

# "Delving into Dyslexia"

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**NZSMTTF Danella Smallridge (TF08-042)**

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## **1 Executive Summary**

This inquiry investigates the nature of dyslexia, reviews the way schools can meet the needs of dyslexic learners and compares a couple of popular specialist interventions. A large body of research evidence has highlighted the complex nature of dyslexia. Phonological awareness is a significant factor in dyslexia and has been the focus of a large amount of overseas research and the development of interventions. The current cognitive and motor study conducted in conjunction with the Action, Brain & Cognition lab at Otago University, has found a consistent and significant difference in reactions times for dyslexic learners on a simple visual-motor response task. This adds weight to the New Zealand Ministry Literature Review on Dyslexia (2007) which states that dyslexia is more complex than merely a simple phonological deficit. Based on my learning from current research and the study of specialist interventions, help for dyslexic students must consider: early diagnosis and intervention; general classroom accommodations; specialist 1:1 teaching in literacy & underlying cognitive weaknesses; developing self-esteem through strengths; fine tuning classroom literacy teaching; using multiple memory hooks; addressing any sensory and motor difficulties; teaching social skills; and enhancing metacognition. Davis Dyslexia and SPELD NZ are both recognized providers of specialist teaching interventions for dyslexic learners. This study examines each in detail, and comments on observed strengths and weaknesses.

## **2 Background**

A student who struggled with literacy learning because of dyslexia inspired this inquiry. In 2007 the New Zealand Ministry of Education officially recognized dyslexia for the first time. The motivation for this year's work was to understand more about dyslexia and how best to meet the needs of these students.

### **2.1 Action, Brain & Cognition Lab**

Associate Professor Liz Franz is the director of this laboratory located in the psychology department at Otago University. In her research programme cognitive and neuroscience techniques, including recordings with digitizer tablets, force keys, 3D-camera recording & functional magnetic resonance imaging (fMRI) and electroencephalography (EEG) are used to examine the neural and cognitive underpinnings of a variety of complex actions and cognitive skills with a focus on bimanual actions and memory processes. As part of this research, Franz's team also examines fundamental neural

mechanisms and processes of rare neurological disorders. Franz directs fMRI Otago, and is also the director of the interdisciplinary Cognitive Science MSc degree programme at Otago. She is also a member of the Brain, Health, Research and Repair Centre (BHRRC) at Otago. For further information on Franz's research program, please see:

[psy.otago.ac.nz/research/actionbraincognition/index.html](http://psy.otago.ac.nz/research/actionbraincognition/index.html)

Dr Franz's interest in neurological disorders and in bimanual actions and cognition provided a perfect match to conduct research on dyslexia, and she encouraged such collaboration from the start.

During this year I have worked with Dr Franz conducting a motor and cognitive study to gather information about the role of the corpus callosum in enabling the two hemispheres of the brain to work together. The study has involved recruiting a group of people with dyslexia, another with autism and a third group of controls without neurological disorder.

The computer automated task used in the research is one that has already been applied to large groups of neurologically-normal right handed and left handed adults, a large group of children between the ages of 4 and 11 ( $n = 100$ ), a group of people who were born without the corpus callosum, a group of people who are skilled musicians (all published research from Franz's lab), and in a group of people with concussion and another with Schizophrenia (both papers in progress).

The simple visual-motor task requires subjects to respond as quickly as possible using one hand (unimanual) or both hands together (bimanual) to a visual stimulus presented on a computer monitor. The task so far has shown that in neurologically-normal right handed and left handed adults, bimanual responses are slower than unimanual responses, an effect we refer to as bimanual cost. Bimanual cost does not yet occur in people who are under the age of about 6 years (when the primary neural structure on which the effect depends—the corpus callosum—is still not developed to a mature level), nor does it occur in people born without a corpus callosum (the primary band of connections between the two cerebral hemispheres (Franz & Fahey, *Psychological Science*, 2007).

Franz's model of the role of the corpus callosum in bimanual cost is straightforward: When people get ready to produce a motor response using one hand, the cerebral hemisphere involved in that hand's response sends a signal across the corpus callosum to the other hemisphere to inform it that a response is pending. That excitatory signal then activates an inhibitory network in the opposite hemisphere, as though telling the receiving hemisphere to delay any other pending responses until the initial one has been sent. This is all fine and good for unimanual responses because the receiving hemisphere is not preparing to respond (so a delay has no effect). But for bimanual responses in which both hemispheres are preparing to respond, the delay actually slows both responses—bimanual cost. Importantly, while bimanual cost is measured only for simple responses, the idea is that it represents a basic mechanism of interhemispheric communication that might also underlie more complex forms of cognition. In

addition to bimanual cost, our task assesses overall speed of responding which is thought to reflect networks within each cerebral hemisphere and other supporting neural systems which remain to be fully understood.

Our task is simple. It requires subjects to press a button when a green circle is presented to the centre of the visual field following a variable time delay. The delay is variable so that people cannot predict just when the green circle will occur. Reaction times are recorded in milliseconds for each response in relation to the time of presentation of the dot. Subjects complete 2 blocks of 36 presentations for each experimental condition: left hand, right hand & bimanual. Details of subjects' handedness are also recorded using a simple inventory and the test results in a score that ranges from +100 (strong right hand preference) to -100 (strong left hand preference).

## **2.2 Davis Dyslexia**

The Davis Method involves using clay to master symbols and words. It also uses a variety of techniques to enhance a dyslexic learner's focus and perception. In order to learn about the Davis method I observed a licensed facilitator working with a client over the period of a week. I also read 2 books written by Ron Davis: "The Gift of Dyslexia"; and "The Gift of Learning" and attended a seminar where a licensed facilitator explained the method. Moreover, I attended a four day Davis Fundamentals course run by DDA Pacific and have subscribed to their magazine. During the course of the year I have spoken to a range of students and their parents who have received help from licensed Davis facilitators.

## **2.3 SPELD NZ**

SPELD NZ (the Specific Learning Disabilities Federation) provides individually tailored tutorial sessions with an emphasis on phonology and cognitive skills. This year I have attended the SPELD NZ annual conference and completed a certificate level qualification through SPELD in teaching students with specific learning disabilities. This comprehensive course involved the completion of 6 modules and a 3 day block course in Wellington. The course covered specific learning disabilities, other special needs, neurology, cognitive neurology, visual learning, auditory learning, motor development and co-ordination, kinaesthetic learning, the beginning learner, emotional development and behaviour, speech and oral language, phonemic and phonological awareness, metacognition and learning, reading, spelling, written language, handwriting, assessment, lesson planning, remedial programmes, maths, dyspraxia, adolescents and adults, parents, teacher support and teaching methods. In addition I have shared ideas with a number of tutors and parents of dyslexic students.

## **2.4 Observations, Discussions & Field Notes**

Dawn Cousins, Resource Teacher of Literacy (RTlit) for Central Otago has generously donated her time to mentor me in my inquiry. She has involved me in discussions about dyslexia and literacy difficulties in a meaningful and

practical way. This year I have been a member of the RTlit management committee and have worked with Dawn to provide feedback to on draft guidelines for dyslexia in schools which the Ministry of Education have been writing. Dawn has provided a sounding board for my ideas, practical advice about literacy interventions and critical thinking in helping me compare and contrast approaches. Dawn has previously been a New Zealand Science, Mathematics & Technology Teacher Fellow and has been a great support person for me this year.

## **2.5 Literature Review**

There has been a huge amount of research conducted internationally in the field of dyslexia. Using the Web of Knowledge search engine at Otago University, has allowed access to the latest findings.

Many internationally acclaimed texts on dyslexia were required reading for the SPELD certificate course. A wide variety of texts recommended by specialists and online information, have allowed a comprehensive review of the body of knowledge concerning dyslexia.

## **3 Objectives addressed in this report**

1. Research and report on the neurological, psychological and social nature of dyslexia (Section 4).
2. Research and review programmes/interventions which are available in New Zealand and internationally including reporting on cost/resource effective and time efficient ways that New Zealand schools can meet the needs of dyslexic children (Section 5).
3. Case study 2 interventions with dyslexic children and document strengths and weaknesses (Section 6).

## **4. The Nature of Dyslexia**

### Definitions

Hundreds of years ago “word blindness” was recognized in Europe and since then much research and debate has ensued about dyslexia and other learning disabilities (Shaywitz, S. 2003). Definitions have varied overtime, between countries and among different experts.

Within New Zealand there is currently a lot of interest in the field of Specific Learning Disabilities (SLD) with dyslexia receiving lots of publicity. Until recently the New Zealand Ministry of Education has not recognised the term “dyslexia.” Dyslexia was accepted in 2007 by the NZ Ministry of Education and a review of definitions was undertaken. Their current working definition reflects the complexity of the area and is four paragraphs long:

*Dyslexia is a spectrum of specific learning difficulties and is evident when accurate and/or fluent reading and writing skills, particularly phonological awareness, develop incompletely or with great difficulty. This may include difficulties with one or more of reading, writing, spelling, numeracy, or musical notation. These difficulties are persistent despite access to learning opportunities that are effective and appropriate for most other children.*

*People with dyslexia can be found across the achievement spectrum and sometimes have a number of associated secondary characteristics which may also need to be addressed, such as difficulties with auditory and/or visual perception; planning and organising; short-term memory; motor skills or social interaction.*

*People with dyslexia often develop compensatory strategies and these can disguise their difficulties. People with dyslexia can also develop compensatory strengths which can provide an opportunity to further advance their learning.*

*Early identification followed by a systematic and sustained process of highly individualised, skilled teaching primarily focused on written language, with specialist support, is critical to enable learners to participate in the full range of social, academic, and other learning opportunities across all areas of the curriculum.*

[http://www.tki.org.nz/r/literacy\\_numeracy/lit\\_dyslexia\\_working\\_definition\\_e.php](http://www.tki.org.nz/r/literacy_numeracy/lit_dyslexia_working_definition_e.php)

Dowrick (2005) has a simple definition which states that SLD are “the difficulties experienced in learning to read, write, spell, or use numbers by people with intelligence apparently adequate for these tasks.” This makes it seem simple and it sums up the main idea.

### Diagnosis & Misdiagnosis

Each individual student with dyslexia displays his or her own unique blend of symptoms. Cognitive symptoms may include age inappropriate reading behaviours, maths difficulties, spelling difficulties, awkward handwriting, lack of understanding of memory strategies, deficient short-term memory, difficulties with attending to their learning and reduced ability to reflect on their learning in a meta-cognitive way. Language symptoms may include sound confusions, tense confusions and grammar difficulties. Motor symptoms may include fine motor skills, gross motor and perceptual motor. Social symptoms may also be part of dyslexia. These symptoms are not exclusive to dyslexic students. One characteristic alone is probably insignificant. It is the pattern of symptoms which points to dyslexia (Chapman, 1992).

