition, Word Construction and Working Memory — are believed to draw upon the core cognitive abilities, based on a consideration of the tasks involved. The conclusions shown in Table 1 are supported by intercorrelations computed between the three tests in a sample of 134 adults, with a 50:50 split between individuals known to have dyslexia and non-dyslexics. The correlation between Word Recognition and Word Construction was found to be high (r=0.83), indicating that both these tests are assessing similar abilities; in fact, both are strongly phonological tasks. However, the correlations of these tests and the Working Memory test were much lower, although still statistically significant. This suggests that the two phonological tests also place demands on working memory, but a little more so in the case of Word Construction (r=0.34) than in the case of Word Recognition (r=0.30).[2]

[2] Note that these correlations were computed on the basis of the full, original (unadaptive) versions of the tests, and are different from the data on the adaptive forms presented in Table 11.

Table 1. The cognitive basis of the three tests in LADS Plus.

	Cognitive skills being assessed		
LADS Plus Test	Phonological processing	Lexical access	Working Memory
Word Recognition	++	+++	+
Word Construction	+++		++
Working Memory			+++

2.1.3 The role of reasoning and intelligence

The decision to include tests of reasoning in LADS Plus was made for two reasons. First, to improve screening accuracy of detection of dyslexia in very bright, well-compensated individuals with dyslexia, who otherwise might 'slip through the net'. Where LADS finds that a person is very bright (on the basis of the reasoning test results) it decreases the time allowed per item in the word recognition and word construction tests, thus picking up bright, well-compensated individuals with dyslexia who have developed the skills to work out what the answers to these items should be, but who, because of their dyslexia, have not been able to automatise them.

Second, the inclusion of the reasoning tests gives Administrators additional information that is helpful in interpreting results. The reasoning tests are not dyslexia-sensitive measures, but give a fairly good estimate of intelligence. Since very bright adults with dyslexia tend to develop more proficient compensatory strategies this can make them more difficult to detect in a screening test of this nature. Conversely, individuals who are at the lower end of the ability range may struggle with some of the requirements of the dyslexia-sensitive tests in LADS Plus, not because they have dyslexia, but because their vocabulary may be limited and because their overall speed of information processing may be relatively slow. In order to avoid excessive numbers of false negatives and false positives in such cases, the information provided by the reasoning measure enables Administrators to take this into account when considering results and making decisions on the most appropriate course of action.

Hence LADS Plus is built on a model of dyslexia identification that takes into account both key dyslexia indicators and performance that is below expectations based on estimated intelligence.

2.2 The adaptive algorithms in LADS Plus

All five of the modules in LADS Plus are adaptive, which makes screening swift and effective. However, the adaptive algorithms that have been employed differ between the tests. The Working Memory module adapts itself to performance of the person taking the test simply by discontinuing after both items at a given difficulty level have been failed. The reasoning modules use probe items to identify the section of the test that is most appropriate for assessing each

individual and then the program administers items that are easier or harder, according to individual performance, discontinuing the test when that person's ceiling has been reached.

The other two modules (Word Recognition and Word Construction) employ a technique generally known as CAST (Computerised Adaptive Sequential Testing), in which blocks of items of known difficulty are administered in an adaptive sequence. In these two LADS Plus modules, the CAST approach utilises a fractionation algorithm that assign persons being assessed to a category, based on their performance on each module. The categories used are as follows:

No indications of dyslexia			Weak indications of dyslexia			Strong indications of dyslexia		
1	2	3	4	5	6	7	8	9

In other words, the higher the score on each assessment module in LADS Plus, the higher the probability that the person has dyslexia. The adaptive fractionation algorithm operates by giving the person blocks of assessment items of similar difficulty and then applying decision rules to the outcome. These decision rules determine whether the individual either (a) clearly falls into one of the specified categories, or (b) whether more blocks of items of a different level of difficulty should be administered before re-applying the decision rules. The difficulty level of each item has already been determined by trials involving both individuals known to have dyslexia and non-dyslexic adults.

2.3 Validation of the tests in LADS Plus

The three dyslexia-sensitive tests in LADS Plus were validated in three separate studies.

Study A. This study (Singleton, Horne and Simmons, 2009) involved 8 centres catering for adults with dyslexia: 2 were in universities, 3 were in colleges of further education, and 3 were in basic skills centres. A total of 140 adults participated in initial trials of the system; 71 of these were known to have dyslexia on the basis of conventional psychological assessments, and the remaining 69 did not have dyslexia (as far as could be determined).

Study B. This study involved 48 randomly selected university students, none of whom was known to have dyslexia.

Study C. This study involved 38 university students (19 with dyslexia and 19 non-dyslexic) who had been closely matched for intelligence.

2.3.1 Validation Study A

The participants were administered the three dyslexia-sensitive tests in LADS Plus, with the full (not adaptive) forms of Word Recognition (120 items) and Word Construction (50 items) being used. Scores are the number of items correct in all cases. Descriptive statistics of the sample are shown in Table 2.

Table 2. LADS Plus results from three different types of institution.[3]

		Word Recognition		Word Construction		Working Memory	
	N	Mean	SD	Mean	SD	Mean	SD
University	47	99.95	12.30	38.70	9.78	5.56	2.70
FE College	47	91.38	23.90	33.27	12.33	4.28	2.54
Basic Skills	46	85.55	25.04	27.91	14.93	3.50	2.47
Total	140	90.60	23.12	32.47	13.10	4.21	2.63

As a check on the validity of the separation into 'Dyslexic' and 'Non Dyslexic' groups, all participants in Study A were administered the Adult Dyslexia Checklist (Vinegrad, 1994), which is a list of 20 yes/no questions relating to difficulties commonly experienced by adults with dyslexia, e.g. 'Do you have difficulties when writing cheques?' The group with dyslexia obtained a mean (average) of 12.03 positive dyslexia indicators on the checklist (SD 3.87) while the non-dyslexic group obtained a mean of 4.47 positive dyslexia indicators (SD 3.32). Scores of 8 or higher are usually regarded indicating a strong likelihood of dyslexia. Statistical analysis (ANOVA) revealed that all three tests in LADS Plus distinguished significantly between the dyslexic and non-dyslexic groups (see Table 3).[4]

[3] SD stands for 'standard deviation', a statistical term that represents the amount of variability of the scores obtained by the members of the group; the higher the SD, the greater the variance amongst the scores in the group. It is not necessary to understand this concept in order to follow the statistical results in this section.

[4] The level of statistical significant is shown as a probability value (p); e.g. $p < 0.01$ means that the result obtained would be expected to occur by chance less than once in every hundred times that these data were collected. In other words, it is highly unlikely that this result is simply a chance event and therefore highly likely that the outcome represents a real difference. Similarly, $p < 0.001$ means that the result obtained would be expected to occur by chance less than once in every thousand times. Hence the smaller the p value the greater degree of confidence one can have in the finding.

Table 3. Comparison of dyslexic and non-dyslexic groups on the LADS Plus tests used in Validation Study A.

		Word Recognition		Word Construction		Working Memory	
	N	Mean	SD	Mean	SD	Mean	SD
Dyslexic	71	74.10	19.83	23.68	11.00	3.20	2.22
Not Dyslexic	69	107.49	11.01	41.12	8.47	5.16	2.68
Significance level		p < 0.001		p < 0.001		p < 0.001	

Internal consistency statistics were also computed and this enabled unreliable items to be eliminated. The overall internal reliability (alpha) scores for the final version of LADS Plus were: Word Recognition: a = 0.95; Word Construction: a = 0.96, which are very high.

The results of comparing the dyslexic and non-dyslexic groups within the three types of institutions were broadly similar, although results for Working Memory were of a lower significance level, especially in the university group. For this reason, further research was carried out to see if a more sensitive measure for the backwards digit span test could be found. Statistical analysis showed that the most sensitive measure was a combined score created by adding the total number of items correct to the total number of digits in their correct positions. Using this combined score showed a highly significant difference was found between the dyslexic and non-dyslexic groups (see Table 4) and the statistical significance for the three types of institution were greatly improved. It was therefore decided to use this combined score in the final version of LADS Plus.

Table 4. Comparison of dyslexic and non-dyslexic adults on the combined score obtained from the LADS Plus Working Memory test.

	N	Mean	SD
Dyslexic	71	14.67	10.65
Not Dyslexic	69	25.97	15.00
Significance level		p < 0.001	

2.3.2 Creation and validation of the adaptive version of LADS Plus

The scores obtained by the participants in Study A were used to calculate difficulty levels for every item in the test and this enabled items to be selected for the adaptive forms of the Word Recognition and Word Construction tests. The data for these tests were then run

through the fractionation algorithm to calibrate the adaptive forms of the tests so that their results approximated as closely as possible to those obtained from the full forms. For the Word Recognition test, a correlation[5] of –0.95 was obtained between the full form and the adaptive form, while for the Word Construction test, the correlation was –0.96. Both these correlations are exceptionally high and are statistically significant ($p < 0.001$). These results indicate that a high degree of confidence can be placed in the fractionation algorithm as the mathematical basis for the adaptive forms of these tests. A similar calibration exercise was carried out on data from the Working Memory test to create outputs that were on the same scale as that of the Word Recognition and Word Construction tests (i.e. ranging from 1 to 9). To check this, data for Working Memory test from Study B were analysed and the correlation between the recalibrated scores and the original raw scores was found to be –0.85, which is also statistically significant ($p < 0.001$).

The data from the adaptive forms of the three tests were then subjected to statistical analysis similar to that carried out on the original data. The results are shown in Table 5.

Table 5. Comparison of dyslexic and non-dyslexic adults on the adaptive forms of the LADS Plus tests (score range 1 – 9 for each test).

		Word Recognition		**Word Construction**		**Working Memory**	
	N	Mean	SD	Mean	SD	Mean	SD
Dyslexic	71	5.6	2.27	6.04	2.43	7.03	2.23
Not Dyslexic	69	2.04	1.36	2.22	1.61	4.72	2.30
Significance level		$p < 0.001$		$p < 0.001$		$p < 0.001$	

As explained in Section 2.1, the value of any screening test depends on having low frequencies of false positives and false negatives. The following tables show the discriminant function analysis carried out on each of the three LADS Plus tests in their adaptive versions, in order to determine percentages of false positives and false negatives. See Table 6, Table 7 and Table 8. The results indicate that the LADS Plus tests come well within the required limits for false negatives (see Table 10), and that with the exception of Working Memory, also come well within the required limits for false positives. The Working Memory test comes somewhat over the expected limits with a false positive rate of 30.6%.

However, on investigation it was found that a substantial proportion of these cases comprised individuals who scored poorly on the test because the instructions were unclear. In the final version of LADS Plus, the instructions for the test were improved in order to correct this.

[5] Correlation is a statistical measure of relatedness between scores obtained on two different measures by the same individuals. The correlation coefficient (r) varies between 1.0 (absolute correlation) and 0 (zero correlation). A positive r indicates that the scores on the two measures are both in the same direction, while a negative r indicates that scores are in opposite directions. In the case of LADS Plus, a negative r is to be expected as the output of the fractionation algorithm is in the opposite direction,i.e. low scores indicating not dyslexic, and high scores indicating dyslexia.

Table 6. Discriminant function analysis of the LADS Plus Word Recognition Test.

	Actual classification		
Classification predicted by LADS Plus	Not Dyslexic	Dyslexic	Totals
Not dyslexic	59	16	75
Dyslexic	10	55	65
Totals	69	71	140

Table 7. Discriminant function analysis of the LADS Plus Word Construction Test.

	Actual classification		
Classification predicted by LADS Plus	Not Dyslexic	Dyslexic	Totals
Not dyslexic	26	7	33
Dyslexic	41	60	101
Totals	67	67	134

Table 8. Discriminant function analysis of the LADS Plus Working Memory Test.[6]

	Actual classification		
Classification predicted by LADS Plus	Not Dyslexic	Dyslexic	Totals
Low (score 3–11)	48	6	54
Borderline (score 12–14)	14	7	21
Moderate (score 15–18)	3	20	23
High (score 19–27)	2	34	37
Totals	67	67	134

[6] Note that in the Working Memory test, data was only obtained from a total of 134 participants.

When the individual scores for each of the three tests is amalgamated to create a composite LADS Plus score (minimum 3, maximum 27), the incidence of false positives was 3.7%, and of false negatives was 4.5% (see Table 9 and Table 10). Overall, the percentage of cases correctly classified by the LADS Plus composite score was almost 92%, which is extremely high for a screening instrument of this type. This demonstrates the power of a screening system in which the classification is based on a composite score derived from a number of strong components, each of which has clear validity and strong predictive accuracy. In addition to using the quantitatively derived classification, Administrators can use their own judgement when examining an individual's LADS Plus profile on a qualitative basis and in making recommendations for action (see Chapter 4 for further discussion of this).

Table 9. Discriminant function analysis of the LADS Plus Composite Score.

	Actual classification		
LADS Plus Composite Score	Not Dyslexic	Dyslexic	Totals
Low (score 3–11)	48	6	54
Borderline (score 12–14)	14	7	21
Moderate (score 15–18)	3	20	23
High (score 19–27)	2	34	37
Totals	67	67	134

Table 10. Percentages of false positives and false negatives obtained in the LADS Plus validation trials.

	False positive %	**False negative %**	**% of cases correctly classified**
Word Recognition	7.1	11.4	81.4
Word Construction	5.7	10.7	83.6
Working Memory	30.6	5.2	64.2
LADS Plus composite score	**3.7**	**4.5**	**91.8**

The LADS Plus composite score shows a sensitivity of .91 and a specificity of .92, which are higher than would be expected for an educational test, and shows LADS Plus to be an extremely useful measure, with a combined sensitivity / specificity score of 1.83.

2.3.3 Validation Study B

In Study B, which employed the adaptive forms of the LADS Plus tests, three additional conventional tests were also administered: Woodcock-Johnson Word Attack Test (a test of phonological decoding skills using non-words), WRAT 3 Spelling Test, and WAIS-III Digit Span Test (digits forwards and backwards). Table 11 shows the intercorrelations between these measures and the scores obtained on the LADS Plus tests.

Table 11. Intercorrelations between scores on the adaptive forms of the LADS Plus tests and three conventional tests (n = 48).

	WR	WC	WM	LC	WJ	WS	DS
LADS Plus Word Recognition (WR)	1.0						
LADS Plus Word Construction (WC)	0.25	1.0					
LADS Plus Working Memory (WM)	0.04	0.28	1.0				
LADS Plus composite score (LC)	0.62 ***	0.70 ***	0.84 ***	1.0			
Woodcock-Johnson Word Attack (WJ)	-0.16	-0.34 *	-0.35 *	-0.49 **	1.0		
WRAT 3 (WS)	-0.28	-0.37 *	-0.33 *	-0.49 **	0.46 **	1.0	
WAIS-III Digit Span (DS)	-0.23	-0.42 **	-0.48 **	-0.58 **	0.40 **	0.20	1.0

Key: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

From these results it can be seen that although each of the three LADS Plus tests contributes significantly to the composite LADS Plus score, each are independent measures, since the intercorrelations between the three LADS Plus tests are all rather low and not statistically significant. The LADS Plus Working Memory test (digits backwards) correlates significantly with WAIS-III Digit Span Test (digits forwards and backwards): $r = -0.58$, $p < 0.001$, thus providing further validation for the former. The results also suggest that the LADS Plus Word Construction test draws upon skills involved in phonological coding, spelling of real words and short-term memory, since the correlations between LADS Plus Word Construction and the three conventional tests were all statistically significant with r in the region of -0.3 to – 0.4. By contrast, the LADS Plus Word Recognition test depends much more on lexical access skills, which were not tested separately in this study. However, in Study A, the participants were also tested using WRAT 3 Reading test, which assesses single word recognition and which therefore depends more on lexical access skills. The correlation between WRAT 3 Reading and LADS Plus Word

Recognition (full form) was found to be 0.89, which is very high and statistically significant ($p < 0.001$), thus providing additional validation for the LADS Plus Word Recognition test.

Inspection of the centile scores for the three conventional tests (see Table 12) indicates that the participants in Study A comprise a group that is above average in phonic skills (Woodcock-Johnson Word Attack) and spelling (as might be expected in university students), but not above average in working memory (and WAIS-III Digit Span). Moreover, it should be noted that the standard deviations (SDs) for both WAIS-III Digit Span and LADS Plus Working Memory are both relatively high. This indicates that there is much greater variance in scores for short-term (working) memory. One important implication of this is that amongst non-dyslexic adults there will be quite a few who have rather weak working memory (at least, as assessed by these types of test). Such individuals are likely to show up as false positives on a dyslexia screening test, and it will be remembered that in Section 2.3.2 it was pointed out that the LADS Plus Working Memory test was found to have a somewhat higher incidence of false positives. This means that extra caution should be exercised when interpreting the results of this particular test.

2.3.4 Gender differences

In Study A, in which the full form of the LADS Plus tests were used, there were 58 males and 82 females. No significant gender differences were found, except in the Word Recognition test, in which the females (mean score 94.45; SD 20.34) were found to score significantly higher than the males (mean score 83.81; SD 22.70), $p < 0.01$).

In Study B, in which the adaptive form of the LADS Plus tests were used, there were 19 males and 29 females. No significant gender differences were found in scores obtained from any of the three LADS Plus tests, nor in the LADS Plus composite score (see Table 12). As a check against this, the same students were administered three conventional tests that assessed comparable skills: Woodcock-Johnson Word Attack Test, WRAT 3 Spelling Test, and WAIS- III Digit Span Test. Although the mean scores suggested some slight differences, none of these were found to be statistically significant (t test). It may therefore be safely concluded that the tests in LADS Plus do not bias either males or females in an unselected sample.

Table 12. Gender differences in scores from LADS Plus and three conventional tests.

	Male (n=19)		**Female (n = 29)**	
	Mean	SD	Mean	SD
LADS Plus Word Recognition	2.95	2.46	2.35	1.17
LADS Plus Word Construction	2.63	1.83	3.13	2.06
LADS Plus Working Memory	3.31	2.98	3.72	2.91
LADS Plus composite score	8.32	4.44	9.03	4.66
Woodcock-Johnson Word Attack (centile score)	83.42	17.93	74.88	24.78

	Male (n=19)		Female (n = 29)	
	Mean	SD	Mean	SD
WRAT 3 Spelling (centile score)	68.77	17.62	72.60	20.95
WAIS-III Digit Span (centile score)	49.11	27.72	40.91	24.28

2.3.5 Validation study C

38 university students (19 dyslexic and 19 non-dyslexic) were tested with LADS Plus. These students had been selected so that the two groups were matched on intelligence using the Wechsler Adult Intelligence Scale (WAIS–IIIUK). Diagnosis, in the case of the students with dyslexia, was made on the basis of extensive psychological testing that followed the assessment criteria laid down in the report of the *National Working Party on Dyslexia in Higher Education* (Singleton, 1999). The mean IQ for the dyslexic group was 112.16 (SD 11.3), and for the non-dyslexic group was 112.29 (SD 10.08). Analysis of variance indicated that there were no significant differences between the groups in intelligence. The LADS Plus scores on the adaptive form of the test for the two groups are shown in Table 13.

Table 13. Mean LADS Plus scores for the dyslexic and non-dyslexic groups in Validation Study C (standard deviations in brackets).

