

The Assessment of Dyslexia

The assessment of dyslexia depends on definition.

If one could clearly define dyslexia, assessment would be relatively easy. However, since dyslexia does not appear to be a completely discrete condition (Stanovich, 1991), but rather the lower part of a distribution, we have to choose criteria from which we can make the diagnosis.

Discrepancy definitions

- age
- other school subjects
- intelligence
- listening comprehension

Older definitions of learning disabilities emphasised discrepancies between age, intelligence, and success in other school subjects. Thus a two-year lag in reading age compared to chronological age was often proposed as a marker for reading disability. This was often also compared with intelligence to discriminate between common-garden poor readers and those with a learning disability or dyslexia (Gough & Tunmer, 1986).

Most assessments of learning disabilities have also emphasised the “unexpected” nature of the problem. That is to say, based on their knowledge of the child, both parents and teachers have expected the child to do well in reading either because of apparent intelligence, or success in other learning activities. Hence the name “Specific” learning difficulties or disabilities.

In recent years, the concept of an IQ-Achievement discrepancy has been commonly accepted as a marker of learning disability. The rationale is that with a high IQ, high performance in all things (including reading) is to be expected. Thus poor reading progress is unexpected and must be due to a disability of some kind when all other explanations have been ruled out (Kirk & Bateman, 1962-3). This idea was unquestioned for many years, and was formalised in 1976 by the US Office of education in their statement about learning disabilities:

“A specific learning disability may be found if a child has a severe discrepancy between achievement and intellectual ability in one or more of several areas: oral expression, written expression, listening comprehension or reading comprehension, basic reading skills, mathematics calculation, mathematics reasoning, or spelling. A ‘severe discrepancy’ is defined to exist when achievement in one or more of the areas falls at or below 50% of the child’s expected achievement level, when age and previous educational experiences are taken into consideration. (USOE, 1976, p.52405)

P.G. Aaron proposed an alternative discrepancy definition, that between reading comprehension and listening comprehension, based on his own studies and those of others such as Gough (1983) (Aaron, 1989, 1991). His argument was that the distinguishing deficit in dyslexia was ability to decode words in the absence of a deficit in comprehension. In hyperlexia, on the other hand, the deficit was in comprehension, in the absence of a difficulty with decoding. Comprehension can be measured independently of reading through listening comprehension. Badian (1999) appears to have offered validation for this concept.

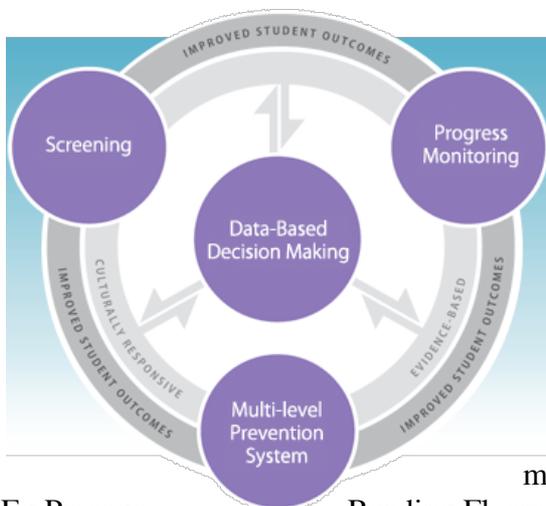
The Dyslexia Institute, now called Dyslexia Action in UK formerly carried out intensive cognitive and attainment testing with a detailed process for determining degree of dyslexia, and still does some of this, though their website indicates that they test spelling and reading, verbal reasoning (understanding), comprehension, memory, processing speed, phonological awareness (sound knowledge), maths, writing speed and more.

The British Dyslexia Association recommends that assessment be done by a chartered psychologist and involve a battery of cognitive, ability and literacy/numeracy attainment tests. The results should show the pattern of strengths and weaknesses and give recommendations for remediation.