Problems which may be noticed include: greater than usual difficulty with learning to read; persistent reversals and letter/word confusions; inconsistency of symptoms; difficulty with learning mathematics facts; difficulty with word problems; difficulty with abstract concepts; poor visual and/or auditory perception; difficulties holding information in “working memory”; muddled speech; restlessness; disorganised behaviour; and problems with co-ordination (Dowrick, 2005).

Secondary social symptoms (such as frustration, anger, loss of motivation and poor self-esteem) can sometimes be noticed ahead of the underlying learning difficulties. (Marshall, 2004) This is consistent with the sentiment expressed by Lois Wells in her book titled "I'm Not Stupid, Lazy or Dumb."

Symptoms in isolation mean nothing. Many children will display some of the above symptoms from time to time. This does not mean they have a specific learning disability. It is the number of symptoms displayed and their severity that sets the SLD/dyslexic student apart (Wells).

"In fact, dyslexia is not a single problem or issue, but the name that is given to a certain common pattern." (Marshall) Shaywitz (2003) emphasizes "history" in diagnosing dyslexia - family history and history of a student's learning difficulties overtime.

In order to say definitively that a student has a SLD/dyslexia in New Zealand, a formal diagnosis is usually made by a trained psychologist and will take into account discrepancies in scores on standardized cognitive tests. The idea is that performance will be "uneven", indicating a "specific" area of need, rather than global deficiencies. Psychological tests are controversial and may exclude students who don't show a large enough discrepancy between different scores. Younger students and those who have not yet slipped too far behind their peers may fail to be detected. SPELD Dunedin uses the Woodcock Johnson III which is an individually administered battery of tests which are used in a variety of educational settings internationally. Individual areas of strength and weakness are then used to plan an individual education plan. The Jean Seabrook memorial School uses a similar battery of tests - the WISCIII.

### What Dyslexia is Not

Barriers to learning are factors which interfere with learning. Some definitions of dyslexia are definitions of elimination (Wells 2004) or exclusion (Chapman 1992). The definition of Richard Lavoie (Wells) talks about things which can cause children to fail at school which are not Specific Learning Disorders: mental impairment; emotional disturbance; lack of opportunity to learn; and modality deficits. Chapman describes physical handicaps, emotional problems, cultural factors, environmental factors and economic factors as being factors to exclude before considering the label SLD. Based on these ideas, SLD including dyslexia, are by definition, the "mystery" factors which prevent normal achievement when all other barriers to learning have been eliminated.

Dyslexia isn't caused by lack of educational opportunities, such as would occur with frequent changes of schools, poor school attendance, or lack of instruction in basic skills. It is not due to poor teaching or neglectful parenting. It doesn't just happen to economically disadvantaged groups and they are represented at all levels of intelligence (including the gifted and talented.)

## Range of Symptoms/Difficulties

Although difficulties with reading and writing are the main cornerstones of dyslexia, these students usually have an array of other difficulties. No single student will experience every problem but will experience a unique blend.

## Oral Language

If students have receptive language difficulties they will struggle to keep up in a busy classroom. Lavoie (1989), states that listening is a cognitive task for the students with dyslexia rather than an associative task, and students can only listen successfully when they are not required to do anything else at the same time. This means they cannot listen and take notes. Many teachers give instructions while students are busy performing other tasks and may give multi-part instructions which will not be followed by the dyslexic student. The consequences for the dyslexic student may be constant feelings of not knowing what they should be doing, being told off for doing the wrong thing and always feeling on a back foot. Exhaustion can result and increasing frustration with the school setting.

If students have difficulty generating language, they will also struggle to participate in the classroom. Often teachers ask questions and do not allow wait time. Time pressure and an audience will exacerbate any language difficulties a student may have. If a student has had the experience of being laughed at for answering a question awkwardly, they may be reluctant to participate in discussions or volunteer answers. The frustration, anxiety and tension associated with this may lead to even poorer skills in language and speech (Lavoie, 1989).

Difficulties vary between individuals but may include:

- Difficulty learning new words or phrases.
- “Forgetfulness” and confusion about word meanings.
- Difficulty understanding multiple word meanings.
- Difficulty with ambiguous or figurative language.
- Difficulty understanding and using grammatical forms including tenses, singular/plural and verb forms.
- Difficulty following instructions.
- Committing social mistakes and “saying the wrong thing.”
- May not fit in with peers and may be on the periphery of social groups.
- Talks in “baby talk”.
- Difficulty finding the right words to express him/herself.
- Uses “filler” words frequently such as thing, junk and stuff.
- Avoids conversations.
- Tends to give brief one word answers or “yes/no/okay”.
- May speak in incomplete sentences.
- May appear to know more than he/she can express.
- May become frustrated and even aggressive due to difficulty expressing needs and settling conflict verbally.



- May show resistance to writing and produce little output (Eide & Eide, 2006).

### Phonological Awareness

Phonological awareness is the “conscious sensitivity to the sound structure of language” (en.wikipedia.org). It may include recognising words within a sentence, syllables within a word and single sounds within a syllable. It is a broad term which encompasses phonemic awareness.

Phonemic awareness is a subset of phonological awareness. It refers to the awareness of single sounds within a word. Phonemes are the smallest distinguishable units of sound e.g. t or sh.

Students with weak phonological awareness will have obvious difficulty cracking the code of language. When reading and spelling they may rely too much on guessing. They may not read independently and may remain inaccurate in their reading. (www.efdlrs.com)

Students with poor phonological awareness will be at a disadvantage when trying to crack the alphabetic code. They will have difficulty generating words which follow similar patterns. They may not show the normal interest in rhymes and rhyming games.

Sometimes children will appear to make a good start to reading but may be relying on a good memory rather than decoding the text. At times a strong visual memory will allow a student to remember the word as a whole. As this student progresses their memory capacity for whole words will be challenged and reading progress will be affected. One of the best predictors of reading success is phonological awareness (Nicholson, 1999). With poor phonological awareness, reading and writing difficulties will almost certainly follow.

Reading and writing are the cornerstones of the school system. Because every subject, including mathematics, rely on reading, students with difficulties in this area may have difficulties in all areas of learning. The “Matthews effect” describes how the gap between those who can and can’t read increases with each year at school ([en.wikipedia.org](http://en.wikipedia.org)).

Tom Nicholson made a number of important points in his paper, delivered to SPELD in 1999, regarding phonological awareness. Phonemic awareness develops in stages. Some publishers confuse phonics, which is the study of letter-sound correspondence, with phonemic awareness. Phonetics describes how sounds are made or expressed. It encompasses allophonic variations. Phonemic awareness is the ability to think about sounds separate from spelling and allophonic variations. Phonological information is processed automatically and unconsciously. In speech sounds overlap (parallel transmission). In English there are about 44 phonemes. Students need to be aware of phonemes to learn the alphabetic principal. Phonological awareness

tests may look at syllables but phonemic awareness tests look at blending, segmenting, deleting and substituting phonemes. Research has highlighted limitations in student's abilities and teaching programmes. Liberman (1997) states, that teachers telling children that sounds in a word can be separated is a "white lie", because when this is attempted the sounds are distorted slightly. Some methods for teaching phonemic awareness include: using coloured chips to represent sounds; pairing it with phonics; I spy; and rhyming games. Nicholson (1996, 1997) found that phonemic awareness was a better predictor of reading success than alphabet knowledge or the number of books in homes. Nicholson concludes that the ability to segment all phonemes in a word is the "door to reading".

A large amount of evidence is building up which shows poor phonological awareness is a key factor in dyslexia (Shaywitz, 2005).

### Visual & Auditory Perception

Learners with dyslexia may have a variety of perceptual difficulties. These may present themselves in a classroom in a variety of ways.

Visual Memory is our memory for things that are seen.

- Dyslexic learners may have immature drawing skills because they don't recall the visual details of the world around them. E.g. A seven year old who draws like a four year old - people as a basic face shape with stick arms and legs.
- They may have difficulty learning sight words. E.g. A typical new entrant would usually learn 18 basic sight words within their 1<sup>st</sup> term at school. Students with a visual memory difficulty may take more than twice as long ([www.teachingexpertise.com/articles](http://www.teachingexpertise.com/articles)).

Visual Discrimination is our ability to recognize similarities and differences between visual images.

- Dyslexic learners may confuse symbols, letters and words that look similar. E.g. saw and was, b and d, or x and +.
- They may find scanning activities frustrating and very difficult. E.g. word searches, dictionary work and using an index (SPELD, 2008).

Visual Sequencing is our ability to see and remember objects in a particular sequence or order.

- Dyslexic learners may have difficulty copying words from the board. E.g. The order of letters in words seen is not remembered in sequence so copying becomes full of errors and takes a very long time due to rechecking.
- They may struggle with algebra and patterning may be difficult. E.g. trying to continue a repeating or sequential pattern with coloured beads will be full of errors.

Visual Figure-Ground is our ability to identify relevant visual information from a background of irrelevant or distracting objects and images.

- Dyslexic learners may have difficulty paying attention to classroom tasks E.g. during writing time things happening outside the classroom window and inside the classroom will easily catch the student's eye.
- They may have a messy disorganized work area and difficulty finding things. E.g. can't find a pencil from amongst other things in his/her pencil case (SPELD, 2008).

Visual Closure is our ability to visualize the whole of an object or word when part of it is hidden or missing.

- Dyslexic learners may have difficulty putting parts together to form a whole E.g. Difficulty with or avoidance of jigsaw puzzles.
- They may have slow difficult reading because they don't have the ability to make fast eye jumps across text like good readers tend to do. E.g. They make a large number of small eye jumps and need to look at all the details (SPELD, 2008).

Auditory Memory is our ability to recall information which we have heard.

- Dyslexic learners may have an inability to retain more than 1 or 2 items presented orally during a lesson. E.g. If the teacher asks students to carry out multi-step instructions students may get confused.
- They may difficulty retaining information in the correct sequence. E.g. Learning poems and songs may be difficult (SPELD, 2008).

Auditory Discrimination is our ability to hear and distinguish similarities and differences between sounds.

- Dyslexic learners may mispronounce words because they can't discern details of sounds. E.g. ships instead of chips
- They may be slower than peers to write decodable words. E.g. pet, pat, pin, bin, bit and bet may be easily confused. (SPELD, 2008)

Auditory Sequencing is our ability to hear and recall sounds in the correct sequence.

- Dyslexic learners may mispronounce of multisyllabic words. E.g. "ephelant" instead of "elephant."
- They may have difficulties with learning to spell words. E.g. letters may be jumbled because the correct sequence is not recalled (SPELD, 2008).

Auditory Figure-Ground is our ability to identify relevant auditory information from a background of irrelevant or distracting sounds.