	Dyslexic (n = 19)	Non-dyslexic (n = 19)
Word Recognition	4.05 (1.78)	2.37 (1.42)
Word Construction	4.00 (2.11)	2.11 (1.56)
Working Memory	3.32 (2.75)	2.89 (2.40)
LADS Plus composite score	11.37 (4.35)	7.37 (3.58)

Analysis of variance indicated that there was a significant difference between the groups in performance on both the Word Recognition test [$F(1,38) = 10.39$; $p<0.05$] and Word Construction [$F(1,38) = 9.92$; $p<0.05$], but the difference between the groups in performance on the Working Memory test was not significant. However, the LADS Plus composite score (created by addition of the scores on all three dyslexia-sensitive tests) showed a significant difference between the groups [$F(1,38) = 9.59$; $p<0.05$]. These results indicate that overall, LADS Plus can discriminate at the group level between dyslexic and non-dyslexic adults even when intelligence is controlled for. This finding also holds for the individual tests of Word Recognition and Word Construction, but not for the Working Memory test. Inspection of the standard deviations in Table 13 shows that the variance in scores was much larger in the Working Memory test compared with the other two tests. In fact, the score distributions for the two groups on the Working Memory test

overlap quite a bit, indicating that many bright students with dyslexia have probably developed compensatory strategies that enable them to cope fairly well with working memory tasks, while some bright non-dyslexics have surprisingly poor working memory skills (at least, on this particular test).

2.3.6 Development and validation of the reasoning modules

The nonverbal reasoning test in LADS Plus has been adapted from the Reasoning module in the computerised assessment suite *LASS Secondary*. This has been validated and shown to be reliable and free of gender bias in a number of separate studies (Horne, 2002; Horne, 2007). In a study with 75 students (47 males and 28 females) from five different secondary schools in England and Wales, the nonverbal reasoning module was validated against the *Matrix Analogies Test – Short Form* (Naglieri, 1985). This is a conventional pencil-and-paper test of matrix reasoning. The correlation coefficient between the two measures was 0.52 ($p < 0.001$). In a separate reliability study involving seven other secondary schools in England and Wales, the nonverbal reasoning module was administered to 101 students on two occasions, separated by a four-week interval. The results showed no significant differences in the results on the two testing occasions (t test) and the test-retest reliability coefficient was 0.51 ($p < 0.001$). Finally, in another study involving 341 male and 389 female students, no significant gender differences were found on the nonverbal reasoning test [male mean 35.45 (SD 9.76); female mean 34.53 (SD 10.29)].

The verbal reasoning test in LADS Plus has been adapted from the verbal reasoning module in the computerised assessment suite *Lucid Ability*. This was validated against the *NFER Nelson Verbal Reasoning Test*, a conventional pencil-and-paper test of verbal reasoning, using a sample of 124 students. The correlation coefficient between the two measures was 0.65 ($p < 0.001$). Gender differences were investigated in a separate study involving 57 females and 53 males. No significant differences were found between males and females in the verbal reasoning test.

2.3.7 The LADS Plus Youth Offender studies

The development of LADS Plus involved several further research studies, including a major project carried out during 2004-05 at HM Youth Offender Institution, Wetherby, in collaboration with the University of Hull and the British Dyslexia Association. The aim was to determine ways in which LADS might be modified to increase screening accuracy when used with individuals who may have non-standard educational backgrounds. The project was carried out in three phases. Phase 1 was conducted during the Spring of 2004 and involved collecting data from an unselected sample of 116 male juvenile offenders aged 15–17 years at Wetherby YOI using the original version of LADS (which did not contain the Verbal reasoning module) and conventional tests of reading and spelling. The results indicated that as a screening tool LADS was acceptable to this population and straightforward for staff to administer but that in its standard form it produced an unacceptably high incidence of false positives (i.e. cases that may have been wrongly classified as having a high probability of dyslexia).

Phase 2 was conducted during the summer and autumn of 2004 and involved assessing cognitive and literacy skills in a selected sample of 36 male juvenile offenders aged 15-17 years, 18 of whom had high probability of dyslexia and 18 of whom had low probability of dyslexia.

The results showed that a very large proportion of the young offenders had low verbal ability, which is consistent with findings from similar studies. To a large extent, this is likely to be due to educational and social disadvantage as well as to lack of reading experience, which contributes significantly to vocabulary growth, especially after the primary stage of education. By contrast, the average non-verbal ability of participants in all phases of the study was found to be within the average range. These results indicate that in this population it is critical to have an instrument for identifying dyslexia which will allow for low levels of reading ability, low verbal intellectual skills and lack of educational opportunities. It was concluded that by incorporating a test of verbal ability into LADS and modifying the classification rules used by the program it should be possible to identify those young offenders who have dyslexia with a satisfactory degree of accuracy while reducing the number of false positives to more acceptable levels.

Phase 3 was carried out during early 2005 and involved administering a modified version of the computer-based screening test that incorporates a measure of verbal reasoning (LADS Plus) to a new unselected sample of 62 juvenile offenders aged 15-17 years. The results indicated that about 31% of young offenders at Wetherby YOI have dyslexia, a figure that is reasonably consistent with comparable studies that have used cognitive tests (as opposed to check lists and rating scales). A further 32% showed borderline symptoms.

The overall conclusions of this project were that computerised screening using the modified program LADS Plus is a practical and efficient solution for identifying dyslexia in juvenile offenders. The report of this project, entitled *Practical Solutions for Identifying Dyslexia in Juvenile Offenders*, was published in 2005 by the British Dyslexia Association.

2.4 Conclusions on the validity of LADS Plus

The process of developing LADS Plus involved three detailed studies of the validation of the dyslexia-sensitive tests, first in their full form, and then in their adaptive forms, including verification of the accuracy of the adaptive fractionation algorithm devised for the program, and checking for gender bias. Participants from several different institutions have been involved. In addition, the reasoning modules have been adapted from similar tests in an established and already widely used test suite, which has been independently validated.

Subsequently studies, including the BDA project at Wetherby YOI enabled further refinement of the program. Thus it may be safely concluded that LADS Plus meets established psychometric criteria for validity and can therefore be used with confidence as a screening test for dyslexia. The individual tests in LADS Plus have good accuracy to discriminate between individuals with dyslexia and non-dyslexic adults and are free of gender bias. Furthermore, the combination of the three LADS Plus scores, either as a composite score, or as a qualitative profile, or both, provides a very high degree of accuracy — much greater than reliance on the individual test results alone. However, it should not be forgotten than LADS Plus is a screening test and, as such, is inevitably subject to some degree of classification inaccuracy. The tests in LADS Plus assess core cognitive skills that are typically weak in dyslexia (phonological processing, lexical access and working memory) and so would be expected to detect the majority of adults with dyslexia. However, adults with atypical forms of dyslexia (e.g. cases in which phonological processing deficits are not found or where visual processing deficits predominate) would not be detected by LADS Plus. The careful development and validation process that LADS Plus has been subjected to has sought

to minimise classification inaccuracy as far as has been practically possible, given the brevity of the tests in the program. In order to keep errors to a minimum, Administrators should refer to Chapter 4 when interpreting results and making decisions about adults who have been screened using LADS Plus.

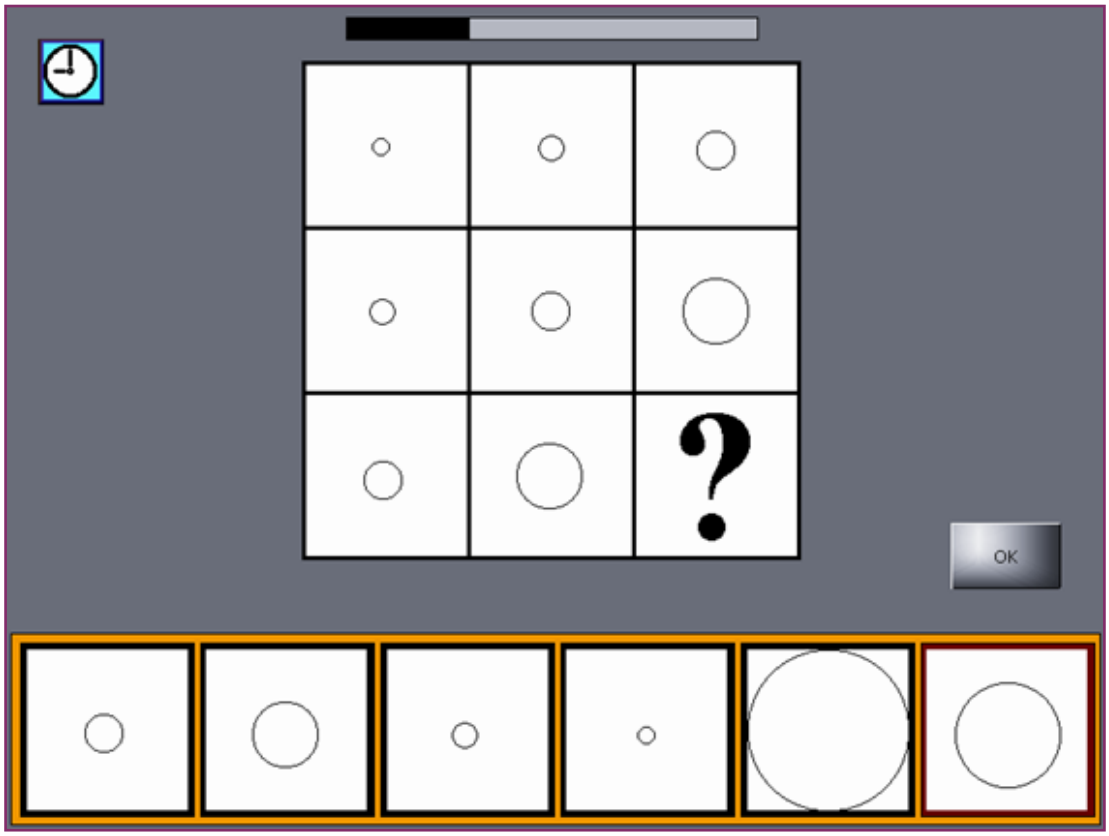
3 Administering LADS Plus

3.1 The assessment modules in LADS Plus

3.1.1 Nonverbal reasoning

Nonverbal reasoning is an adaptive test involving matrix puzzles that can be solved by a careful application of logical reasoning, using both visual and verbal strategies. Each item comprises a 3 × 3 matrix with the bottom right hand square empty. The task is to choose which of six squares at the bottom of the screen complete the pattern, and then click on the 'OK' button to move to the next item (see Figure 1). Progress through the test depends on the person's performance and the test is discontinued when a certain number of items within a given level are failed.

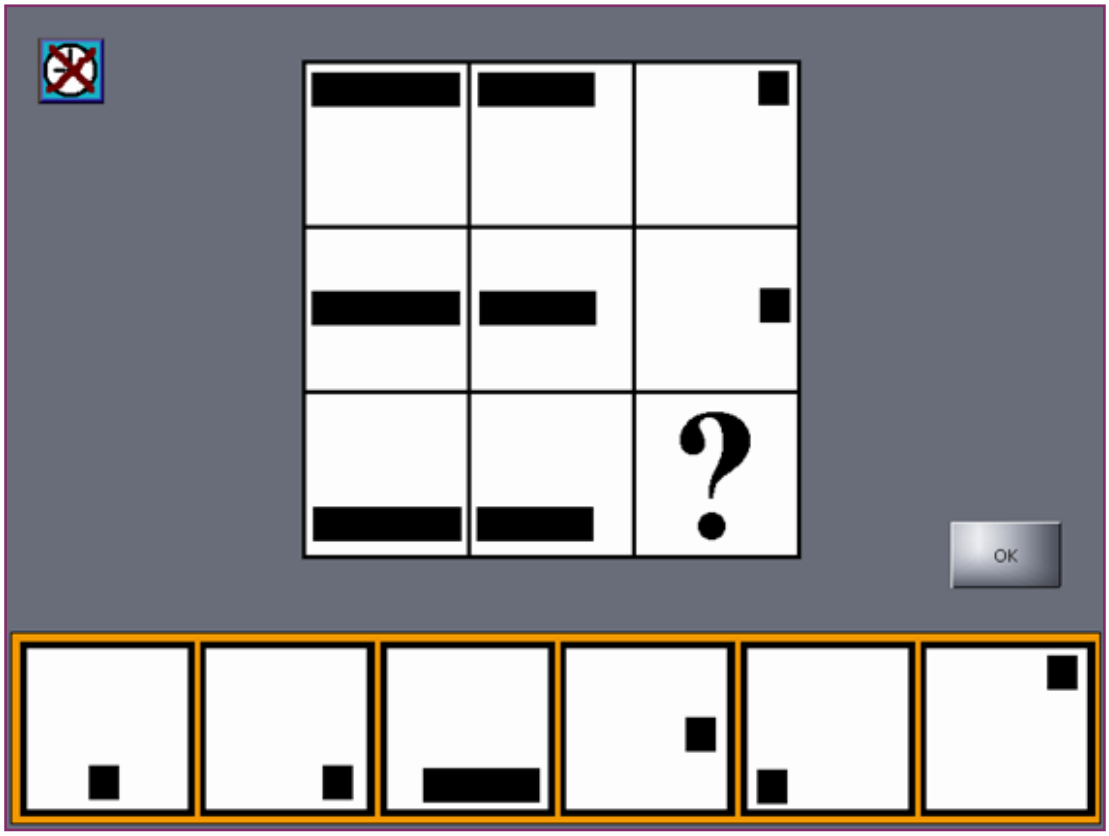
Figure 1. Example screen from the LADS Plus Nonverbal Reasoning test with Timer bar active.



The nonverbal reasoning module is not intended to be a speeded test (i.e. performed against the clock), but in the interests of avoiding excessively lengthy assessment sessions, a (fairly generous) time limit of 30 seconds has been allowed for each item. For most persons this should allow sufficient time for a reasonable attempt at each item. To allow greater time would not increase validity or reliability of the test, so if time runs out then this must be accepted as part of the exigencies of the task. The passage of time is shown by means of a red **Timer bar** across the top of the screen so that users can easily determine when time is running out and they must therefore come to a swift decision. However, a few individuals find this Timer bar unsettling and it

may distract them from the task in hand. If this is the case, the Timer bar may be deactivated by clicking on the clock button shown in the top left-hand corner of the screen (see Figure 2).

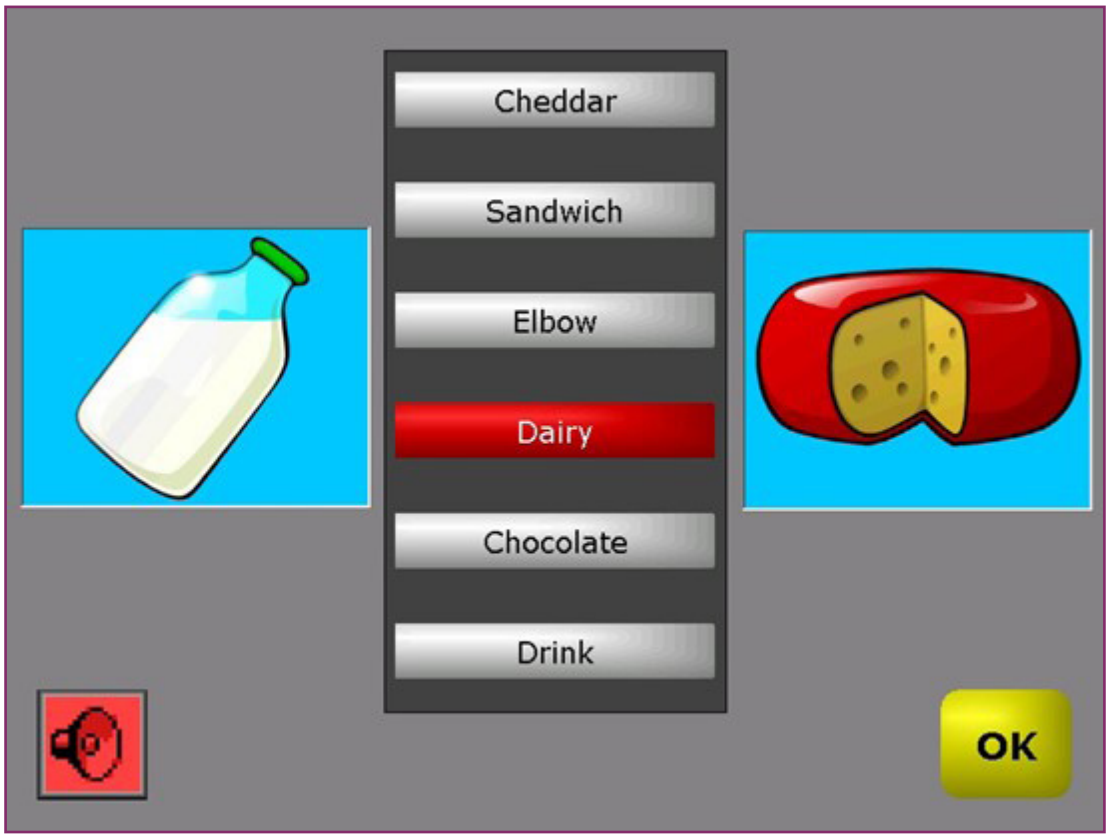
Figure 2. Example screen from the LADS Plus Nonverbal Reasoning test with Timer bar deactivated.



3.1.2 Verbal Reasoning

The verbal reasoning module is an adaptive test of verbal conceptual relationships. In each item two pictures are presented on the screen, separated by six words (see Figure 3). The task is to identify the word that provides the best conceptual link between the two pictures: this is the target word; the other five are distractors. For example, in Figure 3 the pictures are of a bottle of milk and a piece of cheese. Out of the six words on the list, the best word that links these pictures conceptually is 'dairy'. Of the five distractors, two have strong links only with one picture (in this example 'sandwich' and 'cheddar' have strong links with cheese but less so with milk) and two have strong links only with other picture (in this example 'drink' and 'chocolate' have strong links with milk but less so with cheese). The fifth distractor (in this case 'elbow') is randomly selected. (Arguably, 'cheddar' has links with both cheese and milk, but the task is to find the 'best' link, which in this case is 'dairy'). If the person taking the test wishes, the computer will speak the words when they are clicked on, so reading competence is not necessary. The tests phase is preceded by two interactive practice items with audio feedback on responses. Progress through the test depends on the person's performance and the test automatically terminates when the person's ability level has been exceeded.

Figure 3. Example Screen for LADS Plus Verbal Reasoning module.