In recent times, this idea has been seriously questioned by eminent researchers (Aaron, 1989; Siegel, 1989; Stanovich, 1991). The problem according to Stanovich, is that there is no good research evidence that discrepancy-defined poor readers have a different cognitive profile from garden-variety poor readers, nor is there evidence that discrepancy-defined poor readers respond differently to treatment, or have a different prognosis. What is certain is that dyslexics are at the bottom of the distribution of poor readers, even though their profile of skills development may be similar (Ackerman, Dykman, Oglesby, & Newton, 1994). Other studies however, have suggested that IQ discrepancy does become meaningful above age 8, where phonological processing skills appear as a deficit in dyslexics, but as a delay in garden-variety poor readers (Badian, 1996). Above 8, phonological deficits are seen to be resistant to treatment in dyslexics, but not so in other poor readers (Stanovich, Siegel, & Gottardo, 1997). There is still some debate about this, however, since recent studies suggest that dyslexics (ie those with higher IQs) are not easier to remediate than those with lower IQs (Vellutino, Scanlon, & Lyon, 2000).

Response to Intervention

A recent study by Frank M. Gresham and Frank R. Vellutino (2010) has discussed the role of intelligence in identifying children with SLD and presented data based on correlational analyses and hierarchical regression analyses showing that **intelligence is not a strong predictor of reading achievement** and does not predict responsiveness to remedial instruction. These data also indicate that direct measures of responsiveness to intervention (RTI) strongly predict later reading achievement in tutored children from 1st grade through 4th grade. The combined results suggest that RTI approaches to the identification of SLD may have greater utility than psychometric approaches based on IQ scores or individual profile analysis.



Screening to be done 3 times per year on ALL students.

Identify students at risk for poor learning outcomes
Identify students who need additional assessment
Provide data on effectiveness of curriculum etc.

Screen in reading, maths and behaviour & maybe language and writing.

NCRTI Screening Tools Chart gives examples of screening tools, time varying from 2 minutes to 40 minutes.

Eg Passage Reading Fluency – # words read in one minute. Repeated 3x and averaged. Other tests may be whole-class. Screens must be age-appropriate. A cut-score is used to identify students at risk. But screening tools tend to over-identify. So follow-up tests are needed.

If more than 20% students are identified, focus should be on core-curriculum revision.
It can take 2-4 years to fully implement RTI processes.

Symptomatic (Clinical) definitions

Professor Tim Miles and others pioneered symptomatic definitions over many years at the University of Bangor in Wales. Their rationale is outlined in Miles (1993). Essentially, the diagnosis comprises fulfilling criteria defined by years of clinical observations of more than 12 000

subjects with significant and persistent reading and spelling disabilities. The common elements are outlined in the Bangor Dyslexia Test (Miles, 1983)

Bangor Dyslexia Test (Miles, T. R. 1983)

The subsets of this survey instrument are:

- left-right body awareness
- polysyllables
- subtraction
- tables
- months forwards
- months backwards
- digits forwards
- digits backwards
- b-d
- familial incidence

The test yields a profile, and purports to give some indication of severity. It is not necessary for subjects to demonstrate all the difficulties mentioned. It is really a screening test. Diagnostic testing should follow identification using this test. Areas of deficit need to be specified and targeted for remediation.

Irlen’s Overview

Helen Irlen was employed by the University of Southern California to investigate learning disabilities (Irlen, 1985). She conceived them somewhat as follows. I have reduced them to tabular form because this gives us an overview and enables us to not categories and subcategories at a glance. This is a useful table for reference when assessing likely causes of difficulties in reading and spelling. It is not, of course, a means of identifying learning disabilities as distinct from learning difficulties, because the final category (Educational/Personal) includes obvious causes of learning difficulties that are not in any way intrinsic to the individual.