- Dyslexic learners may have poor listening skills especially if the classroom is noisy. E.g. Unless the teacher insists on quiet before giving instructions, the student is unlikely to carry out instructions successfully.
- They may have difficulty in small group work. E.g. Finds it hard to attend to conversation in his group because the noise from other groups is too distracting.

Auditory Closure is our ability to understand the whole of what is heard when part of it is missing.

- Dyslexic learners may have difficulty predicting words when reading using phonetic decoding skills .E.g. Unless the word which is attempted is easily decodable, the student is unlikely to recognize the word. Most students can sound out a word approximately and use their closure skills to guess the correct word.
- They may have poor listening comprehension because any small parts missed can not easily be filled in. E.g. Student may lose meaning while listening to a story more easily than other students (SPELD, 2008).

### Sensory Motor Weaknesses

Gross Motor Skills are our ability to acquire and use normal movement skills as part of childhood motor development. The movements come from the use of large muscle groups and whole body movement.

- Dyslexic learners may have difficulty throwing and catching a ball. E.g. student has difficulty coordinating movements to catch a ball and may appear to be a “butter fingers”.
- They may have difficulty riding a bike. E.g. balance is poor and student may take a long time to learn how to ride especially when turning.
- They may have difficulty hopping and jumping. E.g. Student doesn't achieve success in folk dancing.
- They may have difficulty balancing when using gymnastics apparatus. E.g. student can walk across the balance beam

Fine Motor Movements are our ability to use and co-ordinate precise movements using small muscles such as hands and eyes.

- Dyslexic learners may have difficulty learning to write. Student may have an awkward and/or tiring pencil grip. Students may avoid writing and tire very easily.
- They may have difficulty isolating finger movements. E.g. when trying to learn to play a piano or use a computer keyboard the student has difficulty moving one finger without the others.
- They may have difficulty controlling scissors to cut accurately. E.g. student cuts something in half that was only suppose to have a small cut in it.
- They may have difficulty opening and fastening zips, buttons and shoe laces. E.g. Student may have difficulty going to the bathroom at school.

Crossing the Midline is our ability to develop lateral dominance so that, for example, when we are writing we don't need to change hands when we cross our midline.

- Dyslexic learners may have difficulty learning to swim because the student can't co-ordinate his/her two arms to move independently.
- They may swap their hands when crossing the midline during writing.
- They may have difficulty riding a bike because both legs want to pedal at the same time.
- They may have difficulty forming letters and may reverse letters or words.

Proprioception is our ability to interpret incoming sensory information.

- Dyslexic learners may have difficulty planning motor tasks. This student must think about how to complete a simple action while for others it would be automatic. This often causes frustration. E.g. climbing onto the seesaw.
- They may have difficulty using an appropriate amount of pressure in particular situations, e.g. gripping pencil or paper cup too tightly.
- They may play too rough and injure themselves, others and equipment
- They may have difficulty handling classroom materials carefully such as books and other learning materials.

Spatial Awareness is our ability to understand our bodies in relation to space and the relationship of objects to each other.

- Dyslexic learners may have poor presentation skills – work may seem to be all over the page.
- They may appear clumsy and bump into objects and people regularly.
- They may have difficulties with positional language and may confuse left and right.
- They may have difficulty using equipment during physical education and in the playground (SPELD, 2008).

### Metacognition

Metacognition is knowledge/awareness of your own cognitive processes and the efficient use of knowledge/awareness to self-regulate these processes (en.wikipedia.org). In simple terms metacognition is “thinking about your thinking”. Essentially it is about self-responsibility, initiative, goal setting and time management. Psychologists have used the term for a long time (Flavell, 1979, [www.gse.buffalo.edu](http://www.gse.buffalo.edu)).

Metacognitive knowledge includes understandings about people and learning in general, knowledge of one’s self as a learner, knowledge of task variables and knowledge of cognitive and metacognitive strategies ([www.gse.buffalo.edu](http://www.gse.buffalo.edu)).

Metacognitive monitoring or regulation is the use of metacognitive strategies (sequential processes) to control cognitive strategies to ensure that a cognitive goal has been met. Cognitive and metacognitive strategies are closely intertwined and overlap. For example a method used to obtain knowledge would be considered cognitive but the monitoring of that strategy would be considered metacognitive ([www.gse.buffalo.edu](http://www.gse.buffalo.edu)).

Students with dyslexia tend to have poor metacognitive skills (Speld, 2008). A student with poor metacognitive skills may have difficulty taking charge of their own learning. They may be unaware of their own strengths and weaknesses and seem to lack effective strategies for managing in the classroom. They may appear passive and lack initiative and a sense of responsibility for their learning.

During reading, for example, a student with a weakness in metacognition may simply think of reading as the process of decoding and verbalising sounds. They may not be actively trying to construct meaning. They may not self-

monitor so that if they lose meaning they continue reading regardless. They may not employ cognitive strategies such as visualisation, predicting and questioning to help their own understanding.

When learning spelling words, a student with a weakness in metacognition, may rely on techniques provided by the teacher or others with little consideration of the strategy's effectiveness.

If students are not thinking metacognitively they are not monitoring their learning and cognitive processes. This means that when there is a problem they may be unaware of it. They may continue using a strategy which is ineffective. In reading, for example, students who do not monitor their own understanding may continue to read even when they have lost meaning.

Metacognition is also about knowing a variety of strategies so that if one is not working, others can be tried. Continuing with the reading example, students who do not know about how to separate and blend sounds, rerun a sentence and cross check syntactical cues will be at a distinct disadvantage. They may rely unsuccessfully on one strategy (guess).

Passive learners who do not have metacognitive knowledge and monitoring skills will be dependent on others, such as teachers and parents.

### Emotional wellbeing

Seabrook McKenzie (Speld, 2008) identifies many symptoms of secondary emotional difficulties exhibited by students with SLD and dyslexia. These students may show low motivation, inability to concentrate, social withdrawal, procrastination, hypersensitivity, impulsiveness, apathy, weepiness, dislike and avoidance of school, psychosomatic illnesses, tantrums, bed wetting, attention seeking behaviour, opting out of certain situations, being bullied and being a bully, daydreaming, nightmares, aggression and "I can't do it," syndrome.

Richard Lavoie (1997) states that dyslexic students with poor self-esteem can go one of two ways: they either, behave recklessly and take crazy risks or conservatively and avoid risk taking altogether.

Learning and experiencing new things requires risk taking. Every time a student attempts something new they risk failure. Students with dyslexia who have a low self-esteem and exhibit emotional and behavioural difficulties will be poorly equipped for learning and the risks involved.

Not only will their learning be affected by the difficulties which are inherent in their learning disability, they may also be reluctant to attempt tasks which are even slightly difficult.

In writing, the student may write very short pieces being careful to only use words which are known. The fear of making spelling errors may smother any attempt at being creative.

In oral discussions, the student may not contribute ideas even when they think they have a valid answer because the fear of appearing silly is too great. The fear of being called on by the teacher, may also mean students are unable to focus on what is being discussed.

Frustration, anxiety and tension may prevent the student functioning normally in the classroom at all (Lavoie, 1989 ). As anxiety has a considerable negative impact on learning and thinking, the problems can quickly escalate (Stercq, 2008).

### Social skills

Students with Specific Learning Disorders or dyslexia, may have perceptual and attention problems, so social skills may not be learned as easily. Difficulties may include: listening and understanding what someone has told them; talking and expressing themselves; noticing and interpreting facial expression and body language; and planning and controlling their actions (www.ldonline.org).

In addition, if students with dyslexia appear “different” they may be subject to bullying, name calling, condescension or other social disapproval. This may mean they have had less opportunity than their peers to practice social skills (www.addresources.org).

### Reviewing The Research

Some of the earliest research into dyslexia was based on studies of brain lesions. Inferences about the functionality of different brain areas were made based on deficits exhibited by individuals with specific lesions. Analysis of the brain was only possible after subjects had died and were examined in an autopsy. As technology has progressed, so have research methods. MRI (magnetic resonance imaging) shows internal structures similar to a still x-ray, while the more recently developed fMRI (functional magnetic resonance imaging) shows the blood flow to brain areas as cognitive tasks are performed. The result is a moving image showing the brain at work (Shaywitz, 2005).

Dyslexia has been recognized for many years overseas and there have been large volumes of findings published. There are many theories and numerous studies which try to get at the heart of dyslexia and other learning disabilities, however so much is still not known.

Dowrick (2005) lists a variety of possible causes including unknown environmental factors, maturational lag, different structure of the brain,

different brain chemistry, brain damage, inherited genetic factors and problems with hearing and/or vision.

SPELD NZ (2006) states that SLD can be correlated with, but not necessarily caused by, high testosterone, left handedness, maleness, giftedness in mathematics, creativity, immune disease and headaches. They describe some of the factors which may contribute to SLD: heredity factors especially for males; prenatal environment acting on brain development; birth trauma; and early experiences which impact on the brain. They also state that biochemical factors and neurological irregularities may play a role as well. They clearly state that SLD are not the result of visual or hearing deficits, emotional disturbance or a deprived environment.

“Good scientific research is limited in scope; scientists are careful to study only one particular theory or question, under controlled conditions. The brain is an extremely complex system, and each research project sheds light on only a small part of the mental processes of learning, reading, and dyslexia” (Marshall).

Overseas there has been extensive research conducted trying to find the cause of dyslexia. Scientific findings which are consistently reported for dyslexic students (Marshall) include

- slower speed and response time to language sounds and visual sound symbols
- lack of normal fraction of a second activation in “visual word form area” of the brain. The other side (face recognition areas) was activated
- more symmetrical brains
- less differentiation between left and right hemispheres (may explain reading difficulties and spatial/creative strengths)
- strong adult dyslexic readers shown to use right side ( i.e. alternative pathways)
- phonological training increases use of left language brain areas but also other areas (the learning takes longer and a multi-sensory approach is most effective)

The recent review of Literature on Dyslexia (2008) by the New Zealand Ministry of Education summarises findings from a large number of studies but draws few conclusions about causes. It does, however state that “though there is unanimous agreement that phonology is associated with dyslexia it is becoming clear that phonology is not the only problem.” It also states that there is contradictory evidence of dyslexia having a genetic origin and being more common in males.

Sally Shaywitz (2005) has conducted extensive research into dyslexia including fMRI studies of brain activation. Results show that while dyslexic subjects are reading, very different neural pathways are active compared to “normal” readers. Instead of the Broca’s and Wernicke’s areas on the left side of the brain being active, large sections of the right side of the brain appear to be doing the work. This describes what is occurring but does not



explain why. Karen Waldie ([www.nzherald.co.nz](http://www.nzherald.co.nz)) has made similar findings in New Zealand.

Eide & Eide (2006) state that students with dyslexia have differences in their brain based learning systems (information input, pattern processing, output for action and attention.) They argue that the causes of dyslexia are less important than trying to remedy the learning difficulties.