3.1.3 Word recognition

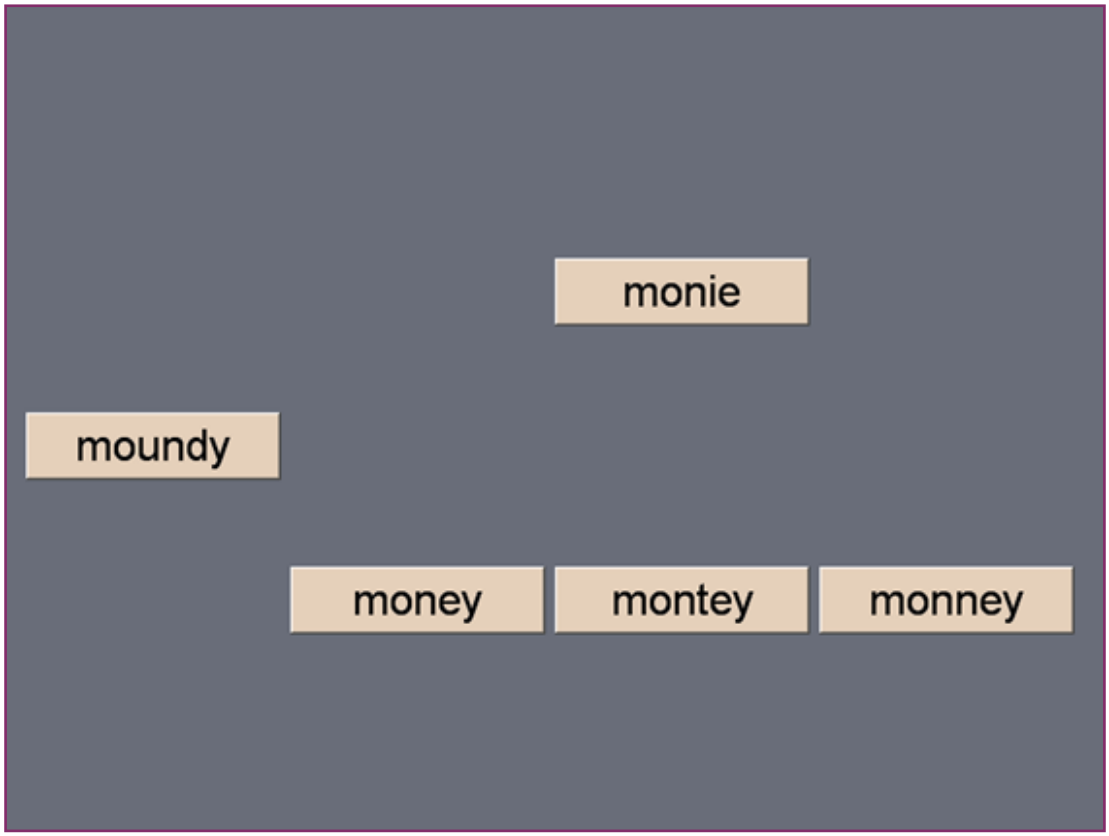
The Word Recognition module is a test of lexical decoding involving speeded recognition of real words from nonwords. Five words appear on the screen in random positions (see Figure 4). Only one of these five is a real word; the other four are nonwords or misspellings of real words. The person taking the test has to click on the real word as quickly as they can. If no response is made within 30 seconds, the program automatically moves on to the next item, in accordance with the adaptive fractionation algorithm. However, for individuals who score within the top 10% of the population on the nonverbal reasoning test (classified 'High' Nonverbal Reasoning ability), the time allowed on this test is reduced to 8 seconds per item. The purpose of this is to place additional processing speed constraints on exceptionally bright individuals who will normally be able to compensate well for any dyslexic difficulties. In the validation studies it was found that this time restriction is still sufficient to allow all bright non-dyslexic individuals to cope with the items satisfactorily.

The test begins with four practice items, which are accompanied by spoken instructions. When the program has delivered sufficient test items to be able to make a reliable classification of the individual into one of the nine categories, the test is terminated. The minimum number of items administered is 10, and the maximum 40, although most people taking the test receive 20 items.

The cognitive processes underpinning this task are (a) rapid retrieval of real words from the mental lexicon (lexical access), and (b) swift and efficient phonological decoding to eliminate nonword distractors. Skilled readers probably carry out these processes simultaneously while quickly scanning all five words. Less skilled readers may need to process each word in

succession, both phonologically and lexically. Readers with dyslexia are likely to have insufficient phonological or lexical skills to cope with the task and so may have to resort to guessing for much of the time.

Figure 4. Example screen from the LADS Plus Word Recognition test



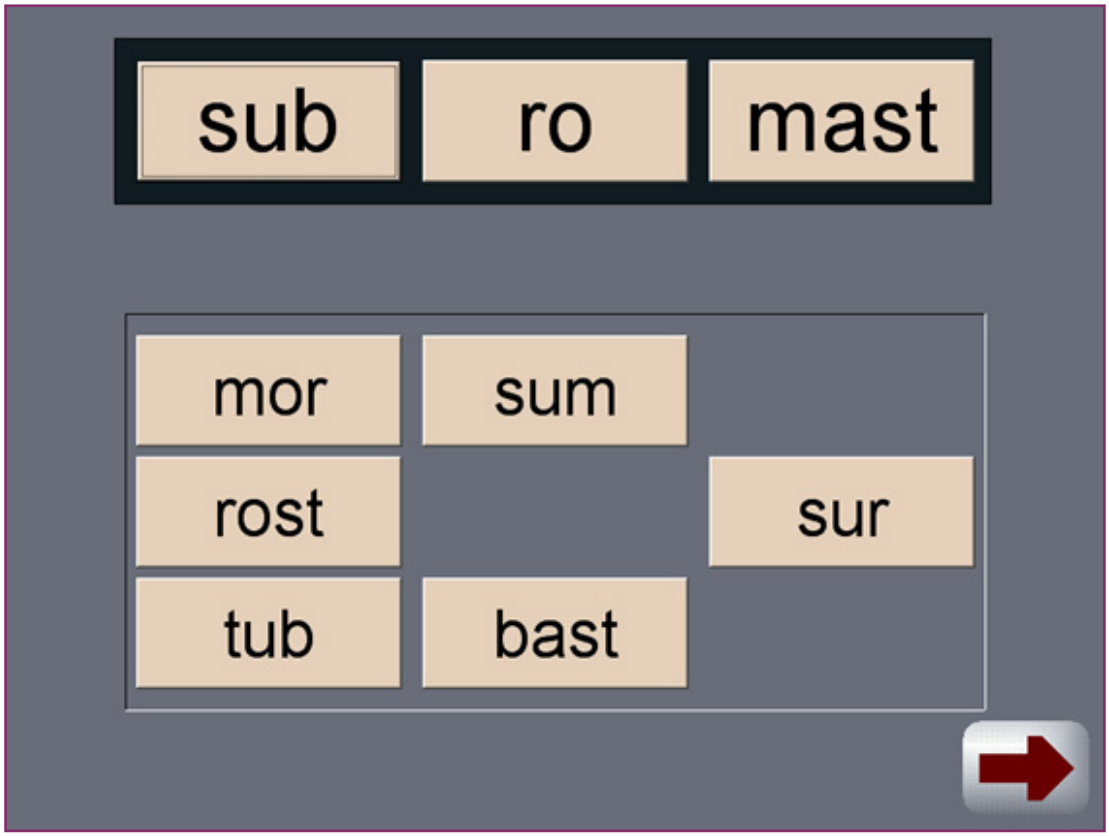
3.1.4 Word construction

The Word Construction module is a test of lexical encoding of nonwords from syllables. The computer speaks a three-syllable nonword (e.g. 'Subromast') and the person taking the test has to click on the syllables that make up this nonword in the correct order, selecting them from nine different syllables displayed on the screen in a 3 ´ 3 grid (see Figure 5). As each syllable is clicked on, it appears in a template at the top of the screen. If a mistake is made, the person can click on the template and it will undo the error, so another choice can be made. When the person is satisfied with their choice of syllables, they must click on an arrow at the bottom right-hand corner of the screen, and the program proceeds to the next item, in accordance with the adaptive fractionation algorithm. The test begins with two practice items, which are accompanied by spoken instructions. The task has to be completed as swiftly as possible. If no response is made within 30 seconds, the program automatically moves on to the next item.

However, for individuals who score within the top 10% of the population on the nonverbal reasoning test (classified 'High' Nonverbal Reasoning ability), the time allowed on this test is reduced to 6 seconds per item. The purpose of this is to place additional processing speed constraints on exceptionally bright individuals who will normally be able to compensate well for any dyslexic difficulties. In the validation studies it was found that this time restriction is still sufficient to allow all bright non-dyslexic individuals to cope with the items satisfactorily. When

the program has delivered sufficient items to be able to make a reliable classification of the individual into one of the nine categories, the test is terminated. The minimum number of items administered is 10, and the maximum 40, although most people taking the test receive 20 items.

Figure 5. Example screen for the LADS Plus Word Construction Test.



The cognitive processes underpinning this task are (at the very least): (a) good phonological awareness whereby the spoken word can be segmented into its constituent syllables, (b) a reliable auditory short-term working memory for holding the results of this segmentation in the correct sequence in the phonological loop while these are actively processed, and (c) an efficient system of phonological encoding whereby graphemic equivalents of phonemic codes can be recognised and assembled in the correct order. As with the word recognition task, few adults with dyslexia are likely to have phonological or working memory processes that are efficient enough for them to be able to carry out this task well. A particularly heavy load is placed on working memory because of the requirement for simultaneous processing of syllables in the grid (in order to be able to select the correct ones) whilst at the same time retaining the nonword heard in the phonological loop.

3.1.5 Working memory

The Working Memory module is a test of backwards digit span. A sequence of digits is spoken by the computer, and the person has to immediately enter these in reverse order from memory using the keyboard. The test begins with two practice items accompanied by verbal instructions. The test then proceeds as in a conventionally delivered digit span task, commencing with items of two digits in sequence, followed by items of three digits, and so on up to nine digits in

sequence. At each level, two items are presented. If correct responses are made to one or both of these items then the program proceeds to the next level, in which there will be one more digit than the previous level. If both items are incorrect, then the program terminates.[7] The task has to be completed as swiftly as possible. The program allows a limited time for each item; this is a function of the number of digits in the item and varies from 14 seconds up to a maximum of 28 seconds. Figure 6 shows an example screen from the Working Memory module.

Figure 6. Example screen from the LADS Plus Working Memory Test.

The computer scores (a) the number of items correct, and (b) the number of digits in correct position. The overall score for the test is a composite of these two measures. This method of scoring provides greater sensitivity than a conventional digit span test, in which only the first method is usually employed.

A backward digit span task places a heavy load on active rehearsal processes in short-term working memory, for which there is ample evidence of weakness in dyslexia. By contrast, a forwards digit span task arguably requires only straightforward recall from the phonological loop in short-term memory, without necessarily impinging on working memory processes. For this reason, backwards digit span is generally regarded as a more sensitive indicator of dyslexia (Turner, 1997; Everatt et al., 2000; Reiter, Tucha and Lange, 2005).

[7] Except at the first level, in which the person is automatically permitted to proceed to the second level. This is a precaution against premature termination of the test in the event of the person making careless errors due to not settling into the test right away.

3.2 Administration procedure

3.2.1 Test sequence

The nonverbal reasoning module must always be administered first (in fact, the program forces this) and the verbal reasoning module next. Thereafter, it is recommended (but not absolutely essential) that the three LADS Plus tests are administered in the order in which they appear on the Tests menu: i.e. Word Recognition first, followed by Word Construction, and Working Memory last. This is because the requirements of the Word Recognition test are the easiest of the three to grasp, while those of the Working Memory test are the hardest to grasp. This sequence allows persons being tested to become acclimatised to the test requirements and get used to the mental demands of the tasks in a less abrupt fashion.

LADS Plus only takes about 25 minutes, on average, to complete and has been designed to be done in one sitting although breaks can be taken between tests if necessary. It is strongly recommended that all five tests are completed as otherwise an automatic interpretation of results cannot be given by the program. In rare cases where an individual has not been able to complete all the tests (e.g. because they have become unwell or because of extreme anxiety) it is still possible to access the report but special care should be exercised when interpreting results — see Section 4.2.7.

3.2.2 Testing environment

All the tests in LADS Plus are mentally challenging and demand close concentration. Therefore, they should be administered in a quiet environment that is as free from distractions as possible. It is essential that persons taking the tests are able to hear the instructions and test words clearly. Unless the testing environment is a quiet one, this is best achieved by means of headphones.

The Administrator should check that the headphones are working properly and that the sound level is suitable for the person being tested (neither too loud nor too quiet). Before a screening session, the supervisor should ensure that the screen, keyboard and mouse are all working normally.

Use of headphones is imperative when more than one person is being tested at the same time in the same room (e.g. in the case of group screening using a network), and special care should be taken to ensure that individuals do not distract others. Instructions should be given beforehand that if any person being tested requires assistance, s/he should put up their hand and wait for the Administrator to come to them. They should not call out for assistance as this may distract others.

3.2.3 Supervision of testing

One of the advantages of LADS Plus is that it can be self-administered, so reducing administrative load and time. The Administrator first should check that the person taking LADS Plus has entered their name and other details correctly on the registration screen (or the Administrator should take responsibility for entering these details). The person being tested

should be told that the screening comprises five separate tests and takes about 25 minutes in all. The Administrator must decide (and inform the person being tested accordingly) whether they wish the person being tested to go through all five tests in sequence and without a break, or whether they wish them to pause and wait for further instructions before proceeding to the next test. Once the Administrator is satisfied that the person is progressing satisfactorily with the tests, most adults can be left to go through the tests themselves, with only light supervision.

However, there are four circumstances in which closer supervision by the Administrator is strongly advised:

1) When testing more than one person at the same time in the same room (e.g. in group screening using a network). This is essential to prevent persons being tested deliberately or inadvertently distracting each another.
2) When the person being tested is suspected of being of low ability (and so may require additional assistance to understand the requirements of the test).
3) When the Administrator is concerned that the person being tested may not take the assessment seriously, and so may respond at random or not respond at all, and just wait for the automatic time out to take the program though the items until termination. Such behaviour would obviously invalidate the results of the screening; by watching the person it is possible to determine whether the person is doing this.
4) When the person being tested seems to be excessively nervous or anxious about the assessment. Although this is extremely rare and most adults are not worried about doing computer-based tests, high levels of anxiety may interfere with cognitive functioning. The person may say things like "My mind has gone completely blank — I can't think of anything at all" or even 'freeze' altogether. In such cases it is recommended that the person is reassured and allowed to calm down before starting. It may also be helpful to have the Administrator sit with them during the assessment, at least until they have got started on the tests, and to give breaks between the tests.

3.2.4 Accessing results

For information on how the Administrator can access results, please consult the *LADS Plus Software User's Guide*. A password will be required to access the results. This is not only to prevent persons being tested from accessing other people's results, but also to ensure that individuals being screened do not access their own results and misunderstand them.

It is recommended that the Administrator should access the results when the person who has been tested is not present. This allows the Administrator to print out the results, consider them carefully and then give proper feedback to the person, including, if necessary, advice on where to obtain further help and/or counselling. Results should not be given to the person who has been tested without careful consideration and proper feedback. These matters are explored more fully in Chapter 4.

3.3 Retesting

Very occasionally, testers may consider retesting an individual with LADS Plus after they have already been tested on it before. Although there may be a valid motive for wanting to do this, generally it is not a good idea because the results of a retest could be misleading for reasons that are explained in Section 3.3.2.

3.3.1 Possible reasons for retesting

Before going any further, however, it is essential to reflect on *why* it might be appropriate to retest an individual. Sometimes the first screening does not conform to expectations. When considering this issue, it is important to bear in mind that LADS Plus is a fairly quick screening test and, like all screening tests, is not infallible. Its advantages are speed combined with an accuracy level that is generally very good for detecting the most common cases of dyslexia where the underlying problems are in phonological skills and verbal memory. But on a very few occasions LADS Plus may get it wrong. In particular, less common types of dyslexia, such as those where the underlying problems are in visual-perceptual or visual-motor skills, are less likely to be detected by LADS Plus. If the individual's difficulties are in the latter aspects of cognition then retesting with LADS Plus is unlikely to shed any light on the matter and it would probably be better to consider alternative forms of assessment or seeking professional help from an educational psychologist.

Another situation where retesting might be under consideration is where the individual was unwell at the time of the first screening, or not appropriately motivated, or distracted, or failed to understand exactly what was required of them. As explained in Section 3.2, the proper course of action is to ensure that the conditions necessary for effective screening are met before embarking on screening in the first place.

3.3.2 Why is retesting not recommended as a general rule?

The chief reason why retesting is not usually a good idea is because all psychological and educational tests are subject to *practice effects*, which are the positive or negative psychological impacts of previous assessment(s) on an individual's performance. Positive impacts, which include factors such as item familiarity and increased confidence as a result of previous experience with the tasks, tend to *inflate* scores on subsequent assessment occasions. Negative impacts, which include factors such as decreased motivation due to boredom with the tasks or overconfidence as a result of feedback from previous assessments, tend to *deflate* scores on subsequent assessment occasions. Furthermore, practice effects will not necessarily affect all individuals to the same extent. Some people may experience more negative effects while others may experience more positive effects. In general, the magnitude of practice effects is a function of how often individuals have been assessed on this or similar tests and the time interval between assessments. Both positive and negative psychological impacts tend to decrease as the time interval between assessments increases.

It can be seen, therefore, that retesting with any psychological or educational test is highly likely to produce results that have been influenced in some way – either positively or negatively – by the original assessment, and as a consequence are less likely to be valid or reliable.

3.3.3 Exceptions to the general rule

Exceptional situations may arise when even the most conscientious tester feels the needs to re-administer one or more of the tests in LADS Plus because it was discovered after the original screening that the individual was unwell, or where a fire drill interrupted the assessment, or if the individual was clearly not applying proper attention or effort to the tasks. In such cases, the results are unlikely to give a true indication of abilities and it is permissible to re-test the individual *but only after an appropriate length of time has elapsed*. Professional opinions differ somewhat on this matter – some authorities recommend at least a year between tests, while others suggest that six months is acceptable. The point is that enough time should have passed to reduce the risk not only of remembering items significantly but also of being demotivated by being confronted with the same test yet again. Of course, it is important to ensure that the individual is properly prepared for the retest, including explaining why the retest is necessary. The first result should be discarded and the second result should be regarded as being more likely to reflect the 'true' abilities of the individual.

If it is considered essential to have answers regarding an individual's educational difficulties sooner rather than later, then instead of rescreening before an acceptable interval has elapsed it would be better to use other types of assessment or to obtain a psychological assessment from a suitably qualified psychologist.

3.4 Assessing individuals who have limited English

Assessment of any individual who has limited proficiency in spoken or written English is often problematic (Cline and Shamsi, 2000). In the case of LADS Plus, we first need to consider the nature of the component sub-tests. As explained in Section 1, the tests in LADS Plus are designed to identify people who display deficits in various aspects of phonological processing, because the principal weight of research evidence on dyslexia supports this approach. So, the critical question is: Can this be carried out satisfactorily in a language other than the person's first language? Fortunately, the answer to this question is yes. There is good evidence that phonological skills of bilingual individuals can be assessed in the majority language (in this case English) when no suitable test in the minority language (which would be their first language) is available. Miller Guron and Lundberg (2003) found that, given sufficient exposure to the majority language, bilingual students whose first language is a minority language may be expected to score comparably on tests of phonological ability and non-word reading in the majority, and thus poor scores on phonological and non-word tests can be taken as indicative of cognitive deficits due to dyslexia rather than necessarily being attributed to lack of experience in the majority language. This result is consistent with findings by Bruck and Genesee (1995), Frederickson and Frith (1998) and Everatt et al. (2000), which show that bilingualism does not impair (and can even enhance) phonological ability in both languages, and that non-dyslexic bilingual individuals can show normal phonological awareness, non-word reading and rapid naming skills. This evidence is further supported by later research (Goldstein et al., 2005; Martinelli & Brincat, 2020).

Hence the evidence indicates that assessment of the various aspects of phonological processing in English can reveal difficulties of a dyslexic nature even in people for whom English is an additional language, although obviously assessors have to exercise caution when interpreting the test results of such individuals. A certain basic knowledge of English is necessary, and the results should be considered in relation to the level of English knowledge of the individual with the conclusion being modified in the light of this. Factors that should be taken into consideration include whether or not English is one of the languages spoken in the person's home, how long the individual has been living in an English-speaking environment, and how long they have been educated in English.

The practice items enable most adults, even those with only a little English, to understand the tasks, and where there is uncertainty a tester or assistant who speaks the student's first language can help with explaining instructions. In order to tackle the Working Memory test the individual will need to know the digits 1–9 in spoken and written form. Provided they do know these, it is safe to interpret high risk scores (red) on Working Memory as genuinely indicative of dyslexia.