These categories have now been validated as follows. The visual category is validated by research in behavioural optometry and scotopic sensitivity. The auditory category is validated by research primarily showing the importance of phonemic skills in beginning reading. Rapid naming has also demonstrated resilience as a predictor in the research (Vellutino, Scanlon & Lyon, 2000). The neurological category has now been largely subsumed in the ADHD research, although it still reflects the existence of some cases that defy explanation or seem to involve mostly motor difficulties, whether visual or physical. Verbal memory also turns out to be predictive of reading disabilities (Vellutino, Scanlon & Lyon, 2000). Irlen did not include IQ in her overview, and this accords with the view offered earlier in this paper that learning disabilities may occur across the intelligence range, thought probably being more difficult to isolate in people of lower intelligence.

Causes and sources of learning difficulties (Irlen, 1985)

<i>Source</i>	<i>Areas affected</i>
Visual & Visual Perception	Eye movement control Convergence, stereopsis Scotopic sensitivity (Irlen) Syndrome
Auditory	Word finding Conceptualisation Receptive/expressive language

	Vocabulary Phonemic awareness'
Neurological	Hyperactivity Impulsivity Primary attention deficit
Memory	Short/long term Overview/details Reading/listening Rote memory
Educational/personal	School changes Lack of individualised teaching Staff changes Failure to understand Emotional problems

Assessments based on definition

Gough (1983) describes the differing types of reading problems that are observed in a diagram that plots listening comprehension against decoding ability. The normal reader has average or better performance in both. The reader who is a slow learner has below average performance in both. The hyperlexic has excellent decoding skills but poor comprehension, while the dyslexic typically has good or excellent listening comprehension but poor decoding skill.

	High	Dyslexic	Normal Reader
Listening Comprehension	Average	Poor Reader	Hyperlexic
	Low		
		Low	High
		Decoding Ability	

Testing Decoding

Castles Test with scoring

a. The Castles Word/Nonword Test (1994)

(Time: 7 mins per child. Words presented on flashcards.)

Regular, Irregular and Non- words.

(Regular)	(Irregular)	(Non)
bed	blood	aspy
brandy	bouquet	baft
chance	bowl	bick
check	break	bleaner
chicken	brooch	boril
context	ceiling	borp
cord	choir	brennet
curb	colonel	brinth
drop	come	crat
flannel	cough	delk
free	eye	doash
hand	friend	drick
life	gauge	farl
long	give	framp
luck	good	ganten
market	head	gop
marsh	iron	grenty
middle	island	gurve
mist	lose	hest
navy	meringue	norf
need	pint	peef
nerve	pretty	peng
peril	routine	pite
plant	shoe	pofe
pump	soul	rint
stench	sure	seldent
tail	tomb	spatch
take	wolf	stendle
weasel	work	tapple
wedding	yacht	trope
(30 words)	(30 words)	(30 words)

Scoring:

Age	Minimum normal score		
	Regular Words	Irregular Words	Non words
7	15	7	6
8	20	12	8
9	22	13	12
10	27	18	18
11	26	19	18
12	28	20	22

An exclusionary Definition

Learning Disabilities Diagnostic Inventory (Hammill & Bryant, 1998)

The diagnostic inventory is based on the definition of the National Joint Committee on Learning Disabilities, (1994.) This is an exclusionary definition, and is a nominal and stipulative definition, rather than an operational definition, according to Kavale and Forness (2000).

“Learning disabilities is a generic term that refers to a heterogeneous group of disorders manifested by significant difficulties in the acquisition and use of listening, speaking, reading, writing, reasoning, or mathematical abilities. These disorders are intrinsic to the individual, presumed to be due to central nervous system dysfunction, and may occur across the lifespan.

“Problems in self-regulatory behaviours, social perception and social interaction may exist with learning disabilities, but do not themselves constitute a learning disability. Although learning disabilities may occur concomitantly with other handicapping conditions (for example, sensory impairment, mental retardation, and serious emotional disturbance) or with extrinsic influences (such as cultural differences, insufficient or inappropriate instruction), they are not the result of those conditions or influences.”