### Cognitive & Motor Study – Otago University

My current research with Dr Liz Franz, Director of the Action, Brain and Cognition Lab at Otago University focuses on the corpus callosum. A bimanual tapping experiment was used to try and learn more about the possible role of the corpus callosum in dyslexia and other learning disabilities. The corpus callosum is a bridge which joins the two cerebral hemispheres. Lois Wells (2004) states that, “being able to cross this bridge in the brain facilitates learning; not being able to do so creates a barrier to learning.”

Previous research at the Action, Brain Cognition lab has isolated a rudimentary form of interhemispheric communication associated with the corpus callosum. The corpus callosum is a very thick band of axons, and is the major link between the brain’s two hemispheres. Neurons from each hemisphere project myelinated (insulated) and unmyelinated (non-insulated) callosal axons, to homologous areas in the other hemisphere, as well as other heterologous areas. My cognitive and motor study used the same task as Franz has used in other studies, which is a computerized reaction time task that is performed using one hand (unimanual) or both hands together (bimanual), to assess whether there is a basic impairment in the mechanism of interhemispheric communication in people with dyslexia. Dyslexia has been associated with brain processing differences and non-typical laterality patterns. However, it is not known whether this might be due to a basic isolable impairment associated with the corpus callosum.

Participants were recruited throughout local school communities, with 109 people taking part. They ranged in age from 6 years to 67 years and included 75 control subjects, 25 people affected by dyslexia and 7 people on the autism spectrum (the latter providing a small sample that eventually can be used as a second control group). Liz Franz plans to continue running trials of children on the autism spectrum in 2009. All participants received a certificate and small gift of thanks.

For analysis purposes all people with dyslexia were matched with a control of the same age, sex and handedness. Comparing the pattern of reaction times for dyslexic and controls (without autism), both groups were slightly slower on the bimanual task compared to the unimanual task. Of note, it is the lack of this slowing on bimanual trials relative to unimanual trials that would have led to evidence in support of basic corpus callosum impairment. That was not the case for either group. When overall reaction times were compared however, people with dyslexia were consistently and significantly slower than their non-

dyslexic counterparts. The slowed reaction times may be due to a number of factors which have been correlated with dyslexia: cognitive efficiency, processing speed, broad attention, cognitive fluency, executive processes, fine motor skills and visual processing. Current work involves looking into ways to examine these more specific hypotheses further. One idea which we are considering, is gaining access to the full cognitive results for students who have completed the Woodcock-Johnson battery of tests. Analysis of the pattern of cognitive weaknesses for students with dyslexia may lead to useful insights. If these cognitive measures could be correlated with other factors, such as reaction time on a variety of tasks, a fuller understanding of dyslexia and the underlying cognitive difficulties may result. Following on from this, specific interventions could be evaluated using a comparison of test and re-test data.

### Other Recently Released Findings

Using the Otago University Library search engines 8703 published research articles were located online related to dyslexia. Of these, 181 were published in 2008 alone. Around the world, researchers have used a variety of methodologies to attempt to answer a wide range of questions about dyslexia. The following 2008 research papers illustrate the variety of research being conducted.

Research (Berninger, Nielson, Abbott, Wijsmann & Raskind, 2008) into the writing process with a group of 122 dyslexic children, using a battery of tests, revealed significant difficulties with automatic letter writing and naming, impaired verbal fluency and spelling difficulties. Grapho-motor planning was not a significant difficulty. Researchers concluded that explicit instruction in phonological, orthographic and morphological processes of spelling were important for dyslexic students.

The neural correlates of previously observed deficits in phonological working memory and executive functions were investigated using fMRI and a parametric verbal working memory task (Vasic, Lohr, Martin & Wolf, 2008). Dyslexic subjects were less accurate than controls especially in high demand working memory tasks. The fMRI data showed functional differences in the dyslexic subjects – with their left superior frontal gyrus being more active and their middle frontal gyrus being less active. This adds to a growing body of evidence which shows dyslexic brains are functionally different.

Hawelka & Wimmer (2008) have previously found a difficulty with dyslexic readers processing letter strings. To find out if this difference was a visual discrimination problem or something more specific, they designed an experiment which had dyslexic subjects reporting letter and pseudo-letters strings nonverbally. Dyslexic subjects performed as well as controls on this purely visual task. It was concluded that the deficit previously reported was due to problems in establishing a string representation which includes position and name codes.

A cross-sectional population study of gender differences in writing development, and dyslexia (Berninger, Nielson, Abbott, Ellen & Raskind, 2008) has found a variety of significant differences. Boys and men were found to be significantly more impaired in handwriting and composing than were girls and women. Although men were more impaired in oral reading than women, there were no differences in any reading measures between girls and boys. The researchers propose that these differences relate to orthographic skills rather than motor skills. They suggest that some previous research into gender differences in dyslexia have been confounded by focussing only on reading, rather than measures of writing.

In the past a large amount of research has considered various subtypes of dyslexia. Research (Ziegler, Castel, Pech-Georgel, Alario & Perry 2008) using the dual route cascaded (DRC) model of reading aloud, examined letter level, orthographic lexicon, phonological lexicon and phoneme system. The results showed no single cause for dyslexia but rather a 'complex pattern of phonological, phonemic, and letter processing deficits' (Ziegler et al, 2008). Significantly, most dyslexics had deficits in more than one domain and within subtypes there was almost always more than one underlying deficit. Researchers concluded that it is more beneficial to investigate dyslexia at the level of each individual, rather than as a single disorder.

There are many e-learning tools available on-line which aim to teach and reinforce a variety of skills, including reading. An investigation (Woodfine, Nunes & Wright, 2008) found that these tools raise difficulties for students with dyslexia and therefore breach the United Kingdom's Special Educational Needs & Disabilities Act which states that learning materials must make "reasonable adjustments" in order to not disadvantage learning disabled students. Their study, which focussed on text-based synchronous activities, provided clear evidence that these learning tools, "marginalise, demotivate and disappoint students with dyslexia" (Woodfine et al. 2008).

Research (Schulz, Maurer, van der Mark, Bucher, Brem, Martin & Brandeis, 2008) aimed at examining whether semantic processing deficits contribute along with core phonological deficits to dyslexic symptoms, analysed functional magnetic resonance imaging (fMRI) and event-related potentials in 52 children, while they read sentences and made judgements about semantics. Dyslexic children showed decreased activation for sentence reading in inferior parietal and frontal regions, and decreased activation in inferior parietal regions during semantic processing. It was concluded that semantic processing deficits are a feature of dyslexia.

Another fMRI study (Quaglino, Bourdin, Czernasty, Vrignaud, Fall, Meyer, Berquin, Devauchelle & de Marco, 2008) compared which areas were activated in dyslexic and normal readers during a pseudo-word reading task. They found differences in connectivity patterns which they interpreted as evidence for a phonological deficit in developmental dyslexia.

Lassus-Sangosse, N'guyen-Morel & Valdois, (2008) compared dyslexic children's performance on a simultaneous visual task and a sequential visual

task. The dyslexic children's performance was most impaired in the simultaneous task, suggesting that a "simultaneous processing disorder" may contribute to dyslexia.

Willburger, Fussenegger, Moll, Wood & Landerl (2008) compared four distinct groups of 8-10 year old children on a rapid automatized naming (RAN) task: dyslexia; dyscalculia; dyslexia and dyscalculia; and control. They found those with dyscalculia had a domain specific deficit related to quantity naming, while the dyslexic/dyscalculic children displayed greater deficits (additive). It was concluded that the cognitive bases of dyslexia and dyscalculia are independent from each other.

In order to find out if infants at risk of developing dyslexia (hereditary factors) would show the same awareness of subtle sound differences (dak, bak) as normal infants, a study of the brain activation in 2 month olds was conducted (van Leeuwen, Been, van Herten, Zwarts, Maassen & van der Leij, 2008). The at-risk infants showed mismatched responses as well as diminished cortical activity in the left hemisphere. This was interpreted as evidence for a temporal processing deficit and may point to a precursor of dyslexia.

Research by Richards & Berninger (2008) compared the brain scans (fMRI) of dyslexic children and controls during a phoneme mapping task. Their results showed dyslexic children's brains were activated in distinctly different ways. Following this the dyslexic children took part in a 3 week intensive intervention involving linguistic awareness, alphabetic principle, decoding, spelling and writing. Following this, brain scans were compared again during a phoneme mapping task. This time there was no statistical difference between the brain activation of the dyslexic or control groups. It was concluded that the intensive intervention served to normalize the functional connectivity of the dyslexic children.

### Conclusions

In conclusion dyslexia is a specific learning disability which causes severe and persistent difficulties with literacy learning and fluency. Differences in neurology (hardware - brain wiring) and cognitive processes (soft-ware) underlie these difficulties. These difficulties are not due to poor teaching, sensory deficits or low intelligence. One in ten learners may be affected by dyslexia in some way.

## **5. Meeting the Needs of Dyslexic Students: Recommendations for Schools**

Based on my learning this year help for dyslexic students must consider:

- Early diagnosis and intervention
- General classroom accommodations

- Specialist 1:1 teaching in literacy & underlying cognitive weaknesses
- Developing self-esteem through strengths
- Fine tuning classroom literacy teaching
- Motor development & co-ordination
- Using multiple memory hooks
- Social skills
- Metacognition

### Early Diagnosis

While there are a mixture of definitions and many theories about the underlying causes of Dyslexia, there is consensus that early intervention is best (N Z Ministry of Education, Sally Shaywitz, Marshall, Wells).

In reference to reading intervention, the Ministry of Education (2007) states that “students who had early intervention compared to remediation at an older age show bigger gains in reading accuracy and fluency. It is also considered easier for them to catch up with their peers, accuracy and fluency.”

Neural plasticity refers to the brains ability to modify itself in response to experience. It was once thought that neural plasticity was extremely limited and that “critical periods’ existed when language learning must occur. Neural plasticity has been shown to be far more extensive than first thought. Even adults can improve their reading and learning with specialised tutoring. However, neural plasticity is greatest before 6 years of age and any early interventions, are therefore, more likely to be successful (Kolb & Whishaw 2003).

Regtvoort & van der Leij (2007) used family history to predict children who may be at risk before they started school. An intervention was implemented before the children started grade 1 at age 6 years. It was found to be highly successful.

In New Zealand B4 School Health Checks have been trialled in the North Island and are being implemented throughout all of New Zealand later this year. The screening procedure includes a variety of health checks and questions about development and behaviour ([www.bewell.org.nz](http://www.bewell.org.nz)). It would be beneficial for these checks be used as a way to identify young children at risk of developing dyslexia/SLD. Maybe, preschoolers who are at risk could be provided with intense early intervention, thus avoiding failure. Training of new entrant teachers to detect dyslexic learning patterns and provide effective early intervention will be a cost effective way to address dyslexia. Government initiatives to reduce new entrant class sizes will also help.