Interpreting the results of the Word Recognition and Word Construction tests, however, is somewhat trickier. The Word Recognition test requires sufficient experience of real English words to be able to swiftly discriminate these from non-words. If the adult's spoken English vocabulary is limited, then it would be expected that their performance on the Word Recognition test will be adversely affected because if they don't know the spoken version of a word, they are unlikely to know its written form. Similarly, the Word Construction test assumes exposure to, or tuition of, the phonic principles governing construction of English words, even though the actual examples are non-words. It must therefore be expected that while some individuals who have limited proficiency in written English may show some impairment of phonic skills compared with typical English first language speakers, the evidence discussed in the last paragraph suggest that this is likely to be minimal. Consequently, a LADS Plus result that shows high risk (red) for Word Recognition or moderate risk (amber) Word Construction is not necessarily indicative of dyslexia because this may simply reflect the individual's limited experience of English, and the more limited that experience is, the greater the likelihood that this is the case. On the other hand, if the person has been in the UK for several years (or has been similarly exposed to spoken and written English in some other environment), it is reasonable to expect that while there may be some modest impairment of performance on Word Recognition or Word Construction compared with other adults, this would not normally take results into the moderate or high risk zones. In this situation, much rests on the result of the third test, Working Memory, which is relatively independent of language effects. If this test shows moderate or high risk it is more likely that dyslexia is the cause, and if so, moderate or high risk results on Word Recognition or Word Construction would support this.

Another result that can help in interpretation of LADS Plus findings is that of the Verbal Reasoning test. Adults with limited proficiency in spoken or written English will typically score much lower on Verbal Reasoning than on Nonverbal Reasoning, because their awareness of the names of verbal concepts will be less than that of a typical English first language speaker. Of course, this pattern of reasoning results is not necessarily indicative of English as an Additional Language: a fair proportion of English first language speakers will also have this pattern, and many individuals with dyslexia do, too. But where the Verbal Reasoning score is average or

better, it is safe to assume that the student has sufficient knowledge of English not only to be able to cope with the Word Recognition and Word Construction tests in LADS Plus, but also that any deficiencies in the results of those tests are genuinely indicative of dyslexia.

A case study where a student for whom English is an additional language (EAL) was assessed using LADS Plus is given in Case Study J (Section 4.3). Like most adults with limited English, this individual responded well to the assessment and extremely valuable information was obtained. For further information on assessment of learning difficulties in literacy (including dyslexia) in EAL students and other multilingual students, see Cline (2000), Cline and Frederickson (1999), Cline and Shamsi (2000), Durkin (2000), Gunderson, D'Silva and Chen (2011), Mortimore et al. (2012), Tsagari and Spanoudis (2013) and Peer and Reid (2016).

3.5 Assessing individuals who have low levels of literacy

In some settings, individuals who have low levels of literacy are likely to be encountered. This is particularly the case with young offenders and prisoners. Working with this client base provides a host of special challenges and it is important to understand and appreciate these in order to provide individuals with a positive and productive experience. For many such individuals the experience of being screened using any tool will be new and there is a strong likelihood that the difficulties that they have perhaps experienced over a long period of time have never previously been linked to dyslexia. Coupled with this is the factor that many will feel particularly emotionally vulnerable around the issue of their literacy skills. It is, therefore, important to appreciate such concerns before embarking on a screening process.

A factor that seems to provide the use of LADS Plus with a distinct advantage is that it is computer-based. This is generally less threatening for individuals with low levels of literacy than those tools that require individuals to read or write, particularly those that require an individual to read aloud.

Often individuals are referred from other agencies or services to unfamiliar individuals for the screening process to be administered. A part of the process in such instances must provide the opportunity to build up a rapport and trust between the client and the administrator. Although LADS Plus can be used to screen large numbers of individuals simultaneously, when working with this group of clients it is usually more effective to work on a one-to-one basis. The reasons for this are:

- Individuals may well require emotional support as they might find the process very stressful.
- The initial instructions given within each test of the LADS Plus may require some explanation and some support may be required in order to coach an individual through the practice examples contained within each test.
- Often individuals require positive reinforcement and encouragement throughout the process.

It should also be understood that an individual may have low levels of literacy for a variety of reasons other than dyslexia and the potential for such factors also needs to be explored in an initial discussion with the client. These factors could include:

Inadequate education. If an individual has had limited opportunity to access education, then it would not be surprising that their literacy levels may be lower than expected.

Broken or disrupted education. If an individual has encountered frequent changes in education such as many changes of school, it may also result in lower than expected literacy levels.

Disrupted social background. If there is a history of social disruption this may also have had an impact on an individual in terms of them being receptive to education due to emotional upheaval etc.

People of lower ability levels. Individuals who are of lower intelligence may well exhibit indicators that are similar to those of dyslexia, for example poor literacy/numeracy skills and difficulty with acquiring work-related skills. Although this is not to say that someone of lower overall intelligence cannot also have dyslexia.

People from diverse communities or ethnic minorities. Individuals who are part of diverse communities or ethnic minorities may not have accessed formal education in the way that might be expected and within some communities, literacy is not necessarily viewed as an important or valuable skill for all individuals to develop.

People who have suffered a brain injury. In some circumstances damage to the brain sustained through an injury can also present very similar to dyslexia.

People who have a history of substance abuse. A history of long-term substance abuse may affect an individual's cognitive (thought processing) skills, and where this is suspected such an issue should be factored into the overall analysis of the results, although such a factor would not also exclude an individual from also having dyslexia. If an individual is currently using any substance that may affect performance, it is worth being cautious within the screening process as such usage may well affect the results. This also includes the use of some prescription medications.

People with physical difficulties. Before continuing with any screening for dyslexia it is always advisable to rule out any other physical factors such as previously undiagnosed problems with hearing or eyesight particularly as low levels of literacy or socio/economic factors may have presented a barrier for an individual in terms of accessing health care provision.

3.5.1 Explaining the screening process

An overview of the process should include information about why the client is there, i.e. to undertake a screening for dyslexia using a computer-based set of activities. It should be explained to the client that the screening process requires them to complete a set of five short activities and that these are non-verbal reasoning, verbal reasoning, word recognition, word construction and memory. The reason for doing this is to ensure that the client feels that they will be fully informed of all aspects of the process.

Although they can take a break after any of the activities the program should not be stopped in the middle of the activities. With each activity the computer will give them some instructions but reassure the client that you are there to give them any assistance if required, although you cannot give them the answers and that in fact you do not know the answers. This seems to really help individuals, in that it doesn't feel as if you are judging them. It is important to reassure the client that these are not tests that they can pass or fail.

3.5.2 Administering the tests

3.5.2.1 Non-verbal and verbal Reasoning

Some individuals can find the tasks in both these tests very daunting. After the instructions have been completed it is helpful to go through them again verbally and using the picture on the screen to illustrate. Explain what is required: choosing from the options on screen they have to pick which one they think is most appropriate. In the case of verbal reasoning, if the Administrator suspects that the person may not be able to read all the words, the option to hear the words spoken by the computer should be selected. Some individuals may be embarrassed or hesitant to request this so the Administrator should take the initiative. Also, in the nonverbal reasoning test explain that on the real task there will be a bar at the top of the screen that is the timer, reassuring them that they have plenty of time to make their choice although it will make a noise when they are running out of time. Another aspect to identify is that the tasks will become more difficult as they work through each test.

On occasions it may be necessary to coach the individual with the first item to build up their confidence. In the non-verbal reasoning test this could be by pointing out that looking across the grid they can see that the circles are getting bigger, and ask which one would they choose from the bottom. Once this item has been completed, they should continue to make their choices without further coaching. It is also worth noting how they tackle each of the tasks, what strategies they use; quite often individuals will verbalise what they are thinking and this can provide a useful insight to the thinking strategies that they are using and that could be applied to other areas. Throughout the task give reassurance, providing this doesn't disturb them during the task. On completion, congratulate them on how well they have done.

Note that some individuals who are anxious, unconfident or not used to being tested may take significantly longer on these tests, as they may need to ponder the possible answers for quite a while. They should be given time to do this and not rushed, as this could lead to unreliable results.

3.5.2.2 Word Recognition

This is perhaps the most challenging of the tasks for such clients for several reasons:

1. It is testing those skills that may be very weak
2. The vocabulary used within the test is quite challenging and may be unfamiliar
3. It is one where the client suspects that they are getting the answers wrong
4. As some of the words displayed look very similar it is difficult, even if they think they know the word, to pick the correct option

5. For those with very weak skills in this area there is not enough time for them to examine every word displayed carefully

If the administrator knows or suspects very low levels of literacy it is worth telling the client that they might find the task more difficult, and perhaps adding that you, the administrator find it hard also, but that if they are not sure of the answer they can simply pick the one that looks most familiar. Throughout the activity it is sometimes helpful to encourage the client by telling them that they are doing well.

Again, additional information can be gathered about how an individual is tackling the activity, as often the client will attempt to sound out the word. Upon completion of the activity reassure the client that they did well and that this one is probably the most difficult of all the activities they will undertake.

3.5.2.3 Word Construction

The instructions for this activity sometimes require further clarification although most individuals complete the task quite easily once they understand what is required. Following the instructions from the computer, coach the individual through the practice elements. Rather than use the word 'syllable' it may be easier to understand if the term 'chunk' is used, so explain that they will hear a word and then they need to build the word from the chunks in the grid, but that the words they will hear are not real words just 'made up' ones. Sometimes an individual will ask you to repeat the word after it has been spoken by the computer, explain that you are not allowed to do this, unless you feel that there has been an outside noise or disturbance that has actually prevented them from hearing it.

This activity can yield some very helpful information, e.g.

- An individual may pick up the first syllable but miss the middle or end one
- They may repeatedly confuse similar sounds
- They may be unable to 'let go' of the previous word when the next one is given and have a very erratic profile of performance getting alternate ones correct
- They may frequently forget the given word or chunks of that word
- It might provide an indication of their decoding skills in terms of whether they can deal with/identify individual letter sounds, blends, long and short vowel sounds, etc.

All such factors give an indication of both the individual's ability to process auditory information, the skills/strategies being used and the level of such skills. Such information can then be used to inform programmes of support and/or intervention.

3.5.2.4 Memory

The instructions that accompany this activity can be a little confusing to some individuals, so it is worth explaining what is required in simple terms and, where necessary, working through a verbal example in addition to the practice item given. Many individuals find this activity very challenging and it is best to remain as unobtrusive as possible during its administration.

4 Interpreting results of LADS Plus and giving feedback

4.1 Introduction

LADS Plus has been designed to give results that are very straightforward to interpret, so that Administrators who are not teachers, specialist assessors or psychologists can deal with them perfectly well. It is not necessary to have a detailed knowledge of dyslexia in order to interpret the results of a LADS Plus screening, but some knowledge of dyslexia is desirable, particularly when giving useful feedback to the person who has been screened. Reid (2016) is recommended for this purpose.

Helpful publications specifically on dyslexia in adults include:

Bartlett and Moody (2010) *Dyslexia in the workplace: An introductory guide (Second Edition)*. Wiley-Blackwell.

Brunswick (2012) Supporting dyslexic adults in Higher Education and the workplace. Wiley-Blackwell.

Du Pre, Gilroy and Miles (2007) *Dyslexia at college* (Third edition). Routledge.

McLoughlin and Leather (2013) *The Dyslexic Adult: Interventions and outcomes – An evidence-based approach.* BPS Blackwell.

Reid and Kirk (2001) *Dyslexia in adults: education and employment.* Wiley.

Further information can be obtained from the British Dyslexia Association (see Section 6).

It is recommended that the Administrator should access the results when the person who has been tested is not present. This allows the Administrator to print out the results, consider them carefully and then give proper feedback to the person, including, if necessary, advice on where to obtain further help and/or counselling. Results should not be given to the person who has been tested without careful consideration and proper feedback (see section 4.4).

Be prepared to listen to the client and answer his or her questions as helpfully as possible. Be prepared for the client to become emotional or upset about the results. Sometimes there is an emotional response because the person is under the mistaken impression that having dyslexia will restrict their educational and/or occupational opportunities. Or their reaction may be one of joyful (or tearful) relief, because at last they know that there is a name for the problems they have experienced for so many years, and that there are sources of help.

Occasionally the reaction is one of anger because the client believes that their dyslexia should have been recognised long ago when they were at school, and this evokes unpleasant memories of childhood humiliation for poor schoolwork. It is often advisable to suggest that the client sees a professional counsellor to talk through their feelings about the news, although few counsellors know very much about dyslexia. Most universities and some colleges have professional counsellors on the staff.

When the client belongs to a special category (e.g. prisoners, young offenders, immigrants), has a nonstandard educational background, poor verbal ability, low levels of literacy, or is vulnerable for any reason, special care needs to be taken when administering LADS Plus and interpreting results.

4.2 Interpreting LADS Plus results

4.2.1 The Reports screen

The *LADS Plus Software User's Guide* explains how the Administrator can access the Reports screen. The Administrator's password will be required. This is not only to prevent persons being tested from accessing other people's results, but also to ensure that a person being tested does not access their own results and misunderstand them.

The report is composed of an upper left-hand white panel showing the person's results on each of the three dyslexia-sensitive tests, the scores for which can range from 1 to 9. The categories used are as follows:

No indications of dyslexia			Weak indications of dyslexia			Strong indications of dyslexia		
1	2	3	4	5	6	7	8	9

These are depicted on the reports screen in graphical form: a red bar signals strong indication of dyslexia on that test, an amber bar signals weak indication of dyslexia on that test, and a green bar signals no indication of dyslexia on that test. In other words, the higher the score on each assessment module in LADS Plus, the higher the probability that the person has dyslexia. If a test has not been completed, no bar will be shown against the name of that test.

To the right there is another white panel showing the person's result on the two reasoning tests, which gives a fair estimate of the person's verbal and nonverbal intelligence. This is also depicted in graphical form (a blue bar for nonverbal reasoning and green bar for verbal reasoning) on a five-point scale as follows: 'low' (bottom 10% of adult population); 'below average' (next 15%); 'average' (middle 50%); 'above average' (next 15%); and 'high' (top 10%).

At the bottom of the reports screen is a third white panel containing the overall classification in terms of the probability that the person has dyslexia. ('high', 'moderate', 'borderline' or 'low') together with a brief description of the results. Note the classification and description will only be shown if the person has completed all five of the LADS Plus tests. In cases where it has not been possible for the individual complete all five tests see Section 4.2.7 for advice on interpretation.

The Administrator may add his or her own comments to a report and these can be included in the lower half of the individual print-out for that each person. Clicking on the **Print** button takes the user to the **LADS Plus Print Preview** screen, through which a print-out may be obtained for each individual. Clicking on the **Testing progress** button on the **Administration menu** will

bring up a simple spreadsheet depicting which of the assessments each registered person has completed. This can also be printed out as a useful record. For further information on printing see the *LADS Plus Software User's Guide*.

4.2.2 Understanding the overall classification

The overall classification, in terms of the probability that the person has dyslexia ('high', 'moderate', 'borderline' or 'low'), is shown on the reports screen and printed report. This classification will only be given if the person has completed all five of the LADS Plus tests; otherwise, it will state 'Report unavailable as assessment incomplete.' The classification algorithm is based on the pattern of LADS Plus scores, which have been calibrated against known adults with dyslexia and non-dyslexic cases. Although research has shown that LADS Plus achieves a high degree of classification accuracy, Administrators are advised to check the classification against the individual's profile on the three tests. This is explained in Section 4.2.5.

LADS Plus has been developed using extremely careful psychometric and statistical analyses to make it as accurate as possible. This scientific development process is described in detail in Chapter 2. However, it is important that those administering LADS Plus or interpreting its results appreciate that no screening tool can be 100% accurate, and consequently occasional misclassifications can occur. It is helpful, therefore for administrators to understand the probability of the test making a misclassification.

In developing screening tests there tends to be a trade-off of *false negatives* (i.e. individuals with dyslexia who are wrongly classified as 'not dyslexic') against *false positives* (i.e. individuals who are not dyslexic who are wrongly classified as 'dyslexic'). This has already been outlined in Section 2.1.1. In LADS Plus, both false negatives and false positives are well within acceptable levels. There comes a point in test development at which it is not usually possible to improve the measures in the test further in order to reduce one type of classification error without at the same time increasing the other. However, since LADS Plus has been designed to help institutions and organisations identify adults with dyslexia so that they can be provided with appropriate support, it was sensible to try to minimise false negatives rather than false positives, so that the smallest possible number of individuals with dyslexia are overlooked.

4.2.3 Probability of dyslexia explained

If a person's overall classification places them in the 'Low probability of dyslexia' category, there is a 95% probability that they are not dyslexic.[8] If a person's overall classification places them in the 'High probability of dyslexia' category, there is a 95% probability that they do have dyslexia. If the person's overall classification places them in the 'Moderate probability of dyslexia' category, there is a 90% probability that they have dyslexia. These individuals appear to experience less extreme dyslexic symptoms, or are very well compensated, and might be regarded as having milder dyslexia.

[8] Please note that the probabilities given in this chapter are based on data obtained in Validation Study A (Section 2.3.1). The calculations were not based on the LADS Plus composite score, but on an algorithm that took into account the pattern of red, amber and green scores, which proved to be more robust in the context of clients of very low or very high general ability.

On the other hand, if a person's overall classification places them in the 'Borderline' category, then there is a 3:1 chance that they will not be dyslexic. In fact, in most cases of this type the individual will have mainly green or amber scores for the LADS Plus tests, but an occasional red score (on the Working Memory test) may occur from time-to-time. Although this implies that it would be safer to advise the person that they do not have dyslexia, such action would mean overlooking a substantial number of cases of dyslexia that might otherwise have been helped. In such cases, it is strongly advised that the Administrator checks the classification against the individual's profile on the three tests before giving feedback to the person who was screened. This is explained in section 4.2.4.

4.2.4 The 'borderline' category

The 'Borderline' category is used by LADS Plus when the person being screened has revealed in the LADS Plus tests some difficulties that could be due to dyslexia, but the LADS Plus profile overall was not marked enough to make a clear categorisation as 'dyslexic'. This is a signal to the Administrator to look more carefully at (a) the results on the separate LADS Plus tests, and (b) the person being tested. In the Validation Studies reported in Chapter 2, about 75% of borderline cases were found not to have dyslexia.

When an individual has been rated as 'Borderline' by LADS Plus, the Administrator should first inspect the results of the separate tests. The most typical reason for an individual being given a 'Borderline' rating is because they have performed poorly on the Working Memory test but satisfactorily on the Word Recognition and Word Construction tests. This will show up as a green score for Word Recognition and Word Construction and a red score for Working Memory. Some adults with highly compensated dyslexia (particularly if they have received specialist tuition or if they read a great deal) can show this profile. Also, brighter adults with dyslexia are usually able to develop more compensatory strategies, so if the Reasoning score is above average or high, then it would be appropriate to suspect that this is the case. Note also that LADS Plus does not use the 'Borderline' rating if the Reasoning score falls into the 'below average' or 'low' category. This is because a proportion of people with below average or low reasoning ability tend to experience slight difficulties on the other LADS Plus tests even though they do not have dyslexia. To use the 'Borderline' rating in such cases would introduce unreliability into the decision process and create unnecessary problems for Administrators. In some cases, it may be possible to resolve the problem by investigating the person's educational history. Evidence of difficulties in literacy when at school would support a conclusion that the person probably has dyslexia. Similarly, if the person being screened on LADS Plus has a child (or children) formally diagnosed as having dyslexia or specific learning difficulties, then there is a greater likelihood of the 'Borderline' rating indicating dyslexia.

Secondly, when making judgements about individuals who fall into the 'Borderline' category, accuracy can be enhanced by utilising any relevant additional information about the person. In cases where the person has been referred for screening or assessment specifically because of difficulties in literacy and/or studying, then if that person is classified as 'Borderline' by LADS Plus it will usually be safe to assume that the person does have dyslexia, and take action accordingly. On the other hand, if the LADS Plus results derive from a general screening of one or more unselected individuals (e.g. on-entry screening to college) unless there is additional evidence that would point to dyslexia, it would be prudent to assume that individuals classified by LADS

Plus as 'Borderline' do not have dyslexia. There are a number of ways in which helpful additional evidence may be sought, including use of adult tests of word reading and spelling (e.g. *WRAT4 Reading*, *WRAT4 Spelling14)* or by using the *Adult Dyslexia Checklist* (which can be downloaded from the British Dyslexia Association's website). If the person is found to have significant difficulties in literacy and/or a large number of problems of a dyslexic nature revealed by the *Adult Dyslexia Checklist,* it will usually be safe to conclude that they probably have dyslexia. Note, however, that because responses on the checklist are highly subjective, and it is vulnerable to falsification, it is not recommended that the checklist is used as the sole means of identifying adults with dyslexia.