Hammill and Bryant have attempted to operationalise this definition by devising six rating scales, corresponding to the areas of underachievement mentioned in the definition. The 6 scales in the inventory are listening, speaking, reading, writing, reasoning, and mathematics.

Each item is a description of a symptom or behaviour that has been shown in the literature to be symptomatic of learning difficulty in the cognitive area in question. (e.g. “Has difficulty discriminating speech sounds”.) The research basis for each category is given. The possible difficulty with the inventory is that it needs some pretty perceptive teacher or tutor to fill it in, and it is rather long. The advantage is that it gives a decision about the likelihood of a learning disability in specific areas, which is much more useful than simply deciding that there is a learning disability per se. It yields a profile of scores as follows (Figure 2):

Figure 2: Profile of Scores from the Learning Disabilities Diagnostic Inventory

Profile of Scores

Stanine	Listening	Speaking	Reading	Writing	Maths	Reasoning	Likelihood of an intrinsic processing disorder
7,8,9							Unlikely
6							Possibly
1,2,3,4,5							Likely

This appears to me to be a distinct advance on most other assessments in that it allows the specific area of deficit to be targeted with diagnostic tests. It deliberately avoids the question of underachievement in relation to IQ. It also specifies some behaviours that may be capable of direct instruction as well as further analysis, assuming that the actual rating scales are available for scrutiny.

Automaticity hypothesis. (Nicolson, R. & Fawcett, A., 1990-96)

Nicolson and Fawcett from Sheffield University in UK discovered, among other things, that dyslexic students had difficulty in completing motor tasks while simultaneously undertaking verbal

tasks. Other students did not have this trouble. They hypothesised that dyslexic students had a generalised automatised difficulty which meant that while they appeared competent at e.g. balance tasks, they were really consciously monitoring their performance, rather than doing it automatically. The same was true of their verbal performance, so when they were asked to combine the two, one disintegrated since an individual cannot attend to two tasks at the one time. In other research, they also noted difficulties children had in voice recognition, and naming speed (Fawcett & Nicolson, 1992; Nicolson & Fawcett, 1990, 1994a & b, 1996).

Combining their findings with other findings about significant factors in dyslexic performance, they devised the *Dyslexia Screening Test* (1996) for children aged 6.5-16.4, a norm-referenced test taking 30-40 minutes. It provides a profile of strengths and weaknesses which can be used for devising intervention. Tasks include three attainment tasks and eight diagnostic tasks:

Attainment:

1. one minute reading
2. two minute spelling
3. one minute writing

Diagnostic

4. rapid naming
5. bead threading
6. postural stability
7. phonemic segmentation
8. backward digit span
9. nonsense passage reading
10. verbal fluency
11. semantic fluency

The tasks that reflect their particular research interest are rapid naming, postural stability and bead threading.