There is a great deal of truth in the classic cliché: it is better to put a safety net at the top of the hill, rather than an ambulance at the bottom. Not only is early intervention more likely to be successful, but so much pain and emotional distress could be avoided or minimised.

The “Matthew Effect” is the phenomenon whereby “the rich get richer and the poor get poorer.” It can be applied in a variety of contexts. In the context of SLD it refers to the way those who are behind in an area get further and further behind. Keith Stanovich, the psychologist who first used the term in reference to reading and language disabilities says-

*“Slow reading acquisition has cognitive, behavioral, and motivational consequences that slow the development of other cognitive skills and inhibit performance on many academic tasks. In short, as reading develops, other cognitive processes linked to it track the level of reading skill. Knowledge bases that are in reciprocal relationships with reading are also inhibited from further development. The longer this developmental sequence is allowed to continue, the more generalized the deficits will become, seeping into more and more areas of cognition and behavior. Or to put it more simply -- and sadly -- in the words of a tearful nine-year-old, already falling frustratingly behind his peers in reading progress, ‘Reading affects everything you do’.”*  
(en.wikipedia.org)

Any classroom teacher will have observed the “Matthew Effect” even if they were unaware of the term. Poor readers avoid reading and are quickly disadvantaged by lack of reading mileage. This lack of exposure to print means they are not exposed to the same stories, knowledge, ideas and vocabulary as their peers. As the gap widens the feelings of inadequacy and failure exacerbate the problem and make the difficulties even more of a challenge to overcome. I have also observed the affects of over-anxious parents, on a child’s reading progress. Instead of reading being a fun activity that families can enjoy together, reading can become a stressful chore and a burden. In normal circumstances, home reading is an essential component of a well rounded reading programme, but in these circumstances, it is better for all concerned, if parents do not continue with home reading. Children with compounded reading anxieties require the most expert teaching, encouragement and guidance.

### Accommodations

Accommodations are modifications made to teaching programmes, routines and the physical features of the learning environment which aim to enhance learning. A wide range of information about possible accommodations is available online. Some pages are linked to my wikispace for teachers <http://danella-digests-dyslexia.wikispaces.com/>

Some accommodations can make a large difference to a dyslexic student without being too onerous to busy classroom teachers. Some other changes may take more effort but will probably enhance the learning of other students as well, so are well worth it.

### General Accommodations

- Seat at the front of the class and/or next to a supportive peer role model.

- Get to know them and ask which aspects of your class are most difficult or stressful. Make some changes.
- Avoid calling on them to read out loud.
- If you want them to read aloud in class give a couple of days warning so they can practice.
- Encourage them to read with a pencil to keep their place (or ruler/finger/bookmark).
- Accentuate the positive and acknowledge strengths.
- Acknowledge difficulties and reassure the student of your interest in supporting them.
- Try to teach concepts in a multi-sensory way? If a dyslexic learner can see, hear and touch it, it will make more sense.
- Show tolerance - toward paper work. Consider content over looks.
- Have structured schedules or routines. Students with learning disabilities cannot cope with upsets or irregularities. Have set routines and procedures.
- Open-ended Inquiry learning environments are not very useful. Structures will need to be put in place to support dyslexic learners.
- Keep directions simple and explicit. Before you give instructions, get the students' attention. Have students give instructions back to you in unison.
- Consider preparing some written instructions or checklists which can be handed out for students to follow.
- When asking a dyslexic learner a question, be silent and allow some processing time.
- Be explicit about learning intentions for the lesson.
- Allow students to stand or move around for brief periods of time.
- Teach and encourage full cursive writing, not printing, because it allows more fluency and less reversal problems.
- Encourage them to critique their own handwriting style against a model and make self improvements.
- Examine the blackboard/whiteboard/interactive-board with careful attention to the colours that are easiest to read, size of text and layout.
- Number points to be copied as this gives a reference for students to see where they are up to (Comrie, 2008).
- Examine the noise level during activities such as reading and spelling. As these will probably be cognitive tasks for dyslexic students, not associative, any distractions which can be eliminated will be beneficial (Lavoie, 1989).
- Provide easy access to suitable reference materials.
- Keep copying from the board to a minimum.
- Encourage good organizational skills by the use of folders and dividers to keep work easily accessible and in an orderly fashion.
- Break tasks down into small easily remembered pieces of information.
- Dyslexic students will struggle to monitor/correct their spelling as they write but will be able to edit afterwards if given a structure and support.
- Allow extra time to complete written work if possible.
- Seek advice from RTlit/RTLB about specific issues you can't resolve by yourself.
- Avoid saying things like "this is easy" and "try harder".

## Homework

- When homework is set, it is important to check that the student correctly writes down exactly what is required. Try to ensure that the appropriate worksheets and books are with the student to take home.
- In the front of the student's homework book get them to write down the telephone numbers of a couple of friends. Then, if there is any doubt over homework, they can ring up and check, rather than worry or spend time doing the wrong work.
- Make sure that messages and day to day classroom activities are written down, and never sent verbally. E.g. music, P. E. swimming etc.
- Make a daily check list for the pupil to refer to each evening. Encourage a daily routine to help develop the child's own self-reliance and responsibilities.
- Revise homework routines to allow success and reduce stress and frustration.
- Homework needs to focus on core learning only.
- For many dyslexic students the most important things would be reinforcing weekly spelling words and practising reading easy decodable material to reinforce reading fluency, sight word recognition and letter patterns already taught.
- Homework needs to be communicated effectively in writing between school and home. At the Jean Seabrook Memorial School teachers use a simple table which allows teachers to communicate easily with parents about the expectations for homework each night. It even tells parents when to look for a notice at the bottom of the school bag.
- Spelling words should be limited to 10 words each week. These words should focus on high frequency words in the context of word families where possible.
- There needs to be a time limit set for each evening – 15-20 minutes. (<http://www.dyslexia.com/library/classroom.htm>)
- A parent education evening or individual meeting with dyslexic student's parents would be helpful. It would be good to set clear expectations for the way that spelling words are revised and reading practice conducted. Parents need to be shown a variety of multi-sensory ways to revise spelling. The need for over-learning should be emphasized. In addition, it is important that home reading is made easier and more enjoyable. Pollock and Waller (1994) recommend reading aloud rather than silent reading because it stimulates more senses and allows monitoring of omissions etc. I would recommend that parents tell their dyslexic child any difficult words so that there is continuity of the story and reduced stress from prolonged "sounding out" of words. (<http://www.dyslexia-teacher.com/t15.html>)

## Maths

- 90% of dyslexic students will struggle with maths and need extra support.
- Check that maths terms are understood (eg. add, sum, total)
- Provide a reference chart for their book or the wall. Revise terms often.
- Teaching and reinforcing estimation skills is very beneficial. Is this answer possible or impossible?
- Encourage the use of calculators, timestable squares and other supports.
- Having children share their strategies verbally is very helpful.



- Let students write down key numbers when working things out mentally using a numeracy strategy so that working memory is freed up.
- Put the decimal point in red ink. It helps visual perception with the dyslexic child.
- Alternative ways of recording should be looked at, such as use a computer for word processing or audio tapes.

## Assessment

- Richard Lavoie (1997) is passionate about the role of self-esteem in learning. He describes how lowered self-esteem due to failure in school leads to increasing problems with learning. If a student has very poor self-esteem, he will not want to take risks and achievement will be increasingly stifled. The more failures a student experiences, the more likely they will be to lose interest in learning and school. I believe that assessment practices should be revised with self-esteem, engagement and motivation as the key considerations.
- Teach how to take a test. (Read, do those questions known, then go back to unknown.) Have transparent assessment criteria. Instead of stating that you will be looking for quality work, share examples of what is expected and make criteria explicit (Logsdon, 2006).
- “In reality it is through classroom assessment that attitudes, skills, knowledge and thinking are fostered, nurtured and accelerated – or stifled.” (Hynes, 1991)
- “Assessment is the most powerful lever teachers have to influence the way students respond to courses and behave as learners” (Gibbs, 1999).
- Ongoing formative assessment which encourages students should take priority over one-off summative tests.
- If a test is necessary it should be carefully constructed and preferably be untimed. Match-up, fill-in-the-blank, and short answer formats are the best methods for dyslexic students. Multi-choice and essay questions should be avoided unless a reader &/or writer can be provided (Houck, 2007).
- Mark written work based on deeper features (content/ideas) rather than surface features (spelling/handwriting).
- Mark topic and inquiry work based on content rather than surface features.
- Consider giving the students highlighter pens so that they can highlight parts of their work they want marked, rather than putting red pen all over their work (<http://www.dyslexia-teacher.com/t15.html>).
- The marking of spelling should be limited to words that the student has been taught to spell. (Hodge, 2000)
- Credit should be given for effort as well as achievement (Hodge, 2000).
- Try a multiple intelligences approach where possible. Allow students to show their learning in their preferred medium: speech, essay, comic strip, animation, slide show, diagram etc.
- Use untimed tests when possible.
- Give oral tests. Have an aide, student or volunteer read the exam to the student and write down his/her answers.
- Have student tape record his/her answers to the test.
- Mark essential information to be answered first. Grade on quality of work, not quantity.

- Consider spelling errors as spelling errors, NOT subject errors.

Do not let the student use his disability as a “crutch” or as an excuse for not trying. Help him/her develop the philosophy that even though he/she is smart he/she will have to work harder than the child who does not have this problem.

([www.dyslexia-teacher.com](http://www.dyslexia-teacher.com), [www.dyslexia.com/library/classroom.htm](http://www.dyslexia.com/library/classroom.htm), [www.thedyslexia.com/pdfdocuments/NeilMackayAtDyslexiaScotland-20040911.pdf](http://www.thedyslexia.com/pdfdocuments/NeilMackayAtDyslexiaScotland-20040911.pdf))

### Specialist 1:1 teaching in Literacy

Schools should seek assistance from qualified experts such as those outlined in Section 6 of this report. Systematic 1:1 teaching which targets the individual student’s specific needs is required. This teaching needs to be at a pace which allows mastery and which is cumulative in nature so that material that is learnt is continually revised and added to. The methods of teaching should be multi-sensory and designed with a sound understanding of memory enhancement and awareness of other cognitive weaknesses which may be underlying the dyslexia.

Those who are interested in gaining the necessary skills should embark on a specific course of study e.g. SPELD Certificate in Teaching Students with Learning Disabilities.

### Developing Self-esteem Through Strengths

To compensate for the loss of self-esteem due to literacy difficulties, dyslexic learners should be encouraged to develop other strengths. It doesn’t matter if it is a sport, hobby or another school subject. Time spent on developing a student’s strength, should never be cut in order to make time for more reading or literacy work (Shaywitz, 2005).