It can be seen that the 'Borderline' category serves the purpose of drawing the Administrator's attention more closely to that individual and their results, and in most cases it should not be inordinately difficult to make a judgement about whether or not that individual is likely to have dyslexia. If in doubt, the Administrator should seek advice from someone who has more knowledge of dyslexia and/or experience of working with adults with dyslexia.

4.2.5 Checking the profile of scores from individual tests

In addition to providing an overall classification in terms of the probability that the person has dyslexia, the LADS Plus report screen and print-out also gives a description of the results. In most cases this will be more than adequate to enable the Administrator to decide on the most appropriate course of action. However, there may be circumstances in which it will be helpful (or even imperative) for the Administrator to check the profile of scores for individual LADS Plus tests. Such circumstances are likely to include the following:

1. If the overall classification places the person in the 'Borderline' category (see Section 4.2.4).
2. If the Administrator has reason to suspect that the overall classification and/or description is incorrect.
3. If the Administrator believes that the overall classification and/or description do not tally with what they already know about the person's capabilities.
4. If the person is known to have very poor literacy skills, possibly as a result of a very disadvantaged background and disrupted schooling. Individuals conforming to this description may often be encountered in prisons or young offender institutions.

Generally speaking, two red scores on individual LADS Plus tests (or one red Plus one or two amber scores), will give a strong indication that the person has dyslexia, regardless of the third score. Likewise, one red score on either Word Recognition or Word Construction, or two to three scores at the top end of the amber range (score 6) will indicate dyslexia, but less strongly. Examples would include individuals with dyslexia who have developed very good strategies for coping with sequential short-term memory tasks, and so can perform surprisingly well on the LADS Plus Working Memory test, but who still experience difficulties with the Word Recognition and Word Construction tests.

Two green scores on individual LADS Plus tests are generally a safe indication that the person does not have dyslexia. This is particularly the case if the highest score is Working Memory, as scores on this test show the greatest variance (of the three LADS Plus tests) amongst non-dyslexic individuals. This means that some non-dyslexic adults perform rather poorly on the LADS

Plus Working Memory test. The most difficult cases to interpret are those with a mixture of score types (red, green and amber) or ones where low amber scores (range 4– 5) predominate. In these cases, a more qualitative approach to interpretation is called for. As a general rule, if the highest score is for Working Memory, and the other two scores are not higher than 4, it is probably safe to conclude that the person does not have dyslexia, but simply has weak (or unpractised) memory skills. But if the highest score is for Word Recognition or Word Construction, and the other two scores are higher than 3, then it is more likely that the person does have dyslexia. If in doubt, the Administrator should seek advice from someone who has more knowledge of dyslexia and/or experience of working with adults with dyslexia. With increased experience in using LADS Plus, it is expected that Administrators will be able to deal more confidently with unusual cases.

4.2.6 A note on intelligence

The verbal and nonverbal reasoning tests in LADS Plus enable the Administrator to gain a fairly good indication of the person's intelligence. But, what is intelligence? In 1997, 52 international experts on intelligence all subscribed to the following definition: "Intelligence is a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience" (Gottfredson, 1997).

Intelligence is a *psychological construct* – in other words, a name given to a hypothesised characteristic that underpins many human cognitive activities that are valued in society at a given time and place. What is meant by 'intelligence' may vary from culture to culture. What enables us to propose the concept of intelligence is the overwhelming evidence that all human cognitive abilities show a *high positive correlation* – in other words, they all tend to measure something in common. The 'something' that they measure in common is generally referred to as 'general intelligence', and it corresponds to what most lay people are thinking of when they use the term 'intelligence'. Put this way, it is clear that intelligence is no more (or less) than the common ground between a wide variety of different cognitive skills, and hence measures of intelligence enable us to predict (to some extent) how well somebody is likely to deal with tasks involving those cognitive skills.

Intelligence is influenced by both genetic and environmental factors. The inherited component in intelligence is substantial – approximately half the variability in IQ scores can be attributed to genetic factors (see Plomin & Petrill, 1997). However, the high heritability of IQ certainly does not mean that environment or education has insignificant impact on intelligence. For some children, the environmental or educational impact will be massive, for others less so. However, education (in its widest sense) is likely to increase intelligence not only by equipping individuals with new knowledge and new strategies for thinking, problem solving and remembering, but also by promoting behaviours and attitudes (such as working hard and concentrating when under pressure) that are likely to enhance test-taking performance.

How can we assess intelligence? To some extent, all measures which involve cognitive abilities – memory, general knowledge, speed of information processing, etc., as well as any tests of educational attainment – are also measures of general intelligence. However, tests that are specifically designed to do the job (i.e. intelligence tests) give us much better measures. But at the end of the day all tests can only give *estimates* of intelligence – they do not measure

intelligence *directly*. During the last 100 years of psychological investigation into intelligence, progress in statistical techniques has enabled researchers to look more closely at the components of intelligence. Researchers have come to recognise that of the various components, the two most important – at least for educational and most occupational purposes – are *verbal ability* and *nonverbal ability*. Most tests of intelligence – whether individually administered or group administered – now comprise measures of verbal and nonverbal ability. There is obviously a wide range of tasks that could be used to assess these two core factors.

Writing an essay or giving a speech both draw upon verbal ability. Working out a route using a map or assembling an item of flat-pack furniture both require nonverbal ability. But research has shown that tasks involving understanding of verbal concepts (verbal reasoning), and tasks involving solving mental problems involving pattern, shape or spatial orientation (nonverbal reasoning), are highly suitable for giving us stable and reliable measures of verbal, and nonverbal ability, respectively. Consequently, the reasoning measures in LADS Plus are tests of verbal concepts and matrix reasoning.

Verbal intelligence is generally a better predictor of educational and academic attainment, while nonverbal intelligence is usually a safer guide to the level of an individual's practical skills. In most individuals, verbal and nonverbal reasoning skills are broadly similar and fall within the average range. Some individuals may excel in both of these aspects of intelligence, and others may have below average or low abilities in both. However, a few people may show more substantial differences between their verbal and nonverbal reasoning skills, or even be high in one and low in the other. There is evidence that nonverbal ability is less affected by cultural and educational factors and verbal ability is more affected cultural and educational factors, so it follows that people from disadvantaged backgrounds or who have not had adequate education are more likely to have higher nonverbal ability than verbal ability. Some people who have dyslexia are also in this category; they often have good practical and visual thinking skills and are less adept at thinking with language. Occasionally, people display good verbal skills but poor nonverbal skills; people with dyspraxia (developmental coordination disorder) tend to fall into this category. In cases where a person has verbal and nonverbal abilities in the same broad area, it is appropriate to average these and to treat the average as an indicator of their general intelligence. However, in cases where a person's verbal and nonverbal abilities are quite different it is not appropriate to average these as this will not properly reflect their intelligence. Instead, they should be regarded as having different capabilities in the two areas of intelligence.

4.2.7 Cases where not all tests have been completed

It is strongly recommended that all five tests in LADS Plus should be completed whenever possible. However, in exceptional circumstances the person may not have completed all five tests, e.g. because they became unwell or because of excessive anxiety. In such cases, the program will not be able to give an automatic categorization in terms of probability of dyslexia, although partial guidance on interpretation will be automatically provided. In order to interpret the findings of the screening the Administrator will need to refer to the results of the individual tests that have been completed (see Section 4.2.5). Sometimes it will be possible to supplement the information gained from LADS Plus with other information available about the person, e.g. gained from interview, results of other tests or examples of the person's work. This may enable

the Administrator to reach a judgement about the likelihood of dyslexia, but special care should be taken in drawing conclusions in these circumstances, and it is recommended that advice be sought from an appropriate psychologist or dyslexia specialist.

4.2.8 Interpreting LADS results of adults with low levels of literacy

There are some additional factors to consider when screening individuals who have low levels of basic skills. In such cases the classification given by LADS Plus should be regarded as a good general indicator, but the profile may need closer scrutiny. Administrators working with adults who have low levels of basic skills should be aware that in this population there a greater risk of 'false positives' (i.e. individuals who show positive on screening but who do not, in fact, have dyslexia). This is especially so in groups of prisoners and young offenders, who typically have disadvantaged backgrounds and disrupted schooling, often resulting in low literacy levels.

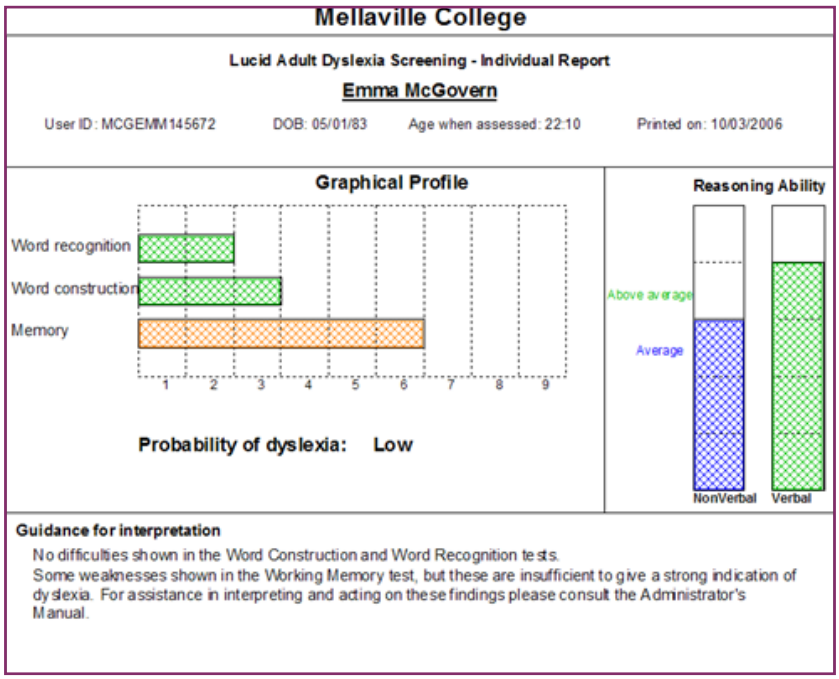
The results from the non-verbal reasoning test are unlikely to be affected by social and educational background factors. Often it will reveal that an individual who may have been assumed not to be particularly bright (because of poor oral vocabulary) is much more capable than was previously thought. It would, however, be very common for this type of client to obtain a high score (red bar) on the Word Recognition test, indicating a major area of difficulty. Although the words used in this test are fairly common, lack of reading experience is likely to mean they have difficulty in making decisions about what might be real words as opposed to nonwords, especially under conditions of time pressure. The areas that yield very useful information in terms of dyslexia identification are the Word Construction and Memory tests. If these are giving positive indications (red bars/high scores) then the overall probability of dyslexia is likely to be high.

4.3 Case studies

The following case studies illustrate a selection of different types of results that may be obtained from LADS Plus.

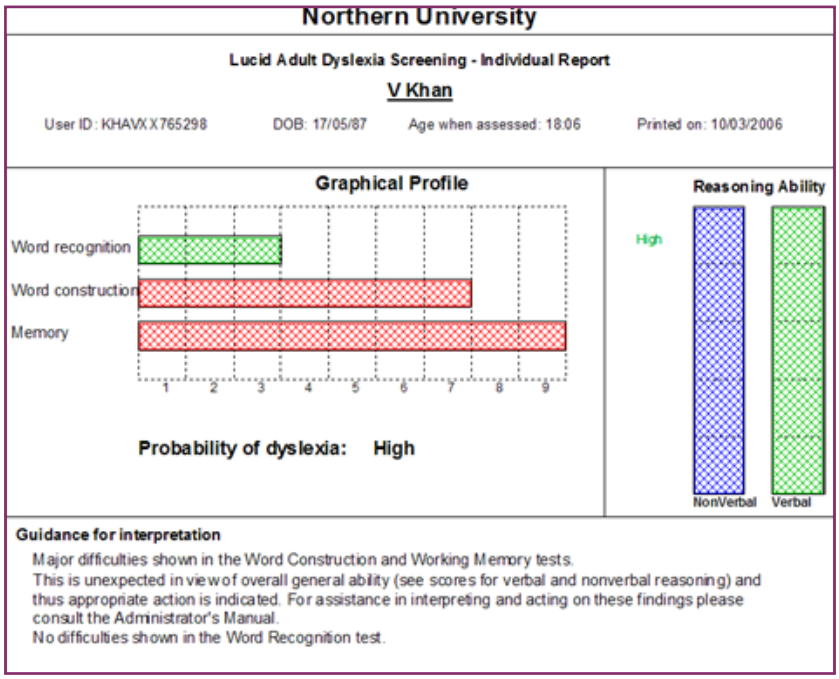
Case study A — This college student had scores of 2 on Word Recognition, 3 on Word Construction and 6 on the Working Memory. Her nonverbal reasoning is average and her verbal reasoning above average. LADS Plus has concluded that the probability of dyslexia is low (see Figure 7). Clearly this student had some problems with the working memory test but not with any other test, and this is insufficient to give a reliable indicator of dyslexia. However, she would probably benefit from advice on how to improve her memory skills and to develop effective revision techniques so that her memory does not let her down in examinations.

Figure 7. Case study A.



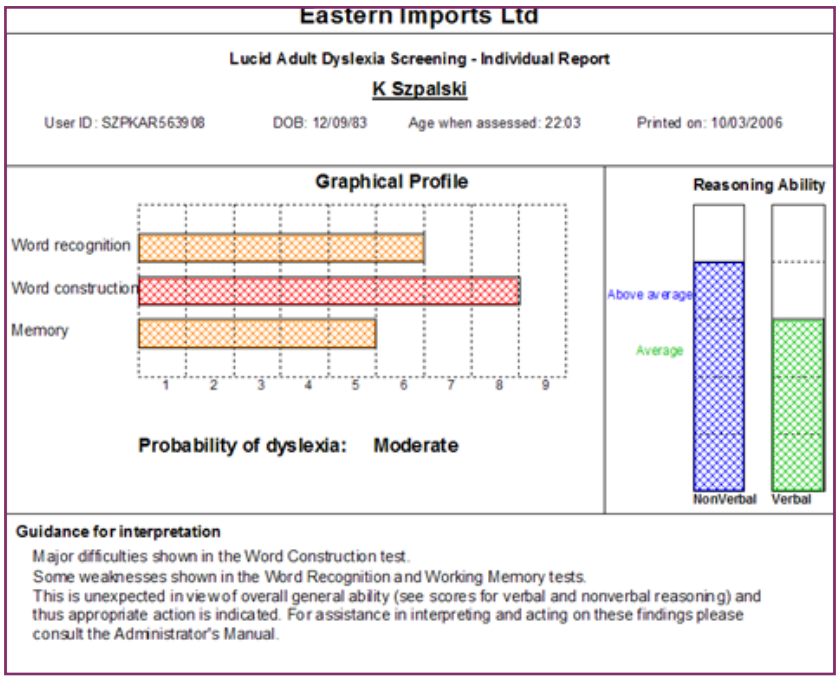
Case study B — This university student is clearly very bright, with both verbal and nonverbal reasoning high (top 10% of the population). He had scores of 3 on the Word Recognition test, 7 on the Word Construction test and 9 on the Working Memory test. LADS Plus has concluded that the probability of dyslexia is high (see Figure 8). This type of profile is often seen in bright adults (especially those at university) who read a lot and who consequently have fairly good word recognition. But his poor working memory and lack of phonic skills are both clearly revealed in the other two dyslexia-sensitive tests.

Figure 8. Case study B.



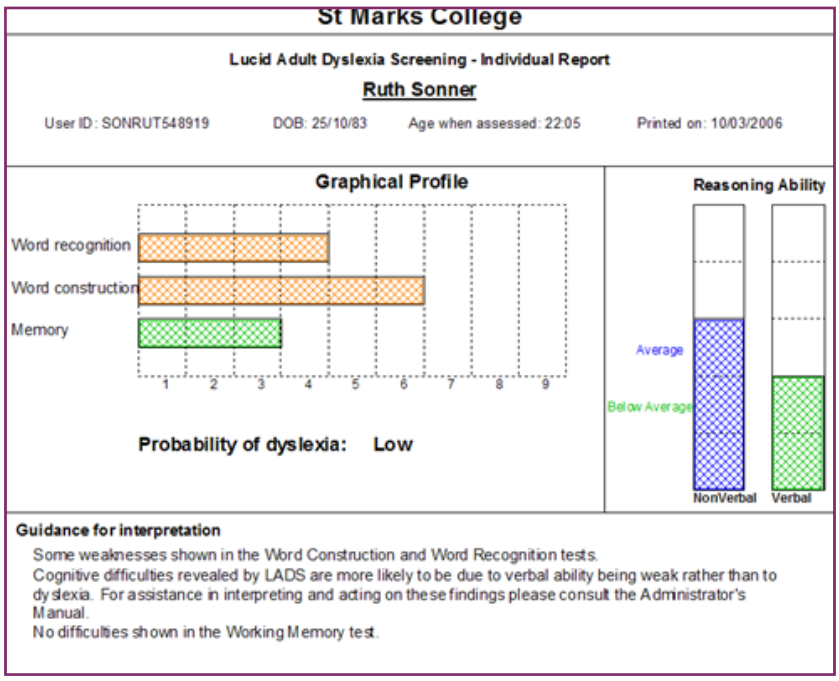
Case study C — This employee has nonverbal reasoning in the above average range and verbal reasoning in the average range. The dyslexia sensitive scores were: 6 on Word Recognition, 8 on Word Construction and 5 on Working Memory (see Figure 9). LADS Plus has concluded that the probability of dyslexia is moderate. Difficulties are clearly shown across the range of the dyslexia-sensitive tests, but particularly in Word Construction.

Figure 9. Case study C.



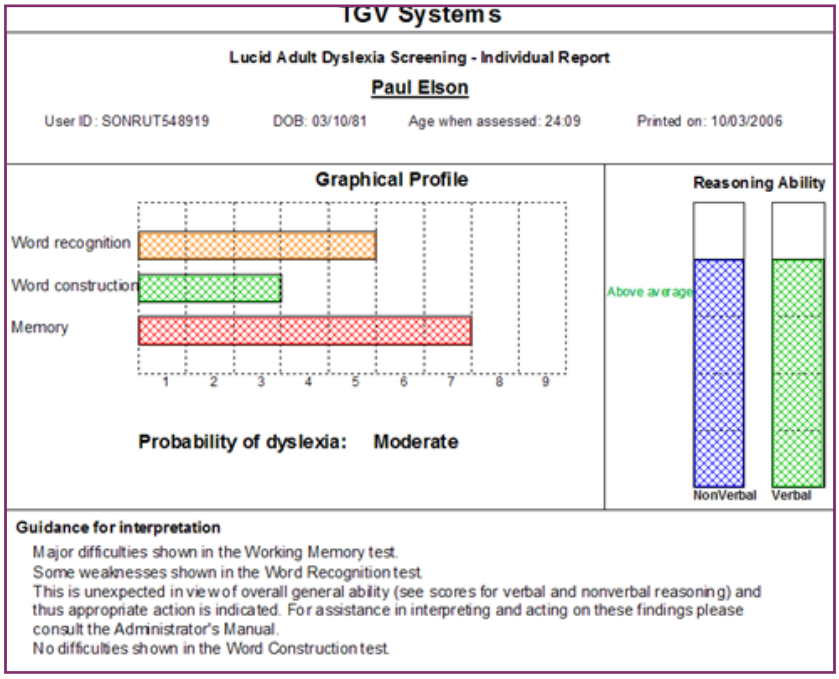
Case study D — This college student, who was referred by her tutor because of poor marks in assessed work, has nonverbal reasoning in the average range and verbal reasoning below average. She has scores of 4 on the Word Recognition test, 6 on the Word Construction test and 3 on the Working Memory test. LADS Plus has concluded that there is a low probability of dyslexia is her case (see Figure 10) and states that her cognitive difficulties are more likely to be due to weak verbal ability rather than dyslexia. Despite the lack of a positive dyslexia screening result, LADS Plus has nevertheless provided useful information about this student which should help to explain her difficulties. The relatively poor result on Word Construction suggests that she is likely to have problems dealing with new vocabulary encountered in her studies. It could be the case that this student was never taught phonic skills at school (or not taught them very well), or it is possible that she has excellent visual memory and so never felt the need to acquire phonic skills because she had no problems in learning to recognise new words by the visual pattern of letters alone. The weak result on Word Recognition could be due to lack of reading experience. These things can be explored with the student and, hopefully, she can be supported more effectively in her college work now that her weaknesses are better understood.