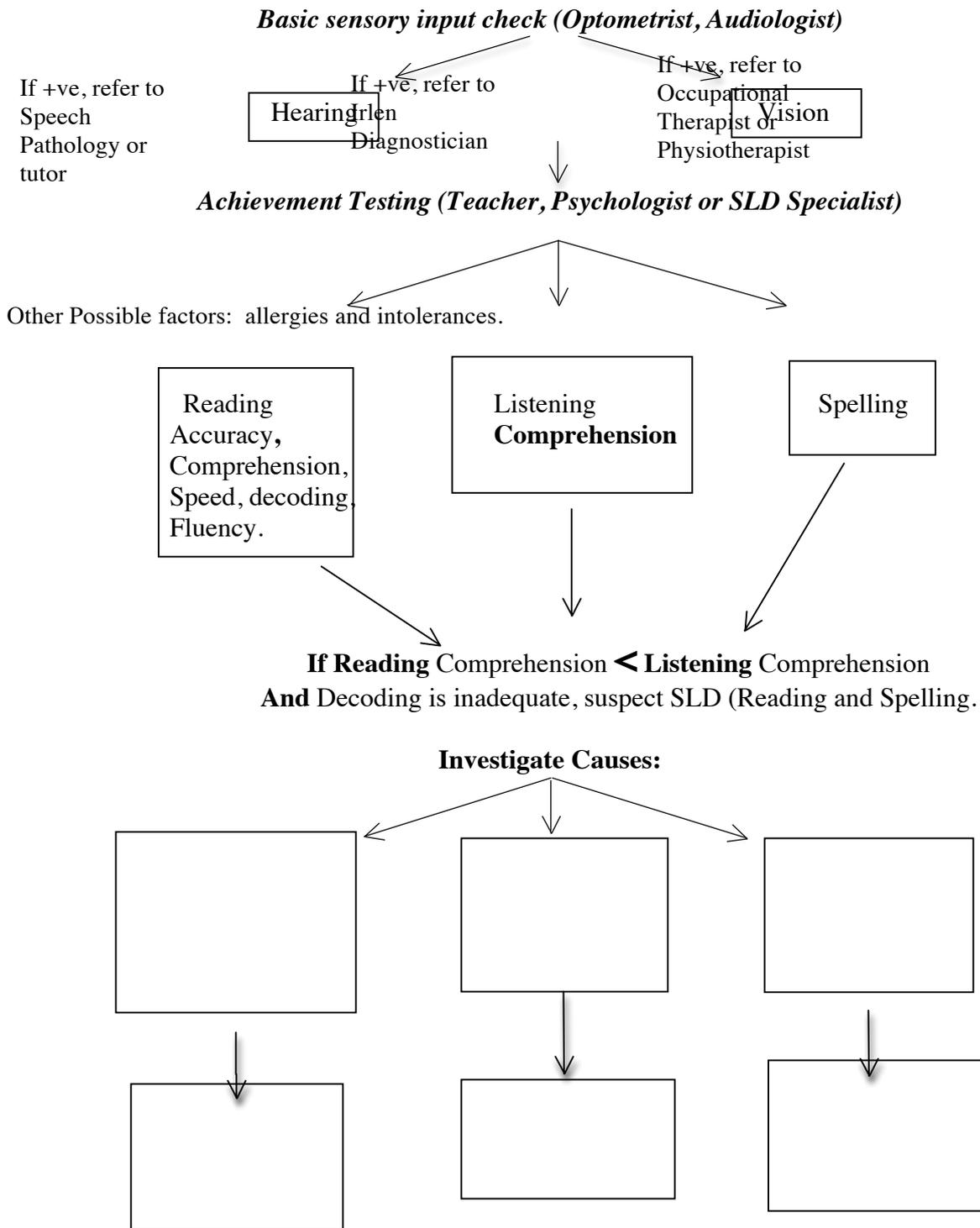
The DORE Program is based on this hypothesis.

There has been a lot of scholarly discussion of this hypothesis, and a recent survey of relevant research concluded that a mixed pattern of results is evident. It is concluded that there is currently clearer evidence for language-based than motor-based automaticity deficits. Future motor automaticity research is likely to require the routine screening of poor readers for common co-occurring developmental difficulties, improved sampling and prospective longitudinal studies. (Savage, 2004). Rapid naming however seems to be a fairly good predictor of reading success and failure.

A summary statement of LD Assessment: Whiting (1998 - 2010)

The diagram above provides a summary of the important issues in the assessment of specific learning disabilities or dyslexia. It has not taken account of non-verbal or mathematics learning disabilities. For these, it is necessary to invoke some brief tests of basic skills such as a one-minute addition and subtraction test.