### Classroom Literacy Teaching

#### Phonics/Letter Patterns & Spelling

- All primary schools should have a proven systematic phonics teaching programme in place.
- The focus on letter patterns and sound analysis needs to continue right throughout the whole primary school.
- At the upper levels, including college, the letter patterns should focus on root words, prefixes and suffixes and include the study of their meanings. (Helby, 2008)
- Each student needs to have a weekly list of approximately 10 words.
- Lists need to cover word families and high frequency words.
- Lists should continue to go home for consolidation each evening.

- Daily class time needs to be devoted to spelling.
- Daily class time needs to be spent on phonics and letter patterns.
- Word meanings need to be clarified at the beginning of the week and revised during the week if necessary. Heather Bell emphasised the importance of this on the recent SPELD block course.
- Daily practice of making the words in a variety of ways is needed: clay, pens, chalk, letter tiles, magnetic letters, keyboard, pipe-cleaners is ideal (<http://www.lbctnz.co.nz/sld/101-tips.html>), letter boxes (Jean Seabrook Memorial School), paper letter cut-outs (Jean Seabrook Memorial School), lino floor tiles to jump on, paint and computer keyboard. A variety of multi-sensory experiences will enhance memory and engagement in learning.
- Computer software which is designed for students with SLD/dyslexia may allow useful consolidation of spelling words. Word shark is highly recommended. (<http://www.realspecial.co.nz/wordshark.asp>)
- Ideally a synchronized whole school approach should be taken to spelling phonological awareness and phonics. E.g. Sounds Alive or Alpha to Omega.
- Daily practice needs to reinforce previous work and build on it.
- There needs to be a strong focus on the skills of listening, separating, blending and manipulating sounds.
- Dictation sentences allow increased transfer of skills to the writing context.
- Word walls, personal spelling dictionaries and teacher/teacher aide support can be used to help prevent spelling errors in the writing context. Seeing words spelt incorrectly is not helpful for dyslexic students. The more times they can see the correct spellings, the more likely they are to master the words (Seabrook, 2008).

### Classroom Reading

Reading is a skill which cuts across all curriculum areas including maths. It is very important that dyslexic students be given every opportunity to develop confidence and skills in reading before they progress to college.

- Instead of daily silent reading many dyslexic students will benefit from 1:1 reading with a buddy or teacher. Ott (1997) states that silent reading can be of limited value to dyslexic readers because it only stimulates the visual sense (not multi-sensory) and errors and omissions go unchecked. When reading failure has impacted on a student's motivation and enjoyment of reading, teachers should not use the usual method of teaching. The advice of many books, experts and websites (Ott, 1997, SPELD, Davis, Dawn Cousins, Jean Seabrook Memorial School, & Houck, M 2007) suggests that these students will benefit more from a teacher/tutor promptly tell them any difficult words, rather than them using a variety of strategies to work them out. This should: allow greater enjoyment in reading because the story is unbroken; reduce stress and frustration from endlessly struggling to decode difficult words; and increase the volume of reading and consequently the number of repetitions of sight words.
- During whole class shared reading teachers should strive to put more emphasis on drawing attention to word patterns even at senior levels.
- In addition to 1:1 reading with dyslexic students, they should be included in a reading group at a suitable level. Instead of running their lesson as guided silent reading it could be run as guided aloud reading. This will allow

a multi-sensory experience as well as the stronger readers being able to scaffold weaker ones.

- Independent activities for older struggling readers can include books on tape/cd and electronic story books by Learning Media. These CD-ROMS contain stories targeting the older struggling reader. They also contain a range of engaging follow-up activities. They are available free to schools. ([http://www.tki.org.nz/r/literacy\\_numeracy/pdf/cdrom-pamphlet.pdf](http://www.tki.org.nz/r/literacy_numeracy/pdf/cdrom-pamphlet.pdf))
- Many games can be played using flash cards to help consolidate sight words. At Seabrook Memorial school I was very impressed by a game called “Guess-the-word”. Sight words are spread out. One student selects the “secret word.” The others take turns to ask questions which can eliminate some words. For example, “Does the word have a t in it?” Words that are eliminated are read aloud one by one as the student turns them over. This continues until the word is guessed. By the time all students in the group have had a turn choosing a “secret word” everyone has had repeated practice reading the words. This is an excellent repetitive and engaging game.
- Another game which I really liked was taught to me by Heather Bell. It also uses flash cards with sight words. It is a version of Tic-Tac-Toe which requires a laminated grid for placing the words into. Each player has a set of sight word cards in a different colour which are shuffled and not looked at. They take turns to read a card and place it on the grid. The goal, like traditional Tic-Tac-Toe is to complete 3 in a row. This game has a slight twist which I really enjoyed – if a player has a word which is already on the board, they must place their card on top of it, rather than choosing a free space. This means the game is exciting and often has a surprise ending.
- Fluency can also be enhanced by some repeated speed reading trials using sight words. Teachers can record a student’s fastest score for each day on a graph. This is a race against him/herself not against others.
- The LEAP programme (SPELD, 2008) can allow dyslexic students to enjoy reading some ungraded text related to their special interests. LEAP Programme uses repeated readings of high interest text following an adult model. The learner does not look at the text while the adult reads. Time and accuracy are monitored and graphed. The reading is repeated until the learner can match the tutors speed.

### Motor Development & Co-ordination

Specific deficits in motor development and co-ordination which may be noticed as children enter primary school need to be targeted.

A student that has difficulty gripping a pencil when they start school will need to work on the development of fine motor-skills. Experiences such as bead threading, modelling, weaving, finger play and cutting and pasting are good. Cross patterning activities may also help ([www.evelinakids.nhs.uk](http://www.evelinakids.nhs.uk)). Students who have trouble with eye tracking can tap a suspended stocking ball, use finger puppets, play with a balloon in a doorway, and blowing bubbles and try to burst with a clap or stomp (Crowe, 2008). Some students show a lack of laterality: swaps hands while writing; difficulties learning to swim and ride a bike; reverses letters; exhibits motor overflow; and has

trouble with cross patterning. To help them try lazy eights (eyes and hands), marching, climbing, crawling, folk dancing and riding a scooter (Connell, 2006).

If a student has difficulty throwing and catching balls, and balancing try bean bag activities (easier to catch than a ball), parachute games, brain gym, balancing games using apparatus, stepping stones game with hoops and climbing activities. For students with poor spatial awareness (appears clumsy and has difficulties arranging school work on the page), try crawling through boxes, action songs, line walking, follow the leader, climbing activities, balancing, jigsaw puzzles, twister, playground equipment exploration and dot-to-dot patterns ([www.teacherexpertise.com/articles/sen](http://www.teacherexpertise.com/articles/sen)).

A student who has difficulty with concepts of time, position and order will benefit from using simple sequencing activities & use toys to show and teach positional terms. If a student is hyperactive and has difficulty sitting still, he or she may be under sensitive to movement (vestibular hyposensitive). This can be helped by allowing heavy movement regularly, trampoline, swings, weight training and use of sucking/chewing to allow concentration. (Edmonds, 2008) If a student is fearful when their feet leave the ground and doesn't like any activities where they need to put their head upside-down, gradually introduce new movement experiences in an unforced way. Encourage the child to carry out learning activities in a variety of positions – sitting, kneeling, laying on stomach, sitting on a Swiss ball etc. ([www.sensory-processing-disorder.com](http://www.sensory-processing-disorder.com))

A number of specialist sensory –motor programmes are available. The Perceptual Motor Programme (PMP) is currently used in our school. PMP is designed to be used in a classroom with children rotating through 5 different activity stations during a session. Parent helpers can be used to help run the session for whole class programmes. The five stations are eye-tracking, locomotion, balance, fitness and co-ordination.

The theory behind PMP is that due to busy life styles many children spend too much time in car seats, front packs, walkers and high chairs and sitting passively in front of TV. They believe that many primitive reflexes are retained as a result – e.g. moro, palmar and plantar.

During a PMP session children have fun with an adult experiencing many kinds of movement. The aim of the activities is for slow controlled movement with an adult providing the associated language.

PMP has techniques for a variety of spatial motor difficulties including midline development and development of the vestibular system (Connell, 2006).

### Memory/Learning Enhancements

Memory can be divided into working (or short term) memory encompassing encoding and reflection, and long term memory encompassing filing, storage and retrieval.

Working Memory is the part of your memory that keeps information in your “mind’s eye.” It is likened by Eide (2006) to a juggler who tries to keep as many balls in the air as possible. It is limited in time (about 1 minute) and capacity (research indicates average adults can hold 8 plus or minus 2 items in working memory. Gleitman, 2006)) Working memory consists of a central executive which co-ordinates processes. Sensory information coming in can only be held for a few seconds unless it is placed in a short term memory buffer. The auditory buffer is like a taped loop which lets you replay sounds in your head. The visual-spatial buffer is like a sketch pad which allows you to replay visual images and patterns. The motor/kinesthetic buffer is like a mime which records muscle movements including speech patterns.

Students with SLD can have various difficulties with working memory. Some have very limited capacity in 1 or more areas. They may also not have the metacognitive/executive knowledge of rehearsal which allows us to hold information in this short term loop for longer. In some cases students may have an over-reliance in one area and a severe deficit in another. For example, many people with dyslexic symptoms have very poor auditory working memory and have difficulty holding phonemic information in their mind. In addition they may have a visual-spatial buffer which is so intense that images and patterns from long term memory can be replayed with ease even when the student is trying to attend to other information. (Eide & Eide, 2006) I believe the experiences described by Ron Davis and others of the “minds eye shifting around” and altered visual perceptions may be a result of a highly developed visual-spatial buffer. These abilities may have advantages in engineering and sculpting but are counterproductive in the 2D world of reading text.

Long Term Memory allows us to file, store and retrieve patterns or information for a few minutes or many years. Depending on the type of memory, they are stored in different parts of the brain. Personal/episodic memories are memories about what has happened to you. They are often context bound and may be attached to feelings, emotions and sensory experiences. Particularly positive, negative or unique experiences can generate powerful personal memories. Impersonal/semantic memories deal with facts and are decontextualized in terms of time, place and emotions. Some students rely on personal memories but struggle with recall of isolated facts. They are the students that need to learn by doing. Some students rely on semantic memories and are good at “book learning” and do well at school but may have difficulties later in the working world (Eide and Eide, 2006).

Long term memories are taken in through sensory systems and are stored in different specialized parts of the brain. These memories can be stored in a variety of memory patterns: Word & Language Memory patterns ; Story or Narrative Memory patterns; Musical Memory Patterns; Procedural Memory Patterns; Rule-Based Memory patterns; and Relationships Memory Patterns.

Students may have difficulties in one or more of these types of pattern. This can cause “road blocks” in learning which need to be got around using other strengths (alternative routes). Memories which are stored using more than one type of pattern will be stronger. The more connections, the stronger the memory will be. For example if the tune and lyrics for a song are learned together, the memory for each will be stronger.