Figure 10. Case study D.



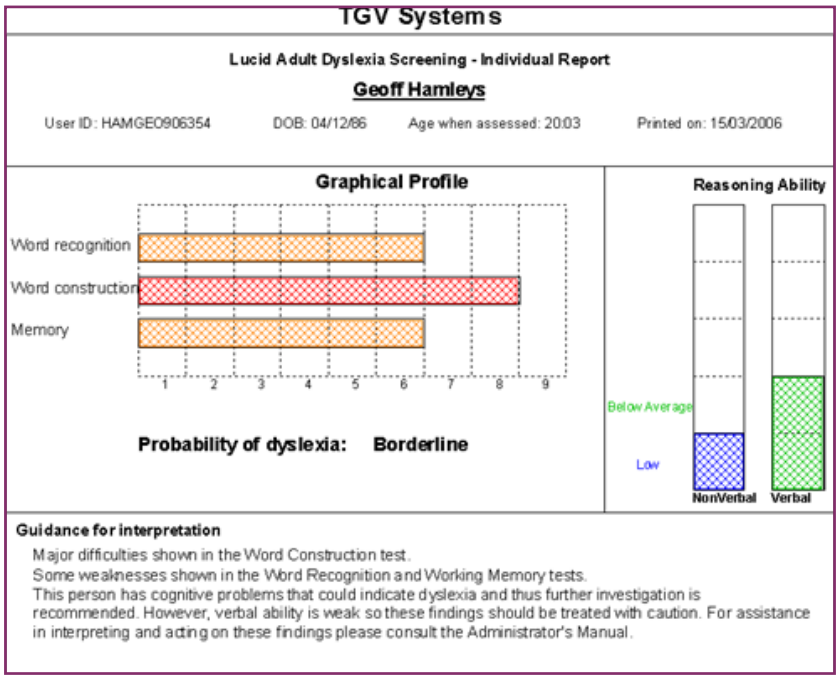
Case study E — This employee has verbal and nonverbal reasoning both in the above average range. He had scores of 5 on the Word Recognition test, 3 on the Word Construction test and 7 on the Working Memory test. LADS Plus has concluded that the probability of dyslexia is moderate (see Figure 11). This pattern is sometimes seen in adults with dyslexia who have received a lot of specialist tuition in phonic skills, so that they experience few problems with the Word Construction test. However, such tuition generally has had less impact on Word Recognition (especially in dealing with homonyms and pseudo-homonyms) and little, if any, impact on Working Memory ability, both of which clearly reveal the underlying dyslexic difficulties.

Figure 11. Case study E.



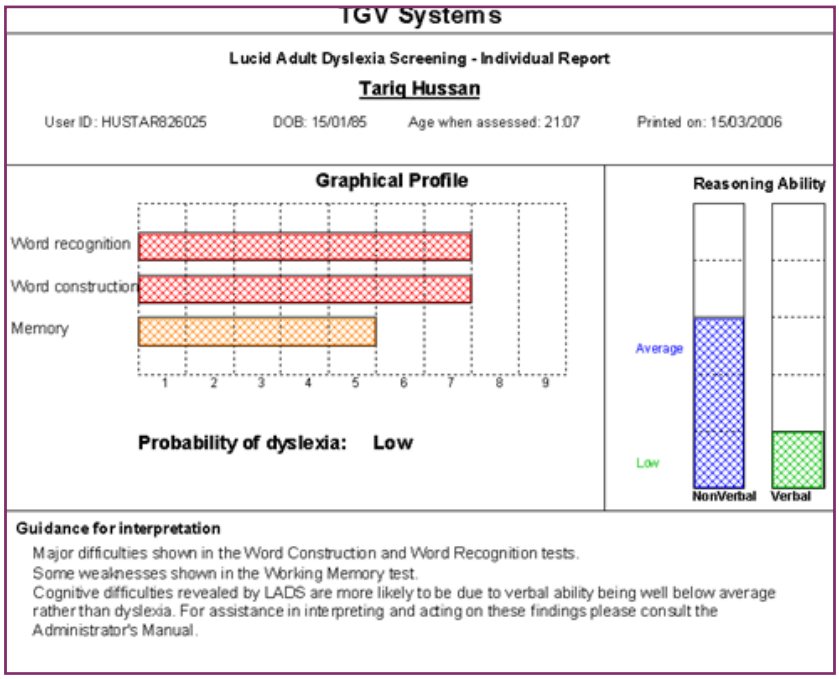
Case study F — This employee has low nonverbal reasoning and below average verbal reasoning. He had scores of 6 on Word Recognition and Working Memory, and 8 on Word Construction (see Figure 12). Clearly, therefore, there are cognitive problems that could indicate dyslexia. However, LADS Plus has concluded that the probability of dyslexia is borderline and recommended caution in interpretation of results. This conclusion has been drawn because general ability is low and hence the results could be due to non-dyslexic causes. A borderline result does not rule out dyslexia but indicates that the Administrator should examine the case more closely before making any decisions. This should include talking to the person about their educational background because if they lacked opportunities to learn to read and write at school, this might explain the poor results on Word Recognition and Word Construction. On the other hand, if they have other family members who have dyslexia then, given the genetic causation of the disorder, this would lend support to a conclusion that they probably have dyslexia.

Figure 12. Case Study F.



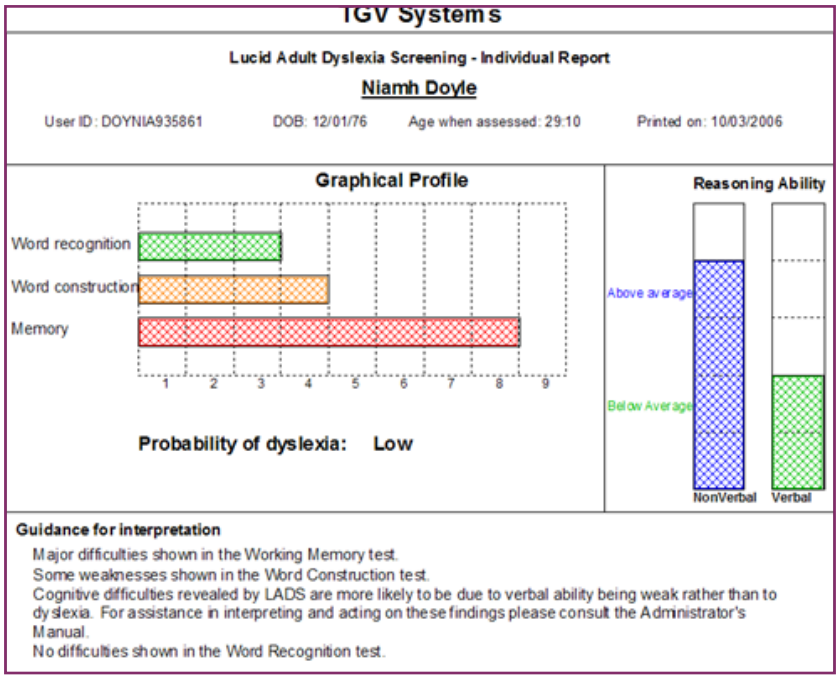
Case study G — This employee has low verbal reasoning and average nonverbal reasoning. He had scores of 7 on Word Recognition and Word Construction, and 5 on Working Memory (see Figure 13). Like the previous case this individual has a lot of difficulties, yet LADS Plus has classified him as having a low probability of dyslexia because of the low verbal ability (bottom 10% of the population). In cases such as these, difficulties on Word Recognition and Word Construction are more likely to be due to poor verbal skills. There are some weaknesses revealed in the Working memory test, but these are insufficient to confirm dyslexia in the face of the other evidence. Clearly this person would benefit from literacy support.

Figure 13. Case study G



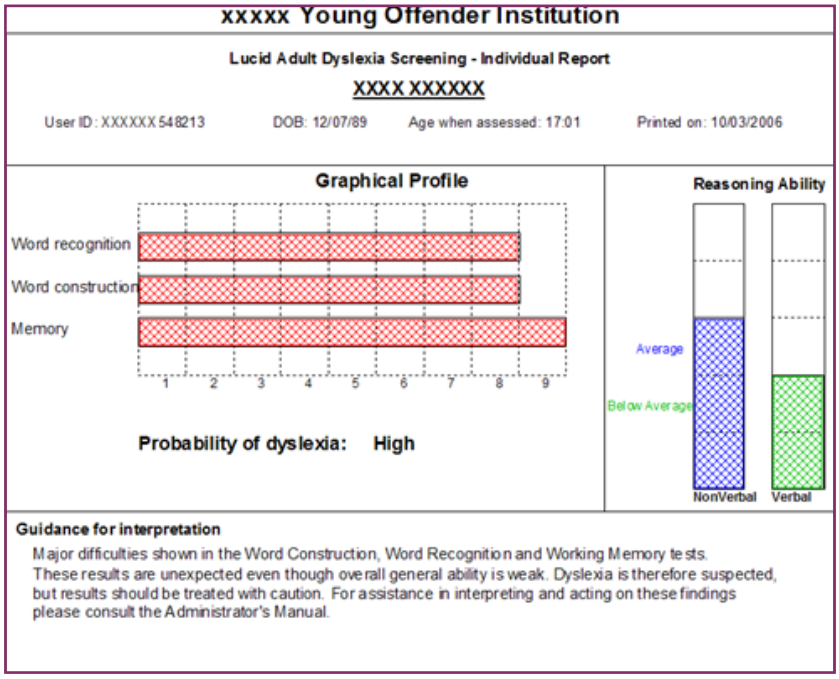
Case study H — This employee has above average nonverbal reasoning and below average verbal reasoning. This is an unusual pattern but sometimes encountered in individuals who have particularly good practical skills or who have not had a particularly good education. He had scores of 3 on Word Recognition, 4 on Word Construction and 8 on Working Memory (see Figure 14). LADS Plus has classified him as having a low probability of dyslexia because, despite his rather poor memory, his literacy skills are not significantly poorer than would be expected from his below average verbal intelligence.

Figure 14. Case study H



Case Study I — This young man, aged 17, who was in a youth offender institution, had a very disadvantaged background and experienced many disruptions to his education from age 11. His reading skills were equivalent to those of an average 12 year-old and his spelling skills in the bottom 1% of his age group. He had poor oral vocabulary knowledge (reflected in his below average verbal reasoning score) but his non-verbal reasoning was in the average range. He had good practical skills and loved tinkering around with cars (in fact, his period in this secure institution was as a direct result of several incidents of taking cars without the owners' consent). He had plans to become a motor mechanic but needed to improve his literacy skills in order to undertake the necessary training.

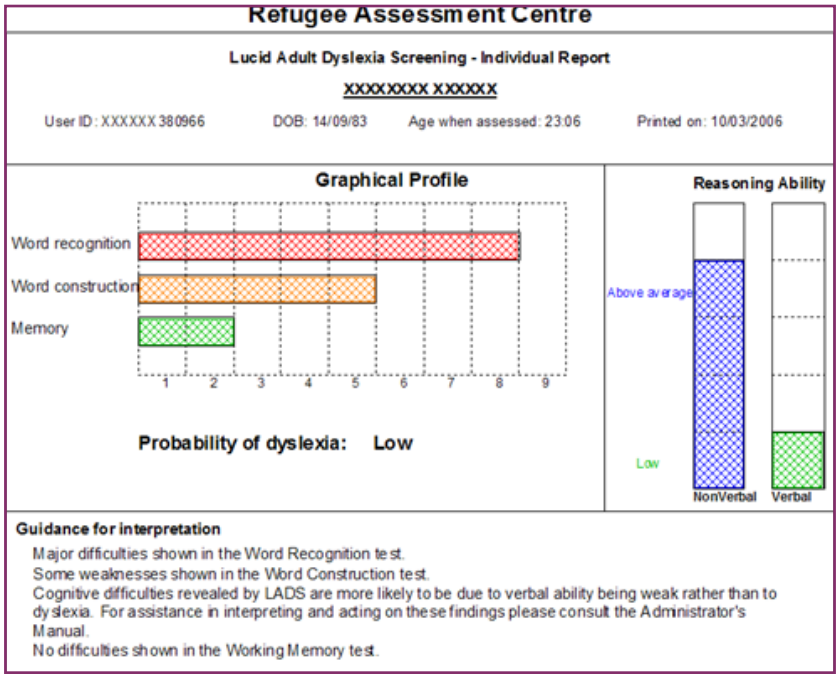
Figure 15. Case study I.



The LADS Plus profile (see Figure 15) shows red scores in all three of the dyslexia-sensitive tests: 8 for Word Recognition, 8 for Word Construction and 9 for Memory. While the score for Word Recognition is understandable in terms of his general low level of literacy, his disadvantaged background, and his general lack of experience with reading, the other two results give a pretty clear indication of dyslexia. The Word Construction test requires not only good auditory memory but also good phonological analysis and sequencing skills, but is not so dependent on reading vocabulary. The skills to do this task are normally acquired in primary school and if adults experience great difficulty with this it usually indicates that they have dyslexia. Hence this young man showed strong evidence of dyslexia, and this was subsequently supported by findings of further psychological tests. He is currently having special tuition for his literacy difficulties that carefully addresses his problems dealing with phonological information, and although he is still struggling, he is making progress and has not abandoned his hopes to pursue a career in motor mechanics.

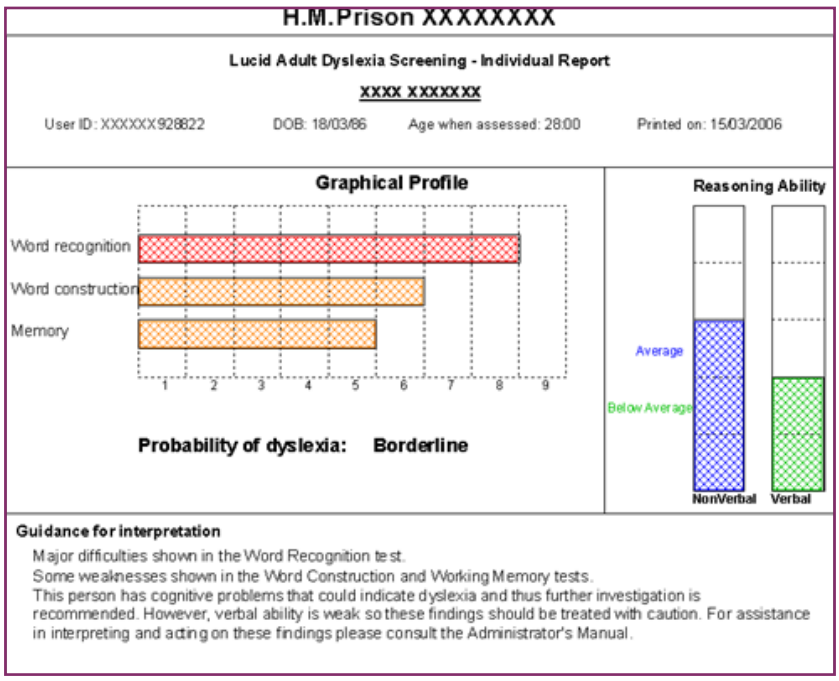
Case Study J — This young woman, aged 23, is a refugee, who has lived in the UK for seven years. She has been working as a kitchen assistant and subsequently a waitress in a hotel, during which time her spoken English has improved considerably. She decided she needed to be able to read and write in English to improve her employment prospects and so has been attending adult literacy education classes. As a routine measure, LADS Plus was administered and the results are shown in Figure 16. From this it can be seen that her non-verbal reasoning was in the above average range. However, her verbal reasoning score is low, and her Word Recognition score is 8, indicating that she has little ability to recognise real English words. Both these results probably reflect the fact that there are many aspects of spoken and written English that she has yet to master. But her Word Construction score is 5, indicating that she has acquired some skills in recognising the sounds of syllables and linking them up with her very limited knowledge of English orthography. Finally, her Memory score is 2, indicating that there are no problems with her working memory. LADS Plus has classified her as having a 'low' probability of dyslexia. Indeed, her poor performance on Word Recognition is to be expected in view of her background. If we therefore put that result to one side, we can see that there is not a great deal of evidence to support the view that she has dyslexia. Her teachers can therefore be reasonably confident that with conscientious application to an adult literacy course, she should be able to develop a satisfactory standard of English literacy as well as continuing to develop her spoken English proficiency.

Figure 16. Case Study J



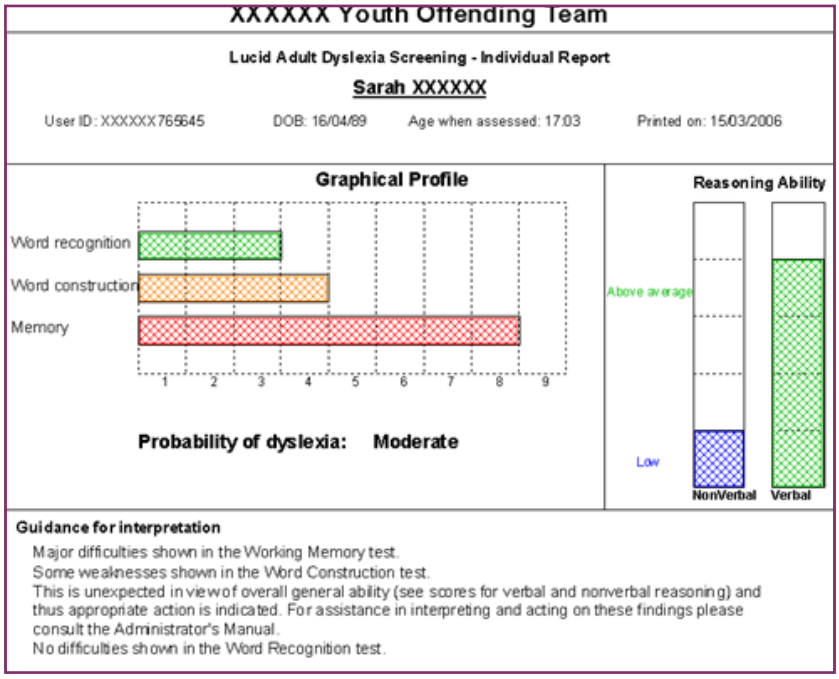
Case Study K — This man, aged 28, was screened using LADS Plus on commencement of a prison sentence. He had a disadvantaged background, disrupted schooling and a history of convictions for various offences before being convicted of burglary. His reading and spelling skills had already been assessed by education staff at a previous secure establishment while he was on remand awaiting trial, and these had been found to be below average. His LADS Plus result is shown in Figure 17. His non-verbal reasoning was in the average range and, as might be expected from his background, his Word Recognition score is 8. However, his Word Construction score is 6, indicating some difficulties with phonological encoding. His Memory score is 5, suggesting some problems with working memory. LADS Plus has classified these results as 'borderline', and it can be seen that if the Word Recognition score is taken out of the equation, we are left with two amber scores, which are consistent with his below average verbal intelligence and educational background. Since the majority of individuals in the 'borderline' category do not have dyslexia, the safest course of action would be to assume that he does not have dyslexia (unless there are indications to the contrary, such as a family history of dyslexia or evidence of early speech and language problems).