A summary of SLD (Dyslexia) Assessment: Whiting (1998-2010)



A Note on Characteristics of Students with Learning Disabilities and Maths Weaknesses

Rose Vukovic and Linda Siegel from NY U and U Brit Colum (2010), found that students in 1st to 4th grades who had persistent difficulty in maths, consistently showed greater difficulty in the following: calculation, practical problem solving, number facts, and reading. In terms of cognitive characteristics, this group was specifically characterized by deficits in math concepts and phonological decoding, though there was some evidence for the involvement of working memory, processing speed, and numerical reasoning.

One Minute Maths Test (Westwood, P., 1975)

ADDITION

2+1=
1+4=
2+2=
4+2=
3+4=
2+3=
5+2=
4+5=
3+5=
2+8=
4+4=
2+5=
1+8=
6+4=
3+7=

6+3=
5+5=
6+2=
2+7=
4+6=
5+7=
8+3=
4+9=
7+6=
8+6=
9+8=
6+9=
8+7=
9+5=
9+7=

SUBTRACTION

2-1=
5-1=
3-2=
5-3=
6-2=
2-2=
6-4=
7-2=
6-1=
7-3=
8-2=
7-5=
8-3=
7-4=
9-3=

8-5=
9-5=
10-4=
9-4=
10-3=
11-2=
10-6=
12-3=
12-6=
11-5=
13-3=
12-9=
14-6=
17-8=
16-9=

Standardised (1974) on 1894 5-11 yr olds in UK. Test-retest =.92 addition, .89 subtraction.

Norms:

ADDITION

AGE	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11
Av Score	2.5	4.5	7	10	13.5	15.5	17.5	19	20	21	22	23
Critical	0	2	3	6	7	9	12	13	14	15	15	16

SUBTRACTION

AGE	5½	6	6½	7	7½	8	8½	9	9½	10	10½	11
Av Score	1	3.5	6.5	8.5	10.5	12	13	15	16.5	17.5	19	21
Critical	0	0	3	6	8	9	10	11	12	13	13	14

Use the critical score to determine who is definitely outside the normal range for age.

One might then investigate basic concepts, and the factors that are known to be difficult for students with learning disabilities involving weakness in mathematics. These have been summed up for us by Bryant, Bryant, & Hammill,(2000).

1. Difficulty with word problems;
2. difficulty with multi-step problems;*
3. difficulty with the language of maths;
4. fails to verify answers;

5. cannot recall number facts automatically (i.e. unable to perform simple calculations);
6. takes a long time to complete calculations;
7. makes borrowing (regrouping) errors;*
8. counts on fingers;
9. reaches unreasonable answers;
10. misspells number words;
11. calculates poorly when the order of digit presentation is altered;
12. orders and spaces numbers inaccurately in multiplication and division;
13. disregards decimals;
14. misplaces digits in multidigit numbers;
15. does not recall number words or digits.

* Items marked thus were the major contributors to the variance between LD with and without maths weakness.

Dr Anna Wilson, cognitive neuroscientist at the University of Canterbury, NZ is one of the new researchers in this field, and comments, “Although dyscalculia is just as prevalent as dyslexia – occurring in about 6% of the population – there is little awareness of it and it is extremely under-researched... For example, learning disabilities often occur together – dyscalculia and dyslexia co-occur around 50% of the time.” In this last respect, we might note that UK combines dyslexia with maths difficulties in their definitional legislation. She notes the following difficulties as typical:

Delays in counting, addition strategies, number facts

Difficulty representing quantity (is 3 or 4 bigger?)

Slow to enumerate objects (i.e. recognize quantity (not count))

Slow to understand the meaning of numbers

Slow to develop a mental number line (understanding proportion)

Difficulty understanding place value

Difficulty with multi-step processes

Difficulty with Stroop tests. (**7** – 9 – which is numerically larger?) (Heine and others, 2010)

Board of Studies Assessments

The requirements for application for special provisions in examinations are given in the Board of Studies Assessment, Certification and Examination Manual (2005), section 10.