### Strategies to Improve Working Memory

- Exercising working memory span can lead to significant improvements. Gradually increase the number of items to be held in working memory using short daily sessions (5 minutes) over a period of months. For auditory memory hold longer and longer sentences in mind. For visual memory hold patterns/shapes in mind. Be careful to use shapes that are not easily translated into verbal sequences. For motor memory hold hand movements or whole body actions in mind.
- Use rehearsal strategies to optimize working memory retention. Sub vocalization (repeating to yourself) is the most common, but focusing on taking a visual “snapshot” or tracing/tapping out steps can be used.
- Develop working memory efficiency by making skills automatic. Reading, writing and mathematics all benefit from automatic recall of information such as phonics, letter formations and basic maths facts.
- Speak slowly, using short direct sentences and try not to present too much information at once. Preview terms and concepts before it is time to use them.
- Allow accommodations in class which lessen the burden on working memory: dictate the story for teacher to scribe, use a calculator and other external memory aides such as charts and printed schedules (Eide & Eide, 2006).

### Strategies to Improve Long Term Memory

- Improve encoding efficiency by simplifying patterns. By paraphrasing information, highlighting keywords and taking notes (using visual colour coding if visual memory is a strength) the amount of information to be processed can be reduced.
- Improve encoding by elaboration and association. Elaboration techniques link new learning to existing connections and may be achieved through use of imagery and other mnemonics.
- Improve encoding efficiency by increasing general knowledge. The more patterns a student has, the more ways new learning may be linked in. Field trips and documentaries can be useful.
- Optimize long term memory by review and rehearsal. Repeated activation of the neurons can help solidify “wiring.” Daily revision initially, followed by increasing intervals between revisions is optimum. Revision can include making associations and can be made fun. Those with memory difficulties may need more consistent revision than others.
- Use multi-sensory approaches so that strong and weak modes are stimulated creating patterns with more interconnections. Combine visual,

verbal & kinesthetic inputs with different forms of elaboration to increase understanding and memory.

- Maximize the best of each modality. For example use vivid colour, memorable graphics and humour/surprise/drama for visual information.
- Build on a strong personal memory by using “hanging.” This is when you try to link items to personal memories. For example vivid imagery can be used to link items to be remembered to items in a student’s bedroom.
- Use experiential learning to make the most of strong personal memory.
- Create a silly or meaningful story to link unrelated items to be remembered.
- For students with a strong verbal memory teach strategies such as verbal mediation (explicitly voice all significant information to be remembered including orientation), peg systems where information is linked to word pegs (e.g. one-gun, two-shoe), acronyms and initialization, and embedding facts in rhyme.
- For students with strong auditory-verbal learners use taped books, and spell words out loud.
- For students with a strong verbal spatial memory use visualisation strategies, visual pegs, computer graphics programmes, and improve verbal memory by encouraging verbal descriptions of images and events. “Method of loci” is an ancient way of remembering a speech by associating each part to a familiar route ([www.helpguide.org](http://www.helpguide.org)).
- For students with a strong musical memory use songs (e.g. alphabet song), online resources from [www.audiomemory.com](http://www.audiomemory.com), [www.sing-smart.com](http://www.sing-smart.com) and [www.lyricallearning.com](http://www.lyricallearning.com), and songwriting.
- For students with a strong sensorimotor memory use interaction with real objects, use tactile 2D and 3D experiences (air writing), and action songs/pegs as mnemonics.
- For students with a strong memory for rules or procedures use rule based phonics and teach complex information as simplified rules and procedures (Eide and Eide, 2006).

### Social skills Training

Social skills training might include special lessons for the children who lack social skills. Lessons may cover: manners and approaching others in appropriate ways; behaving appropriately in the classroom; handling anger and frustration; and using acceptable ways to handle conflict ([www.Idonline.org](http://www.Idonline.org)).

Formal social skills training involves identifying skills which need to be taught, using small group lessons to explicitly teach the skills and monitoring the behaviour back in the classroom with rewards for success ([www.Idonline.org](http://www.Idonline.org)).

Social skills may also be taught in the classroom. This approach is suggested by many including Dr Spencer Kagan. Discuss the need for social skills. Pick one skill at a time to teach: taking turns, praising, sharing materials, asking for help, using quiet voices, participating equally, staying on task, saying kind things, using names, encouraging others, patient waiting, communicating clearly, accepting differences, active listening, resolving conflicts, following



directions, paraphrasing, managing materials, staying with a team, sharing ideas, recording ideas, sharing tasks, celebrating success and helping others. Use T charts (looks like/sounds like) to unpack exactly what the skill entails. Practice the skill in a game or simple activity. Pause during the activity to reflect on how they are using the skill. At the end discuss what went well and what needs more work (home.att.net).

Another variation on the direct teaching approach is the 5 step method by Rebecca Pope ([www.angelfire.com](http://www.angelfire.com)): 1. Access all information which is needed for the behaviour in question; 2. Model the behaviour; 3. Practice ; 4. Reinforce with verbal feedback; and 5. Re-teach.

Books or other media can be used to explore social skills. Read a story that contains a suitable social situation and discuss the actions and consequences in the story. Arrange pictures and describe people's feelings and actions. Some books have been written to help students on the autism spectrum learn social skills. These may be useful for other students struggling to understand social situations. For example "The Social Skills Picture Book Teaching Play, Emotion, and Communication to Children with Autism" by Dr. Jed Baker.

The Social Skills Autopsy approach is based on the understanding that social skill errors are usually unintentional and that punishment would therefore, be inappropriate. To conduct an autopsy you need to spend some quite time with the student after a social error has occurred. First you ask the student what happened and facilitate them identifying the mistake he/she made. Next you discuss alternative actions he/she "could" have taken (rather than "should"). Then the teacher creates an imaginary scenario similar to the original one. The student is asked to come up with a suitable solution. A homework task is then given which requires the student to practice the new strategy/skill in a real social situation and then report back when successful (Rick Lovoie, [www.lonline.org](http://www.lonline.org)).

### Metacognition

- Improve metamemory skills by teaching a variety of memory strategies and how and when they might be most effectively used ([www.educaton.calumet.purdue.edu](http://www.educaton.calumet.purdue.edu)).
- Facilitate students to learn more about their own memory strengths and weaknesses.
- Teach students to take responsibility for their own comprehension listening, reading or viewing material.
- Teach students to make connections, predictions and inferences, use context clues, use text features, use graphic organizers and write comments and questions on post-it notes in the margins while reading. ([www.benchmarkeducation.com](http://www.benchmarkeducation.com))

- The SPELD course book recommends the Reciprocal Reading technique which focuses on questioning, clarifying, summarizing and predicting. I have used this technique successfully in my year 5/6 class. It really improves student's sense of responsibility for their own comprehension.
- Teach students to monitor their understanding during reading and watch out for his/her mind wandering, reciting text without it meaning anything, forgetting what had been read, and an inability to answer his/her own questions.
- Teach metacognitive strategies for reading through the teacher "think-aloud" technique. Try this during shared reading, guided reading or while reading to students. This can be used to teach a variety of cognitive strategies, how to select an appropriate strategy, monitor the strategy and combine strategies in an orchestrated fashion (www.benchmarkeducation.com).
- Encourage greater awareness of metacognition through encouraging discussion about thinking. Reflective journals can be used and teacher lead debriefing following a learning session can be valuable. (www.ericdigests.org)
- Teach students to be aware of internal and external factors which impact on their learning (temperature, hunger, noise, distractions) and teach strategies for overcoming these factors.
- Davis Focusing strategies encourage students to focus their attention for learning and to take control of their energy levels. Orientation or alignment focuses attention and perceptions and energy dial allows students to consciously control their arousal level and to adjust it according to the task (Davis & Braun, 1997).

## **6. Case Study: A Comparison of Specialist Teaching Interventions for Dyslexia.**

Two popular interventions which are available to students in Otago were researched and compared.

### **6.1 Davis Dyslexia**

#### Background

Ron Davis was born with severe autism and dyslexia. He was labelled uneducable and was functionally illiterate until age 38 when he discovered a method which allowed him to learn to read. Based on his own experiences he set up "The Reading Research Council" in 1981, and has researched and developed the Davis Dyslexia Reading Correction Program and Davis Orientation Counselling. Today licensed Davis facilitators provide specialist dyslexia help to clients in 300 countries.

([http://www.ddapacific.co.nz/davis\\_bio.html](http://www.ddapacific.co.nz/davis_bio.html))

#### Underlying Philosophy

All dyslexic learners share three characteristics: the ability to think primarily in conceptual pictures/mental images; the ability to experience these mental images as though they were actual perception; and a lower than normal threshold for confusion. (Davis, 2004) When these characteristics are combined, a learner attempting to master 2D symbols, such as words on a page, will be prone to “disorientation” as he/she perceptually flips unrecognized items around in space in an attempt to recognize them. Disorientations may last in duration from, imperceptible up to several minutes or hours. This disorientation alters the senses and leads to inaccurate perception and mistakes. This in turn leads to emotional reactions and frustration which causes other dyslexia related symptoms (Davis, 2004).

In order to cope with the disorientations, dyslexic learners develop coping mechanisms or compulsive solutions. “It is the compulsive force contained in these “solutions” that prevents the normal learning process from occurring and therefore creates the disability aspect of dyslexia” (Davis, 2004).

The Davis Methods are aimed at controlling disorientation using Orientation counselling, and preventing them from occurring by teaching Symbol mastery.

#### Tutor Training

Licensed Davis Facilitators complete an intensive training programme which includes workshops, supervised practice and assignments. No prior teacher training is required. Trainees need to invest a substantial amount of money to complete the full course and must have a special empathy with dyslexic learners.

#### Clients

The Davis Methods were designed with adult learners in mind. A standard intervention requires a self-motivated participant who is willing to commit to extensive follow-up work at home. It is generally not made available to students under the age of 9 years. Strong parental commitment is required for the intervention. Usually parents (and/or clients) must read the “Gift of Dyslexia” before commencing an intervention.

#### Assessment

A full cognitive assessment by a psychologist is not required. Clients complete a detailed symptoms profile as part of the initial interview. This is used as the basis for setting goals. A perceptual ability test is conducted to clarify the relative strengths of the client’s visual and kinaesthetic modes of learning.

#### Intervention

The intervention involves 30-50 hours over a period of approximately 5 to 10 days, of intensive 1:1 work with a licensed facilitator. Orientation Counselling, which aims to give clients the ability to control and turn off perceptual distortion, allows quick and accurate perception and eliminates confusion (gives certainty). Orientation is used for clients with strong visual perception and alignment is used for those who are more strongly kinaesthetic.