Figure 17. Case Study K.



Case Study L — Sarah is a 17 year-old juvenile offender with a history of shoplifting and handling stolen goods. No other members of her family have criminal records. Her parents are both in employment and her older brother is an apprentice bricklayer. She has one other sibling: a sister, aged 14, who is doing well at school. Sarah fell out with her parents because of her drug taking habits and as a result left the family home six months ago. At school she had been an argumentative and rebellious pupil who left at age 16 with minimal qualifications. She had been working on a production line in a local factory but was dismissed after a vociferous argument with a supervisor. Sarah is currently being supervised by the Youth Offending Team, which administered LADS Plus as part of routine screening of its clients. Her results show that she has above average verbal ability but low nonverbal ability. LADS Plus has classified Sarah as having a moderate probability of dyslexia. In particular, her very poor Working Memory result is strongly suggestive of dyslexia, and although her Word Recognition and Word Construction results are not typical of dyslexia, they are nevertheless inconsistent with her above average verbal intelligence.

Figure 18. Case Study L.



4.4 Giving feedback to adults screened with LADS Plus

The decisions made and type of feedback given to persons being screened with LADS Plus will depend to a large extent on the purposes and circumstances of the screening. In some institutions there will be established procedures to follow, as LADS Plus will simply replace or augment existing forms of dyslexia screening. In others, new procedures will need to be instigated. Until such procedures are established, Administrators will have to use their own judgement regarding the best course of action.

The way that feedback is delivered is almost as important as the content. Using superior, condescending or disinterested tones and inappropriate body language will ensure that the

person to whom you are giving feedback does not receive it well, no matter how constructive you think it is.

The knowledge of the other person and their background that will have been gathered at a previous stage of the screening process is important within the feedback context so that you can illustrate the information about their strengths and difficulties with specific examples that have relevance to them. For some individuals this information will be new and can potentially affect the way that they see themselves. It can also bring to the surface a great deal of emotion.

It is vital that any feedback session is conducted in private and sufficient time is allowed for this process. It is also up to the client to decide what information will be made available, and to whom.

It is useful to ask open questions to ensure the client's understanding, e.g. 'would you like to summarise what we have discussed?'. Avoid asking closed questions, e.g. 'Have you understood?' or 'Is that all right?' which make it harder for the person to say 'No'.

The skill of giving effective feedback following a screening session requires consideration and effective communication skills. It also requires that there is an opportunity for an individual to get further information and support at a later date if they wish to, so information about support agencies should also be provided. Identification of dyslexia should not usually be viewed as the end of a process but instead the beginning of a new and, hopefully, more positive one. The individual should be leaving with a greater level of awareness and understanding.

Feedback is more likely to help an individual if it:

- is given promptly
- gives specific information
- contains positive words
- gives detailed comment on how success has been achieved or not achieved
- can be linked to further positive courses of action.

4.4.1 General guidelines

1. Give feedback based on the LADS Plus classification, but point out that LADS Plus is a screening system and does not purport to give a definitive diagnosis, e.g. *"The LADS Plus screening indicated that you probably have dyslexia. LADS Plus is a screening test, which is not the same as a full psychological assessment for dyslexia. Although the results are not definite proof of dyslexia, they indicate that there is a 90% probability that you have dyslexia."*
2. If a client seeks (or requires a definitive diagnosis, e.g. for DSA purposes) they should be referred to an educational or occupational psychologist who specialises in the assessment of adults for dyslexia.
3. It should be pointed out that although LADS Plus, overall, is over 90% accurate, some misclassifications occur. In particular, adults with unusual forms of dyslexia (e.g. characterised by underlying problems in visual processing) may not be detected by LADS Plus.
4. It may help the person to understand their problems if they are shown the graphical chart of the individual LADS Plus test results. If this is done, the nature of the tests should be explained to them in simple terms.

5. It should be explained that the tests in LADS Plus do not measure reading and spelling in conventional terms. However, the LADS Plus Word Recognition and Word Construction tests correlate highly with conventional reading and spelling measures and so the results of these will give a reasonably accurate prediction of whether or not the person is likely to have difficulties in reading and/or spelling. (Much will depend on the difficulty of any reading and writing tasks that the person has to carry out on a daily basis; if they do not normally have to deal with challenging reading or writing tasks, they may not appreciate that they have difficulties in reading and writing.)
6. It should also be pointed out that the Working Memory test in LADS Plus does not measure the totality of memory skills, only a small part of it. Although working memory may be weak, other aspects of memory may function satisfactorily.
7. Inform the client that there are many ways in which the difficulties experienced by adults with dyslexia can be helped and supported, both in education and employment (see Chapter 5 for further information on this matter).
8. Consider suggesting that the person talks to a professional counsellor if they need help in coming to terms with the discovery that they may have dyslexia.
9. Finally, it will often be found helpful to add that there are highly successful individuals with dyslexia in many walks of life, and that dyslexia is not necessarily a bar to achievement in education or in employment.

4.4.2 Universities and colleges of higher education

In educational institutions where it is expected that a positive screening result will normally be followed up by a full diagnostic assessment, use of LADS Plus will require little modification to existing procedures. This is normally the case in universities, where to apply for the Disabled Students Allowances (DSA) and to be granted additional time in examinations, students will normally be expected to produce evidence in the form of a report by a psychologist or other accredited dyslexia professional, that conform to guidelines laid down by the DfES working group on dyslexia in higher education (2005). Generally, it will be expedient to be cautious and refer for psychological assessment all except those who have been classified by the program as 'Low probability of dyslexia'. The student should be given feedback on the LADS Plus screening based on the classification, e.g. *"The LADS Plus screening indicated that there is a high/moderate probability that you have dyslexia (or the results were borderline), and so you are being referred for full psychological assessment."* Some explanation of what dyslexia is will be necessary, unless this has already been discussed with the student. When a student who has been screened with LADS Plus is referred for psychological assessment, a copy of the LADS Plus print-out should be sent to the psychologist in advance of the assessment. The Administrator may add comments to the print-out by clicking on the **Add Comment** button on the report screen and typing text into the box.

While the student is waiting for a psychological assessment to be carried out, or to receive the report of that assessment, it would be appropriate to treat them as having dyslexia for internal purposes (e.g. provision of learning support, and special arrangements in examinations), as over three-quarters of such cases are likely to be classed as having dyslexia following a psychological assessment. For more information on supporting adults with dyslexia, see Chapter 5.

4.4.3 Other educational institutions

In educational institutions other than universities (e.g. schools, 6th Form Colleges, and Further Education Colleges), a psychological assessment is not usually required for the student to receive support. In such institutions it would be appropriate to instigate support without further assessment in cases where the LADS Plus results classifies the student as having a 'High' or 'Moderate' probability of dyslexia. In cases where the LADS Plus results classifies the student as 'Borderline', the Administrator will need to check the profile of scores for individual LADS Plus tests before a decision can be made (see Section 4.2.5). The student should be given feedback on the LADS Plus screening based on the classification, e.g. *"The LADS Plus screening indicated that you are probably dyslexic. Although LADS Plus is not a full diagnostic test for dyslexia, the result indicates that there is a 90% probability that you actually have dyslexia, and so we are recommending that you have appropriate support to help you with your studies."* Again, explanation of what dyslexia is will be necessary, unless this has already been discussed with the student. For more information on supporting adults with dyslexia, see Chapter 5.

Where additional time in public examinations (e.g. GCSE, 'A' level) is required, further assessment will be necessary to supply appropriate evidence to the examination board(s). This assessment may be carried out by an educational psychologist, or by a specialist teacher who has approved qualifications in assessing and teaching students with dyslexia. If in doubt, the examination board should be consulted. The British Dyslexia Association can also advise on this. A LADS Plus report will not be adequate, by itself, to support an application for additional time in public examinations because additional evidence (e.g. of current reading skills and writing speed) will be necessary. However, the LADS Plus result may be included as additional evidence in assessment reports (provided the student is at least 16 years of age), because the tests in LADS Plus have been standardised and measure key cognitive indicators of dyslexia.

In cases where special examination arrangements (e.g. additional time) are being requested on grounds of dyslexia, the certificate issued by an educational psychologist (or by a specialist teacher who is entitled to issue such certificates) should contain appropriate diagnostic evidence of dyslexia. LADS Plus is an appropriate source of such evidence, and LADS Plus results may be cited in such cases. The Joint Council for Qualifications (JCQ) provides annual guidance on preparation applications for access arrangements and reasonable adjustments for examination candidates with dyslexia and other special educational needs.

4.4.4 Other situations, including employment

In other circumstances in which LADS Plus is being used, such as in the workplace or as part of careers or employment counselling, Administrators will have to use their own judgement regarding the best course of action. In employment situations, it will often be the case that some adaptations to the person's working practices or environment will be beneficial: for further information on this, see Section 5.2. The **British Dyslexia Association** (BDA) and Dyslexia Scotland websites provide guidance to employers for supporting employees with dyslexia.

Where there is an obvious need for tuition in basic skills, it is recommended that the local authority should first be consulted for information on adult literacy programmes in the locality.

Chapter 5 gives detailed advice and information on supporting adults with dyslexia in various settings.

4.4.5 Making a referral to a psychologist

In many cases the LADS Plus results will be sufficient for an adult with dyslexia to be able to obtain the support they require, whether in education or in employment. In some circumstances, however, a diagnosis by a suitably qualified psychologist will be necessary. For example, this is usually necessary for a student with dyslexia in higher education to be eligible for Disabled Students Allowances (DSA). If there is an unresolved dispute between an adult with dyslexia and their employer or their educational institution to which the issue of their dyslexia has a direct bearing, then a psychological assessment and report will be necessary if there are plans to take legal action on this matter. Legal aid may be available to pursue a legal case. Further advice on legal issues can be obtained from the following:

Citizens Advice Bureau

Disability Law Service

Disability Rights Commission

Many educational institutions have psychologists to whom they regularly refer students for diagnostic assessment. However, employers and other organisations may not know who to approach for this service. Care should be exercised in selecting a psychologist to carry out a diagnostic assessment. It should not be assumed, for example, that all educational psychologists will necessarily be able to carry out this task. Most educational psychologists deal largely with the pre-16 sector and have little, if any, experience of assessing adults. They may not even have access to psychological tests that are suitable for assessing adults. Although some occupational psychologists, clinical psychologists and other psychologists may be able to carry out diagnostic assessment of adults for dyslexia, most will not have either the training or the experience to do this. The British Psychological Society (BPS) maintains the *Directory of Chartered Psychologists*, which lists services offered by Chartered Psychologists. Assessments can also be arranged via the British Dyslexia Association.

When referring a client who has been screened on LADS Plus to a psychologist for diagnostic assessment, a print-out of the LADS Plus report should be sent together with any other relevant information.

4.4.6 Providing feedback to individuals with low levels of literacy

When working with this particularly vulnerable client group, the feedback part of the process is vital and should be undertaken not only with a high degree of sensitivity and professionalism, but also provide the individual with a clear explanation of both their strengths and difficulties and how this relates to dyslexia. It is, therefore, important the person providing the feedback has a reasonable understanding of dyslexia in order that they can provide appropriate and useful information.

For vulnerable individuals there may not be many opportunities to secure praise and reassurance, yet there will often be discouragements. In the case of dyslexia identification, we need to provide an individual with information on how they can capitalise on their strengths to support those areas where there might be specific difficulties.

It is sometimes difficult to find the necessary balance between being honest about performance and being gentle on another person's feelings. This can be a particular difficulty where an individual has achieved a low score on the verbal and/or non-verbal reasoning tests. On such occasions it is probably best not to draw attention to this. Where an individual has scored average or above, providing this information can provide an individual with an enormous confidence boost, as many within this vulnerable client group genuinely believe that their difficulties stem from a lack of intellect as opposed to a specific difficulty. It is also vital that the feedback provides them with the opportunity to move forward in a direction of their choosing.

5 Supporting adults with dyslexia

5.1 Introduction

This chapter is designed to provide guidance for Administrators in following up a screening with LADS Plus. The issues and recommendations in this chapter are things that an Administrator, teacher, mentor, counsellor or support worker will want to share with an adult with dyslexia in order to help them find solutions to their difficulties. The chapter has not been written in a style that is suitable to be read by adults with dyslexia themselves, so it is preferable to impart the information through discussion rather than by giving this chapter to the person with dyslexia to read.

Most adults with dyslexia who are screened using LADS Plus will fall into one (or sometimes both) of two categories: employment and education. Hence this chapter has been organised around the issues that typically arise in these two areas, and the two sections that follow this (i.e. 5.2 and 6.2) consider what legal rights the adult with dyslexia has (based on the provisions of the Disability Discrimination Act) and how disputes may be resolved. However, since the day-to-day needs of the adult with dyslexia are often very similar, whether they are a student or an employee, the final two sections (i.e. 5.5 and 5.6), which deal with specific support strategies, do not distinguish between employment and education but are applicable to both.

Although fairly comprehensive, this chapter does not purport to cover *all* the issues concerning adults with dyslexia. If further information is required, a number of books have been recommended in Section 4.1.

5.2 Employment issues

5.2.1 The Equality Act (Employment in England, Scotland and Wales)

The Equality Act 2010 protects people from discrimination, harassment or victimisation in employment on the basis of disability (as well as eight other protected characteristics). The Act covers all phases of employment from recruitment through to post-termination processes (e.g. references). .

For the purposes of the Act a person is regarded as having a disability if he or she has a physical or mental impairment which has a substantial and long-term adverse effect on their ability to carry out normal day-to-day activities. Although dyslexia does not always affect a person's ability to carry out normal day-to-day activities because they often develop compensatory strategies, if people with dyslexia cannot do this for any reason the effects can be disabling and would therefore come within the terms of the Act.

Employers must make 'reasonable adjustments' to their premises or employment arrangements, if these substantially disadvantage an employee, or prospective employee, with a disability

compared to a non-disabled person. 'Reasonable adjustments' in cases of employees or prospective employees with dyslexia might include:

- supplying additional training
- reallocating part of a job to another employee
- acquiring additional equipment
- modifying instructions or reference manuals
- modifying procedures for testing or assessment
- providing a reader
- allowing absences from work for special tuition in literacy, coaching in organisational and other workplace skills etc.

5.2.2 Supporting dyslexic adults in the workplace

The **British Dyslexia Association** (BDA) maintains that if employers become 'dyslexia-friendly' then in addition to supporting employees with dyslexia, they will reap benefits for their business as a whole. The BDA highlights that a dyslexia-friendly workplace can reduce stress, increase morale and motivation, and reduce staff turnover and sickness leave. They suggest four areas to consider in creating a dyslexia-friendly workplace:

1. Staff awareness of dyslexia, and the challenges and strengths it presents
2. A flexible and supportive approach
3. Introduction of assistive technology
4. Changing communication methods, e.g. using coloured paper, larger fonts, audio files etc.

5.2.3 Resolving disputes

If an employee believes he or she has been discriminated against, the issue should first be raised with an appropriate person in their organisation (e.g. their line manager, personnel manager or trade union official), who may be able to resolve the issue or explain the organisation's internal complaints and appeals procedure. Remember that LADS Plus is only a screening system and does not purport to provide a diagnosis of dyslexia, so if an employee is minded to take a dispute further (e.g. to Court) then further professional evidence of their dyslexia will be necessary, e.g. from a suitably qualified psychologist.

Further advice and help may be sought from the following organisations:

ACAS (Advisory, Conciliation and Arbitration Services) is a government agency that will provide free initial advice on an employment query, and try to negotiate a settlement. A copy of any complaint lodged with a tribunal will be sent automatically to an ACAS conciliation officer. If conciliation is successful, the parties will reach an agreement, which will normally be recorded in writing.

Citizens Advice Bureau can help individuals negotiate with their employer and may in some cases be able to represent them at a hearing.

Disability Law Service provides free legal advice to disabled people and representation where appropriate.

Disability Rights Commission provides information on disability rights to individuals in employment / education as well as employers and service providers.

Equality and Human Rights Commission. This is an independent body working towards the elimination of discrimination against, and equalising opportunities for, disabled people.

Employers Forum on Disability. This is a business membership organization that provides solutions for businesses to recruit, retain and provide products and services to people with disabilities.

Local Law Centres may provide free advice and representation. Contact the **Law Centres Federation** to locate the nearest.

5.3 Educational issues

5.3.1 The Disability Discrimination Act (Education)

The Equality Act 2010 also protects people in education (including further and higher education institutions) from discrimination, harassment or victimisation in employment on the basis of disability. The Act covers all phases of education from selection / admission through to post-qualification processes (e.g. providing references).

For the purposes of the Act a person is regarded as having a disability if he or she has a physical or mental impairment which has a substantial and long-term adverse effect on their ability to carry out normal day-to-day activities. Although dyslexia does not always affect a student's ability to carry out normal day-to-day activities in their educational setting because they often develop compensatory strategies, if students with dyslexia cannot do this for any reason the effects can be disabling and would therefore come within the terms of the Act.

Education providers are required by the Act to make 'reasonable adjustments' to ensure that a disabled student is not placed at a 'substantial disadvantage'. Making 'adjustments' means that if a disabled person is at a 'substantial disadvantage', the education provider is required to take reasonable steps to alleviate that disadvantage. This might include:

- changing admissions, administrative and examination procedures
- changing course content, including work placements
- changing physical features and premises
- changing teaching arrangements
- providing additional teaching
- providing communication and support services
- offering information in alternative formats
- training staff.

For example, if a student with dyslexia who has writing difficulties and needs to record lectures is not permitted to do so, this is likely to be unlawful because it constitutes a failure to make 'reasonable adjustments'.

Many educational institutions have **Disability Statements**, which state what the institution offers for disabled students. However, if particular support is not mentioned within the statement, this does not mean it cannot be provided. Institutions are expected to make reasonable adjustments to all facilities available for disabled students. Disability statements are available on the institution's website or direct from the institution.

Some adult students will continue to receive support from existing sources such as the Disabled Students Allowances (DSA) in higher education. In such cases, the institution may not be expected to cover the same disability support that is met by another source. However, if not all the needs of a disabled person are met by other sources, then the institution would be expected to provide reasonable additional support.

5.3.2 Resolving disputes

If a student believes he or she has been discriminated against because of their dyslexia, the issue should first be raised with an appropriate person in their institution (e.g. disability coordinator, student union's welfare officer). They may be able to resolve the issue or explain the institution's internal complaints / appeals procedure. Remember that LADS Plus is only a screening system and does not purport to provide a diagnosis of dyslexia, so if a student is minded to take a dispute further (e.g. to Court) then further professional evidence of their dyslexia will be necessary, e.g. from a suitably qualified psychologist.

Further advice and help may be sought from the following organisations:

Citizens Advice Bureau can help individuals negotiate with the educational institution and may in some cases be able to represent them at a hearing.

Disability Law Service provides free legal advice to disabled people and representation where appropriate.

Disability Rights Commission provides information on disability rights to individuals in employment / education as well as employers and service providers.

Equality and Human Rights Commission. This is an independent body working towards the elimination of discrimination against, and equalising opportunities for, disabled people.

Local Law Centres may provide free advice and representation. Contact the **Law Centres Federation** to locate the nearest.

Skill: National Bureau for Students with Disabilities promotes opportunities for young people and adults with disabilities in post-16 education, training and employment.