Information from NSW BoS, <http://www.boardofstudies.nsw.edu.au/disability-provisions/>

Any HSC and School Certificate student with a disability recognised in the Commonwealth *Disability Standards for Education 2005* is entitled to special provisions in examinations.

The definition of ‘disability’ in the *Disability Discrimination Act 1992* includes:

- physical
- intellectual
- psychiatric
- sensory
- neurological, and
- learning disabilities, as well as
- physical disfigurement, and
- the presence in the body of disease-causing organisms.

([Australian Human Rights Commission](#)).

ACE (Assessment Certification and Examination) Manual Section 10:

School Certificate and Higher School Certificate Special Examination Provisions

10.5 Evidence

When an application is submitted, evidence must be included indicating the precise nature of the special need and the consequent effect on examination performance.

A student with a special need may be affected in a variety of ways in an examination.

For example:

- (a) difficulty in reading and comprehending written questions;
- (b) severe spelling difficulty which impedes communication;
- (c) difficulty expressing thoughts in writing;
- (d) illegible or extremely slow writing.

The appendix to this section sets out some examples of difficulties in examinations, possible special provisions and the types of evidence required in an application for special examination provision(s). An explanation of the terms used in the appendix follows.

The term test results in the table includes:

- (a) results of tests in relevant skill areas – eg in reading, the Neale Analysis of Reading Ability (3rd edition), the Woodcock Reading Mastery Test – Revised, or the Woodcock Reading Mastery Test – Revised/NU; in spelling, the South Australian Spelling Test;
- (b) essay examples conducted under examination conditions with the time allocation recorded and with teacher comments relating to the essay examples;
- (c) psychometric test results. These are not a minimum documentation requirement.

If a psychometric test has been conducted within the last four years and the test results are available, they may be attached to the application. The term medical report refers to detailed medical documentation. In such supporting documentation, the nature of the special need must be identified and the probable extent to which the student’s performance in the examination will be affected must be described and substantiated. The term teacher comments refers to comments by class teachers. These should describe how the student functions in both the classroom and the examination room. Supporting documents and other evidence submitted with an application for special provision(s) must be as recent as possible, and must be no more than 12 months old.

Difficulty/Impairment in Examination	Some Possible Provisions	Minimum Documentation
Difficulty in reading and comprehending the written word <ul style="list-style-type: none"> • slow reading speed • low level of reading accuracy • poor comprehension 	Reader, extra time, exam supervision	Current individual reading test results Essays Teacher comments
Slow writing rate	Writer, personal computer, exam supervision	Essays Teacher comments
Severe spelling difficulty that impedes communication	Writer, exam supervision	Spelling test results Essays
Illegible handwriting	Teacher comments Computer, writer, extra time to rest, exam supervision	Essays Teacher comments
Difficulty with light sensitivity to white paper	Transparency overlay, coloured paper, large print papers, extra time to rest	Medical/vision report (evidence of scotopic sensitivity is required) Teacher comments

The term **test results** in the table includes:

(a) **Reading**, the Neale Analysis of Reading Ability (3rd edition) Woodcock Reading Mastery Test – Revised, or Woodcock Reading Mastery Test – Revised/NU;

Spelling, the South Australian Spelling Test;

(b) **essay examples** conducted under examination conditions with the time allocation recorded and with teacher comments relating to the essay examples;

(c) **psychometric test results**. These are not a minimum documentation requirement. If a psychometric test has been conducted within the last four years and the test results are available, they may be attached to the application.

Medical report refers to detailed medical documentation. In such supporting documentation, the nature of the special need must be identified and the probable extent to which the student’s performance in the examination will be affected must be described and substantiated.

Teacher comments refers to comments by class teachers. These should describe how the student functions in both the classroom and the examination room.

Supporting documents and other evidence submitted with an application for special provision(s) must be as recent as possible, and must be no more than 12 months old.

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