Clients are taught to monitor their mental state and take responsibility for adjusting their own orientation. Other skills taught allow clients to adjust their state of mind in order to learn more effectively. Release Procedure is taught to reduce stress, resolve headaches, relieve stress during concentration and allow a relaxed learning state. Dial setting uses visualization to help clients adjust their own energy levels and experience of time in order to optimize learning. Koosh ball exercises are used to reinforce balance and optimal orientation. It also addresses 'timing' and any co-ordination difficulties.

Symbol Mastery attempts to allow deep learning of letters, punctuation marks and sight words. In mastering upper and lower case letters clients create their own alphabet and interact with it in order to master it fully. When mastering words, clients make the word in clay and, after studying a dyslexic friendly dictionary, create a 3D model to represent the meaning of the word (this uses higher order thinking). Verbalisation is combined with this multisensory process to create a well anchored memory. During the intervention the lower and uppercase alphabet, common punctuation symbols and a few trigger words (common sight words which don't have a clear meaning easily visualized) are mastered.

Davis facilitators use three reading techniques to encourage more fluent reading and allow dyslexic learners to have more positive and less stressful reading experiences. Spell reading and Sweep-Sweep-Spell are techniques designed to help clients access familiar words without the confusion of "sounding them out" as this is often not an easy skill for those with dyslexia. In spell reading the learner reads the letter names of the difficult word. If he/she knows the word they read it. If they don't, their reading support person gives them the word, they repeat it and continue reading. In sweep-sweep-spell learners sweep a difficult word twice with their finger and eyes before using the spell reading technique. If the word is recognized after it has been "swept" the learner reads the word and continues. The third reading technique used by Davis, is Picture-At-Punctuation. After reading each sentence or clause, the learner has to create and describe a mental image to represent the meaning of what has been read. This essentially encourages visualisation as a comprehension strategy.

Facilitators watch the client's body language and empower them to take breaks when necessary. Activities are switched between as necessary to maintain energy and focus.

Following their course with the facilitator, clients work on symbol mastery with 2 trigger words per week until they have completed mastery of all words. The same technique can also be used to master other words such as school spelling words. Ten minutes per day using the Davis Reading techniques is also recommended. Clients and their parents are able to contact the facilitator by phone or email over the following year for advice and support. Facilitators usually make 2 to 3 follow up visits.

### Strengths & Weaknesses

Because the programme is usually quite different from what is offered at school, it can provide new hope for students with dyslexia. The intervention encourages self-responsibility and greater awareness of ones own learning. For this reason it is often a refreshing and empowering experience. An intensive week long 1:1 course allows students to make some good initial progress, which will help motivate them for the individual work to follow.

A strong commitment by the student and their support parent is required for this method to be successful. If the individual word mastery work is not continued and the self help skills, such as orientation, are not practised gains will be limited.

Some criticisms from overseas ([gimpyblog.wordpress.com/2007/10/08/19/](http://gimpyblog.wordpress.com/2007/10/08/19/)) suggest the cost of the intervention is exorbitant and Davis Methods are essentially a money making scheme. Based on the hardworking and dedicated facilitators I have met in New Zealand, I have to disagree. Most facilitators have a personal connection with dyslexia (often a family member is affected) and are extremely passionate about helping others.

The main strengths that I see include: 1:1 personal attention for a whole week; relaxed learning environment with lots of support and praise; pace dictated by the individual; multi-sensory methods combined with higher order thinking (creativity) providing secure memory hooks; empowerment and sense of autonomy for learners who have had bad past experiences; reading techniques which allow reading to become less stressful, more successful and more enjoyable; and skills which can be applied to master a variety of material in a students future life.

Based on discussions with past clients and their parents, my main concern is the failure rate due to lack of follow-up after the initial intervention. Clients and parents must make a full commitment to completing the word mastery learning at home. If this is not possible, the course costs are probably not justified.

The Davis methodology addresses motivation and metacognitive issues for dyslexic learners. It provides slow paced multi-sensory literacy learning which focuses on understanding and meaning. I would recommend the Davis techniques to parents, teachers and other SLD tutors. Teacher workshops and The Davis Fundamentals Course will give teachers and tutors some great ideas for multi-sensory teaching and empowering learners with metacognitive skills. A full cognitive assessment is not part of the Davis intervention. Addressing underlying cognitive difficulties such as processing speed, dual processing, auditory perception and cognitive efficiency are outside the parameters of this system.

## 6.2 SPELD NZ

### Background

In 1971 the Dyslexia Association of NZ was founded to help intelligent students who had trouble learning. Dr Jean Seabrook (speech therapist and psychologist), Mrs Kerr (a doctor's wife with several dyslexic children of her own) and Brother Damien Keane (head school teacher) were key figures in the set up of this non-profit agency.

In 1974 this organisation became The Federation of Specific Learning Disabilities Associations or SPELD NZ. With about 30 branches nationwide, SPELD NZ aims to raise awareness of SLD, support families of those with SLD and provide assessment and tailored educational programmes for SLD students. SPELD is a non-profit organisation.

### Underlying Philosophy

Each student with dyslexia is unique and interventions need to be tailor made for the individual based on thorough assessment of strengths and weaknesses. The results of research point to proven methodologies for improving literacy skills as well as underlying cognitive weaknesses. It is important that tutors keep up to date with developments which may enhance student learning.

### Tutor Training

All SPELD tutors are qualified teachers who have completed additional qualifications in teaching students with specific learning disabilities. Tutors are kept up to date via regular meetings and conferences. Teacher training programmes can be completed during school holiday block courses or by distance. The distance course is particularly suitable for teachers who live in remote areas, such as Central Otago. Delivery of training programmes is currently being reviewed to streamline administration and enhance learning for teachers.

### Clients

SPELD tutoring is individually tailored to the learner and is suitable for all ages and abilities.

### Assessment

SPELD collects confidential case history information from newly referred students. Once they become annual financial members they can be tested using the Woodcock-Johnson III to get a clear picture of their strengths and weaknesses. This test is an internationally recognised battery of cognitive tests which is administered individually by a registered psychologist with at least a "C" level qualification. Re-testing is recommended after a year to gauge progress and set new goals. This testing is always carried out by a psychologist and never the tutor. Costs may vary slightly across different centres. Many SPELD associations carry out fundraising activities so that no students miss out for financial reasons.

### Intervention

Individual Programmes are designed to meet the needs of each client as assessed by the Woodcock-Johnson III. Programmes will include teaching

which address achievement difficulties (for example reading and spelling) and also targets areas of cognitive weakness (for example visual discrimination and cognitive efficiency).

Traditionally teaching takes place in one hour sessions held weekly over the course of at least a year. Many tutors work from home but some conduct their weekly sessions at school, sometimes during school hours. A small amount of homework is usually set by tutors to help consolidate learning. Many tutors are happy to advise classroom teachers at no charge, about ways to further consolidate student learning in the normal classroom.

As programmes are completely individualised I can only provide an example of the content covered in a one hour session.

Example Only

5 minutes: Revising letter patterns covered last week

15 minutes: Learning new letter patterns (phonics) with a variety of multi-sensory methods.

5 minutes: Playing a game to improve visual discrimination.

10 minutes: Dictated sentences to contextualize new and previously learned letter patterns

5 minutes: Using visualisation &/or rehearsal as a memory strategy to recall letter strings

10 minutes: Reading decodable text which reinforces letter patterns and sight words.

5 minutes: Listening games designed to improve phonological awareness and auditory memory.

5 minutes: Repeated speed trials with sight word reading. Fastest score for the day recorded and graphed.

Parent education evenings and newsletters provide on-going support for SLD students and their families. Tutorial sessions can continue for as long as the client wants additional support. Sometimes this continues for many years into high school. Formal annual reassessment and goal setting help the programme evolve with the student. Personal goals such as studying for a drivers licence or learning exam techniques can also be incorporated as needed.

### Strengths & Weaknesses

The comprehensive assessment used pinpoints individual strengths and weaknesses. Time is carefully spent on skills and knowledge that the student needs most. A variety of multi-sensory techniques are used which ensure sessions stay interesting: magnetic letters, clay, whiteboards, letter floor mats, flash cards, games, computer activities, pipe cleaners, worksheets, letter tiles and word puzzles. Sometimes external motivators, such as \$2 shop toys, are used to help motivate disheartened learners. The ongoing nature of the intervention provides good support for parents and dyslexic learners.

The main weakness is the short sessions. Some other specialist tutors, such as at Jean Seabrook Memorial School, offer 3 week 1:1 morning block

courses to clients to get them off to a good start. This is usually followed up with one hour weekly sessions. This kind of approach could be considered by SPELD in their strategic planning. In addition, when tutors have input into classroom programmes/accommodations the benefit to the student can be further enhanced.

## **7. Key Conclusions**

The really complicated thing about dyslexia is - no two students will have exactly the same symptoms. Each dyslexic student will have their own unique blend of difficulties. This can make it very difficult for us to spot them in our busy classrooms. Dyslexia is not just about reversing letters and words - but it can be part of it. The one thing all dyslexic students have in common is severe and persistent difficulties with literacy. Most will have additional difficulties in a variety of areas: maths, speech, information processing, memory, motor skills and organisation. The exact causes of dyslexia are unknown. Dyslexics' brains are wired differently (possibly for a variety of reasons - heredity, prenatal factors and early experiences). Instead of using the verbal sequential left side of the brain when they read, they rely on the right side, which usually specialises in spatial non-linear thinking.

Dyslexia is a severe & persistent difficulty with literacy learning & fluency. It is not due to poor teaching, sensory deficits or low intelligence. It is characterised by differences in neurology and cognitive processes. It may affect 1 in 10 learners.

A number of major concerns for the welfare of dyslexic students have been raised by this inquiry. Dyslexic learners have to work harder than others to keep up and experience frustration, fatigue, overloading & low self-esteem. If teachers are not alerted to the signs to watch for, many dyslexic learners may be misdiagnosed as lazy or naughty. Those with undiagnosed dyslexia are at risk for downward spiral leading to prison. Undergraduate teaching courses should include information about the symptoms which may indicate dyslexia. Professional development needs to be made available to all schools so that current practising teachers have the knowledge and skills to identify dyslexic students and help support their learning more effectively.

Dyslexic students need focussed multi-sensory literacy teaching which is systematic, cumulative & involves over-learning. Underlying cognitive weaknesses need diagnosis & remediation. Classroom programmes & assessment need modified. Schools need support from specialists to make changes and provide specific help to dyslexic learners. Ongoing 1:1 specialist teaching will be a necessary investment. When schools and specialists work in a co-ordinated way, students stand to make substantial gains.



My motor and cognitive study has contributed to a growing body of evidence that suggests dyslexia is more than just a phonological deficit. Future research should continue to explore underlying cognitive difficulties which underlie this wide spread learning disability. If people with dyslexia are slower on simple visual-motor responses, as our new research suggests, then this slowness alone might tell us something important about brain processes involved in other cognitive skills. Although there is no easy answer in the literature as to why such slowing would occur, this seems a very worthwhile research question to follow up.

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