5.3.3 Education of offenders

Research indicates that dyslexia is three to four times more common amongst prisoners and offenders than in the general population (BDA, 2005; Dyslexia Institute, 2005; Alexander-Passe, 2015). Dyslexia increases the risks of people failing educationally, of leaving school without qualifications and consequently struggling to find employment – factors that are all associated with offending. When dyslexia remains undetected and unaddressed the person does not simply lack the ability to read and write. There can also be huge emotional burdens because the person does not understand their learning difficulties. Policy initiatives, such as the *The Offender's Learning Journey* (DfES, 2004), acknowledge that identifying dyslexia amongst offenders and providing appropriate educational support is important in strategies to reduce reoffending. The *Review of Offender Learning* (MoJ, 2011) reiterated the need to assess and address the needs of offenders with learning difficulties.

5.4 Developing basic skills

When an adult has been identified as having (or probably having) dyslexia, the immediate temptation is to concentrate on their difficulties in reading, writing and spelling (and, possibly, maths) and try to improve those deficiencies in basic skills by providing specialist tuition. However, this is not always such a helpful strategy, for a number of reasons:

1. **Suitability.** In essence, this approach relies on taking adults with dyslexia 'back to the classroom' to try to teach them what they failed to learn when they were originally in school. Although the teaching method this time round might be different, revisiting the experiences of their schooldays (which were probably not very pleasant) is likely to be counterproductive and possibly emotionally unsettling, because it underlines their inadequacies as learners.
2. **Time.** Specialist tuition is not a 'quick fix'. It is usually a very time-consuming process that requires several months – if not years – of hard work on at least a weekly basis. Few adults with dyslexia, especially those in employment, full-time education or training, or who have families to look after, can find the time to devote to this.
3. **Availability.** Teaching adults with dyslexia is a very specialist job, and few teachers have been trained for it. The chances of an adult with dyslexia being able to find a suitably qualified tutor in the locality, who can provide tuition at mutually convenient times, are slim. While most local authorities run special classes for adults with poor literacy skills, these are rarely designed to meet the learning needs of those with dyslexia, and generally offer intensive individual specialist tuition.
4. **Cost.** Remedial teaching requires specialist skills and is very labour intensive, so it is usually expensive. Tuition from a private dyslexia tutor, at two sessions a week for two years (which would not be unreasonable) can cost in excess of £8,000. Although most of us would value literacy far higher than that, in practice few adults can afford such costs. Since adults with poor literacy skills are likely to be in relatively low-paid employment – if in employment at all – the expense can present real difficulties. Although adult literacy classes run by local authorities are inexpensive – or even free to those not in employment – they may not always be suitable.

As a general principle, therefore, it may be concluded that what most adults with dyslexia require is not to be sent back to school to try to learn what they failed to learn. Rather, what they require is support to *enable* them to cope with the demands of a literate world, at work, in the family, in education, and in leisure time. For further suggestions on this, see Section 5.5.

Obviously there will be exceptions to the general principle given above. If an adult with dyslexia has exceptionally poor basic skills, and this deficiency alone is preventing the person from:

a) obtaining employment,
b) gaining promotion within employment
c) being accepted on to a course of training or education
d) successfully completing a course of training or education

then specialist tuition may be required. Before embarking on this course of action, however, the person needs to understand exactly what is involved, and that a great deal of hard work will be expected of them. Their motivation and determination will be a major factor in determining success. Although such specialist tuition is expensive it may be possible to obtain financial assistance through an Access to Work grant. . Helpful guidance on ways in which basic skills can be improved for adults with dyslexia (whether in employment or unemployed) may also obtained from the following agencies:

Skills for Life
Learn Direct
Learning and Work Institute
Open Learn

5.5 Managing dyslexic difficulties

5.5.1 Short-term memory

Poor short-term memory, especially in the visual and auditory modalities, is often associated with dyslexia. Below are some of the difficulties it causes:

General difficulties

- remembering telephone numbers
- copying down numbers correctly
- remembering messages, instructions and directions
- keeping track of ideas when speaking, listening or writing
- remembering people's names
- remembering where things have been put

Studying difficulties

- taking notes in lectures
- formulating responses to questions in seminars

Workplace difficulties

- taking notes in meetings
- following discussions
- following oral instructions
- taking telephone messages

Managing the difficulties

- break numbers and words into chunks
- read sentences slowly and methodically
- try to identify the central theme of each paragraph you read
- request repeats or written back-up for instructions
- ask for instructions to be given in visual form, e.g. flow charts
- use set formats for telephone messages
- use visual symbols or pictures as cues and reminders
- record instructions / lectures / meetings
- take regular rest breaks
- do relaxation exercises

5.5.2 Sequencing and structure

The logical sequencing and structuring of information, ideas and activities is a necessary part of human life. Language, in particular, is highly structured. It is not surprising, therefore, that people with dyslexia have a number of difficulties with language, especially written language. However, they also often have difficulties in many other tasks that involve sequencing and structure. Some commonly-reported difficulties are listed below.

General difficulties

- writing and copying words and numbers
- following instructions / carrying out instructions in the correct sequence
- working under pressure
- keeping workspace tidy
- organising daily life

Studying difficulties

- structuring essays
- taking succinct notes
- organising work and revision schedules
- presenting an argument logically in a seminar
- dealing with library catalogues / finding books

Workplace difficulties

- filing documents / retrieving files
- following work protocols
- writing letters and memos
- structuring reports
- presenting ideas clearly in oral interactions / presentations
- carrying out tasks in an efficient, logical way
- dealing with a varied workload
- getting the times and places of meetings wrong
- missing appointments
- failing to prioritise / missing deadlines
- not having the right papers

Managing the difficulties

- read words and sentences bit by bit
- skim text to get an overview before reading for detail
- use alphabet cards
- colour code columns and rows of figures
- colour code instructions / protocols
- colour code files, e.g., use red for urgent work
- clearly label files
- keep workspace tidy
- plan daily, weekly and monthly action lists
- leave some time each day to deal with emergencies / unexpected tasks
- at the beginning of each day review the action plan for that day
- at the end of each day check what has / hasn't been done
- pre-plan essays and reports
- pre-plan oral interactions / presentations
- pre-plan tasks, and split them into sections / stages
- work one step at a time

5.5.3 Perception and movement

Dyslexia is sometimes associated with perceptual and motor difficulties (dyspraxia). .

General difficulties

- poor balance and posture
- clumsy gait and movement
- difficulty with bat and ball games
- tendency to fall, trip, bump into things and people
- poor handwriting and typing
- lack of manual dexterity (needed in tasks such as cooking)
- over-sensitivity to light and noise
- discriminating between left and right
- judging distance
- finding one's way about
- doing numerical and spatial tasks
- planning and organising thought, and expressing thoughts
- organising daily life
- social interaction

Studying difficulties

- presentation of written work
- keeping place when reading
- keeping overall structure of essay in mind

Workplace difficulties

- using machines such as photocopiers
- entering data on a computer / calculator
- copying down figures correctly and in the proper columns
- remembering where things have been put
- taking messages
- using a date stamp
- keeping papers in order
- carrying trays, e.g. of coffee mugs

Managing the difficulties

- use a ruler to keep place on page
- photocopy text onto coloured paper
- colour-mark layout of tables of numbers
- systematically scan each part of graphs, charts, tables of numbers

- use an ergonomic keyboard
- use keyboard shortcuts / slow down the mouse
- plan a daily, weekly and monthly work schedule
- carefully pre-plan before going to a new place
- use upside-down maps
- make a note of routes, e.g. to photocopying room
- request a quiet workspace
- get a tray with high sides and a long central handle (from disability organisations)
- use specially adapted utensils for cooking / tools for DIY

5.5.4 Emotions

People with dyslexia are increasingly encouraged to view their dyslexia in a positive light. However, many individuals with dyslexia feel a number of distressing emotions about their difficulties and their situation. Most commonly reported are the following:

Confusion and bewilderment

Many adults with dyslexia are unaware that they have a recognizable pattern of difficulties which can be significantly alleviated through the learning of appropriate skills and strategies. Therefore, an adult with dyslexia may feel confused that they seem to be quite bright and quick-thinking in some ways, but quite slow in others.

Embarrassment, shame and guilt

Feelings of embarrassment about dyslexia can deepen into shame, and, whereas embarrassment is often specific to a particular situation, shame seems to seep through the whole personality.

Often people with dyslexia come to feel that they have a guilty secret. Ella, a successful potter, describes it thus:

"I had a secret inside me. I kept 'it' in a box; and would only open the lid very cautiously. You may well laugh when you know the contents of the box: it was dyslexia. That word, that almost indescribable thing, lived in the box and pervaded almost every part of my life, but no one could see it. It was a living nightmare."

Lack of confidence, low self-esteem

The emotions described above – bewilderment, shame, guilt – deal a crippling blow to confidence and self-esteem. Lack of confidence manifests itself both in relation to specific tasks that a person with dyslexia finds difficult, and in a more general way. At work there may be a feeling of not being competent to hold down one's job. There may also be nervousness about applying for promotion, or for another job. In interviews, particularly, lack of confidence can be very damaging.

The daily questionings of one's own abilities and capacities will slowly but surely erode one's self-esteem. Lack of confidence may result in aggressive or defensive behaviour.

Frustration and anger

A sense of being imprisoned, trapped, impotent is often reported by adults with dyslexia. George, a long-distance lorry driver, describes it thus: "I felt I couldn't move in any direction. In my job I was always moving, going in all directions, but in myself I couldn't go anywhere. I was grounded. That's why I liked the driving – I would drive and drive and drive to try and get away from the frustration, but however far you drive, you can't get away from yourself."

In human beings, frustration often turns to anger.

Anxiety, fear and panic

Whatever difficulties one may have in life, anxiety usually makes them worse, and this is certainly true of dyslexic difficulties: adults with dyslexia become locked in a vicious circle of anxiety and inefficiency. Anxiety and stress can also precipitate physical symptoms: panic attacks, nausea, migraine, susceptibility to illness. Being physically below par naturally further reduces efficiency and so the downward spiral continues.

Despondency, depression and despair

If the difficulties continue to go unrecognised, if there is continual failure in attempts to study and hold down jobs, then the person with dyslexia may lose hope and sink into depression.

Relief, determination and hope

All the emotions that have been described here are commonly reported by adults with dyslexia. However, once dyslexic difficulties have been recognized, and strategies for dealing with them put in place, life can often take a turn for the better. All the energy that previously went into worrying about the difficulties, and covering them up, can now be channeled into developing effective ways of dealing with them, both practically and emotionally. What usually emerges most strongly is a sense of hope and a feeling of determination to turn one's life around.

As James, who was recently diagnosed as having dyslexia, said: "I felt as if the prison doors had been opened. I looked out and saw paths leading in all directions. I didn't know which of the paths was mine. All I did know was that I would have a path in the future and that the years of confinement were over."

5.6 Technology support

5.6.1 Why technology support?

In this manual we have chosen to focus strongly on technology support for adults with dyslexia, for several reasons.

1. It is widely accessible.
2. It does not require the assistance of a specialist dyslexia teacher, although training is beneficial and sometimes essential.

3. It generally costs less than specialist tuition and is more cost-effective.
4. Developing the necessary technological skills is faster and takes up less time than following a remedial programme. Great strides can be made in a relatively short period.
5. It is very flexible, and can support adults with dyslexia in education, at work, and in their leisure pursuits.
6. The technological skills acquired are transferable and can enhance employment and promotion prospects.

5.6.2 Practical issues

For adults in employment, or seeking employment, funding to pay for additional technological requirements may be available through an Access to Work grant. Whereas students who are taking full or part-time undergraduate or postgraduate courses can apply for a Disabled Students Allowance (DSA) which can be used to purchase suitable technology to support their studies.

Technology that may be extremely helpful for one dyslexic person may prove ineffectual for another. Wherever possible, try things out before making a purchase. All items of technology will require a period of learning in order to develop the necessary skills. It is beneficial if the person concerned is prepared to 'have a go' and learn from trial and error. It is essential not to become downhearted when things go wrong and to be realistic about what the technology can achieve. In all such matters, it helps to have someone who can be called upon for advice and support.

The environment in which the technology is being used should also be a consideration.

Digital recorders, as well as speech recognition software usually require a quiet environment. A built-in microphone can pick up external noises (especially in busy surroundings) and this may disrupt the activity. This will probably mean that the user needs a headset.

5.7 Supporting reading

Adults with dyslexia are often able to perform better on conventional reading or spelling tests rather than the tests on LADS Plus, but difficulties still arise. Reading mechanically word-by-word can be arduous and accuracy (and comprehension) may only come after many attempts.

5.7.1 Vocabulary

Due to a lack of practice, the vocabulary of an adult with dyslexia may be weak. The use of online dictionaries (e.g. Cambridge Dictionary; Collins Online Dictionary; Dictionary.com) and encyclopedias (e.g. Encyclopedia Britannica; Encyclopedia.com) is beneficial. These have search functions that do not always require the whole word to be finished and often come with speech feedback whereby the word is read by a recorded voice.

5.7.2 Text-to-speech

For reading paper-based materials, scanning pens (e.g. ***ReaderPen***; ***Scanmarker***; ***ExamReader***; ***C-Pen***) can read text aloud and transfer text onto a computer.

Text-to-speech software is designed to read the text on the screen and can help those who tend to skip lines or whose eye jumps a small section of text so that the meaning is lost. This type of software can also be used when syntax problems result in a misunderstanding of the whole, despite being able to cope with particular phrases or clauses. Poor comprehension also occurs when someone is reading so slowly that they cannot remember what was at the beginning of a section and find themselves re-reading parts over and over again without improving their understanding. If someone is reading at around 150 words per minute, a text to speech program can provide intelligible speech at a higher rate and even encourage faster reading speeds (the average adult reading speed tends to be around 240 words per minute).

Examples of suitable text-to-speech programs are ***Texthelp Read and Write***, ***ClaroRead***, and ***Kurzweil***. These programs can also be used with scanned versions of paper-based materials. There are also some free text-to-speech apps, and many commonly used pieces of software have built-in text-to-speech functions (e.g. the Speak feature in Microsoft Word, Powerpoint and Outlook), although these are much more limited in their use.

5.7.3 Electronic books

Electronic books (or 'E-books') can be read on-line in a web browser on a computer without any specialist software (other than a text-to-speech program, if required). There is the advantage of being able to change the background colours and visual appearance of the text. E-books can be downloaded from many websites and stored on computers or tablets. Text can be highlighted and the font size can be enlarged to assist reading.

5.7.4 Audio books

Standard audio versions of popular books are widely available and can be downloaded onto computers, tablets and phones. DAISY (Digital Accessible Information System) talking books allow the user a higher level of navigation and bookmarking than standard audio books, allowing them to have a similar experience to readers of print books. DAISY talking books represent the world standard for educational and training materials for adults with dyslexia.

5.8 Supporting writing

5.8.1 Mind-mapping

Once a good collection of information or material is available it may help to brainstorm ideas with a graphical planning program, e.g. ***Inspiration.*** In this application ideas are held within shapes or alongside pictures and lines link the shapes (although these can also have notes on them). The material can be switched between linear text mode and graphical mode. This type of

brainstorming is usually called mind mapping or concept mapping using concept webs or spider diagrams. Other suitable mind-mapping programs are ***MindManager, MindView, Pro-Study*** and ***MindGenius.***

5.8.2 Speech recognition

Speech recognition software such as ***Dragon*** allow the user to dictate into most text-based programs or into their own text windows. It is essential that training is undertaken and time is spent really ensuring that the initial attempts at using the programs are well supported.

Text-to-speech software works well in combination with speech-to-text software where sections of dictated text are read back to help with corrections.

5.8.3 Auto-text and prediction

Most office software packages have ways of automating text as in AutoText in Microsoft Word. This function can provide a user with a personal database of words that are often misspelled or phrases that are most commonly used with access by a single keystroke.

Word prediction and phrase prediction programs can help those with slow typing speeds as they produce possible choices as the user types, however it means that the screen must be watched and it can be hard to choose the correct word from a long list. These can be used with text-to-speech software (see Section 5.7.2), which generally have a floating window with a choice of words that can be increased or decreased in number to suit the user.

5.8.4 Proofing and spell checking

As an adult, failure to spell accurately may affect the whole writing process and dampen the creative instincts that most people have when wishing to exchange ideas on paper. It is important to realise that spelling is a very small part of the whole process of written communication and spell checkers do not necessarily help all users.

Having assembled the text and formatted the document, proof reading and checking spelling may not always be the easiest of tasks, although most programs will have provided the writer with squiggly lines which halt the typist mid-flow and this can be very disconcerting.

However, generic spelling checkers incorporated in word processing packages do recognise most spelling mistakes, some grammatical errors such as missed capital letters, duplicated words and even the odd homophone. Nevertheless, if a word is badly misspelled then a built-in spell checker may not offer the correct word in its list of suggested alternatives. In the case of homophones (e.g. wood, would), an adult with dyslexia may struggle to determine which is the correct spelling out of the alternatives suggested. Where additional spelling support is required, speech recognition software, such as Dragon, can be enhanced with the addition of spelling software, such as ***Spellex***.

5.9 Help with organisation

Trying to remember discussions, organise work and cope with messages can be difficult for many adults with dyslexia. Computers, tablets and smartphones all have tools that can help individuals with organization, in terms of calendars (that can be viewed across different devices), alarms, reminders, voice memos etc. These tools may be used to form lists that can be checked off and for planning ahead with tutors or employers. These ideas may help one to keep to deadlines and improve organisation and time management skills.

For adults with dyslexia at University, *The Study Skills Handbook* (Stella Cottrell, 2019) and *Study Skills for Students with Dyslexia* (Sandra Hargreaves and Jamie Crabb, 2016) are useful resources. For those in employment, *Dyslexia: How to Survive and Succeed at Work* (Sylvia Moody, 2006) is very comprehensive.

6 Appendices

6.1 Organisations and general resources

N.B. The following list is in alphabetical order, not in order of importance. Every effort has been made to ensure that information is correct at the time of going to press, but nevertheless cannot be guaranteed.

Ability Net: https://www.abilitynet.org.uk/

ACAS (Advisory, Conciliation and Arbitration Service). https://www.acas.org.uk/

ACE – Advisory Centre for Education. www.ace-ed.org.uk

Action on Access: http://www.actiononaccess.org/

British Dyslexia Association: http://www.bdadyslexia.org.uk/

British Psychological Society: www.bps.org.uk

Closing the Gap (US): www.closingthegap.com/

DFE (Department for Education): https://www.gov.uk/government/organisations/department-for-education

Disability Law Service: https://dls.org.uk/

DIAL UK: www.dialuk.info/

Dyslexia Scotland: https://dyslexiascotland.org.uk/

Dyslexic.Com: https://www.dyslexic.com/

Dyspraxia Foundation: www.dyspraxiafoundation.org.uk

Education and Training Foundation: https://www.excellencegateway.org.uk/

EmployAbility: www.employ-ability.org.uk/

Equality and Human Rights Commission: http://www.equalityhumanrights.com/

Equality Commission for Northern Ireland: www.equalityni.org

Helen Arkell Dyslexia Charity: www.arkellcentre.org.uk.

LD OnLine (US): www.ldonline.org/

LearnDirect: https://www.learndirect.com/

PATOSS (Professional Association of Teachers of Students with Specific Learning Difficulties): www.patoss-dyslexia.org

Prospects: www.prospects.ac.uk

Shaw Trust: www.shaw-trust.org.uk/

SKILL (The National Bureau for Students with Disabilities): www.skill.org.uk

Student Finance England: http://practitioners.studentfinanceengland.co.uk/

TUC (Trade Union Congress): www.tuc.org.uk

UCAS (Universities & Colleges Admissions Service for the UK): www.ucas.ac.uk

UKCISA (The UK Council for International Student Affairs): https://www.ukcisa.org.uk/

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