DYSLEXIA AND WORKING MEMORY

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LITERACY CARE & THE CHILD DEVELOPMENT NETWORK

Part One: Dyslexia

Part Two: Working Memory

What is Dyslexia

Any ideas ?

Formal Definition

- Dyslexia is a specific learning disability that is neurological in origin. It is characterized by difficulties with accurate and/or fluent word recognition and by poor spelling and decoding abilities. These difficulties typically result from a deficit in the phonological component of language that is often unexpected in relation to other cognitive abilities and the provision of effective classroom instruction. Secondary consequences may include problems in reading comprehension and reduced reading experience that can impede the growth of vocabulary and background knowledge
- (International Dyslexia Association 2011)

Important Parts of the Definition

- Neurological origin – Neurological Signature
- Specifically to do with Written Text – the squiggles on the page
- Causal aspects directly traceable to the phonological and orthographical systems
- Unexpected relative to oral language, cognitive development and strengths

Terminology

- Learning Difficulty
- Specific Learning Disability

Specific Reading Disorder

Literacy Disability

Reading and Spelling Disability

Terminology (Cont')

Delay

Implies a mild problem from which in time the child will recover without organized intervention. Often suggests a differential of about 12 months

CA = 800 RA = 700

NB: 12 month delay at 7 yrs may be more serious than a 12 month delay at 12 yrs

Terminology (Cont')

Difficulty

Implies a moderate problem that may or may not be caused by non constitutional factors and from which the child will recover if tutored or simply applying greater effort or spending more time. May be 18 months behind.

Terminology (Cont')

Disability

Implies a severe, specific neuro-developmental problem that is constitutional to the child, separate from other difficulties and that will not recover unless treated with a designed and systematic intervention. Could be lifelong. May be over 24 months behind

Terminology (Cont')

Other Dys's

- Dysgraphia (Cognitive Dysgraphia)
- Dyscalculia (Maths)
- Dyspraxia (Motor)

Dyslexia is a separate pathology from other learning disabilities including SLI and ADHD

Just a Few Facts

- Dyslexia is not an oral, receptive or expressive language based learning disability. It is specifically a phonological and orthographic processing based learning disability.
- Individuals with dyslexia **may have** difficulty with either receptive or expressive oral language skills but not necessarily.
- It is the most common form of learning disability.
- Approximately 15-20% of the population have a learning problem to some degree

A few more facts……

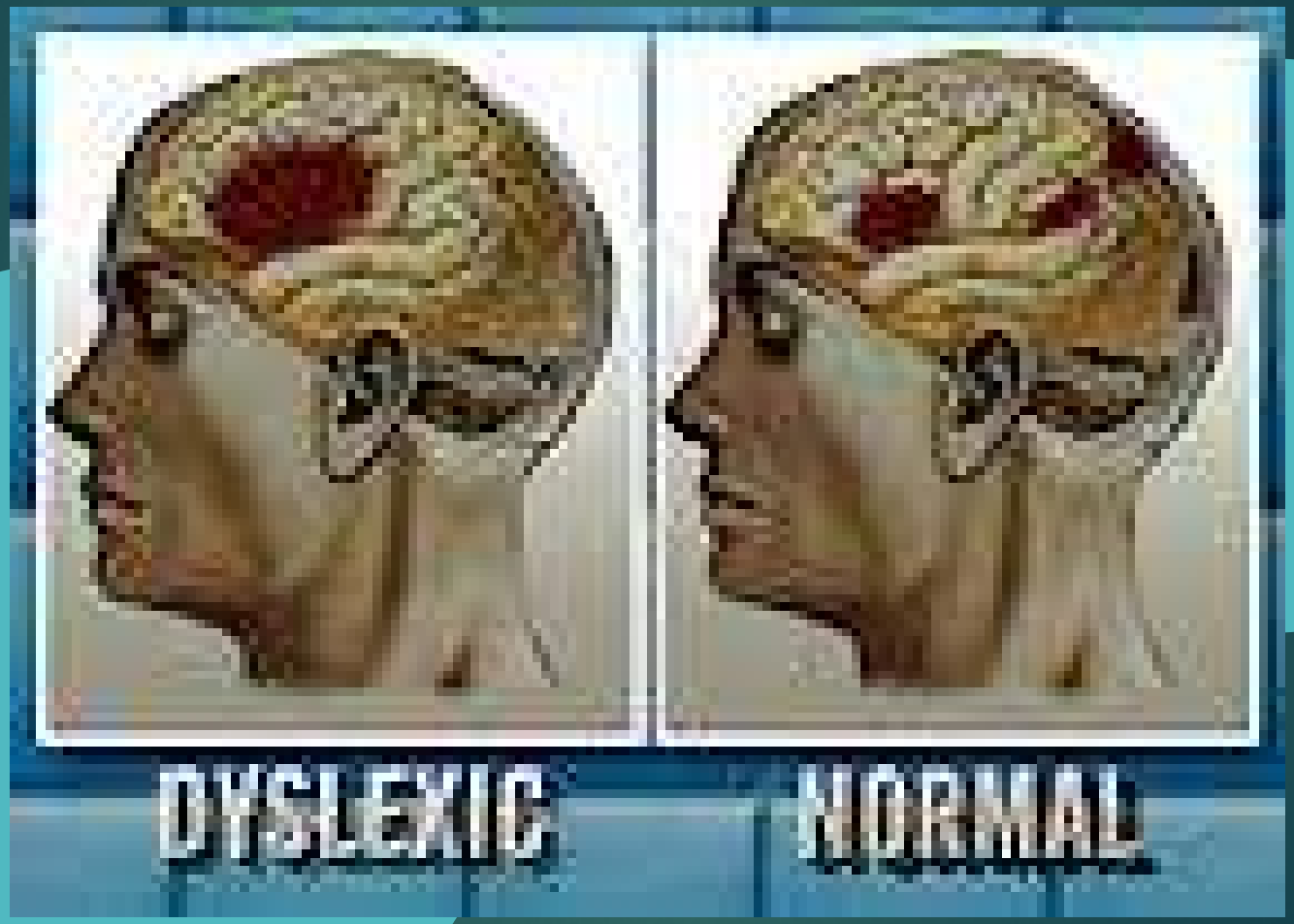
- The National Institutes of Health (US) report that 60% to 80% of those with learning disabilities have problems with reading and spelling skills.
- Statistically %20 of your school will struggle with written text. %10 will meet the criteria for Disability

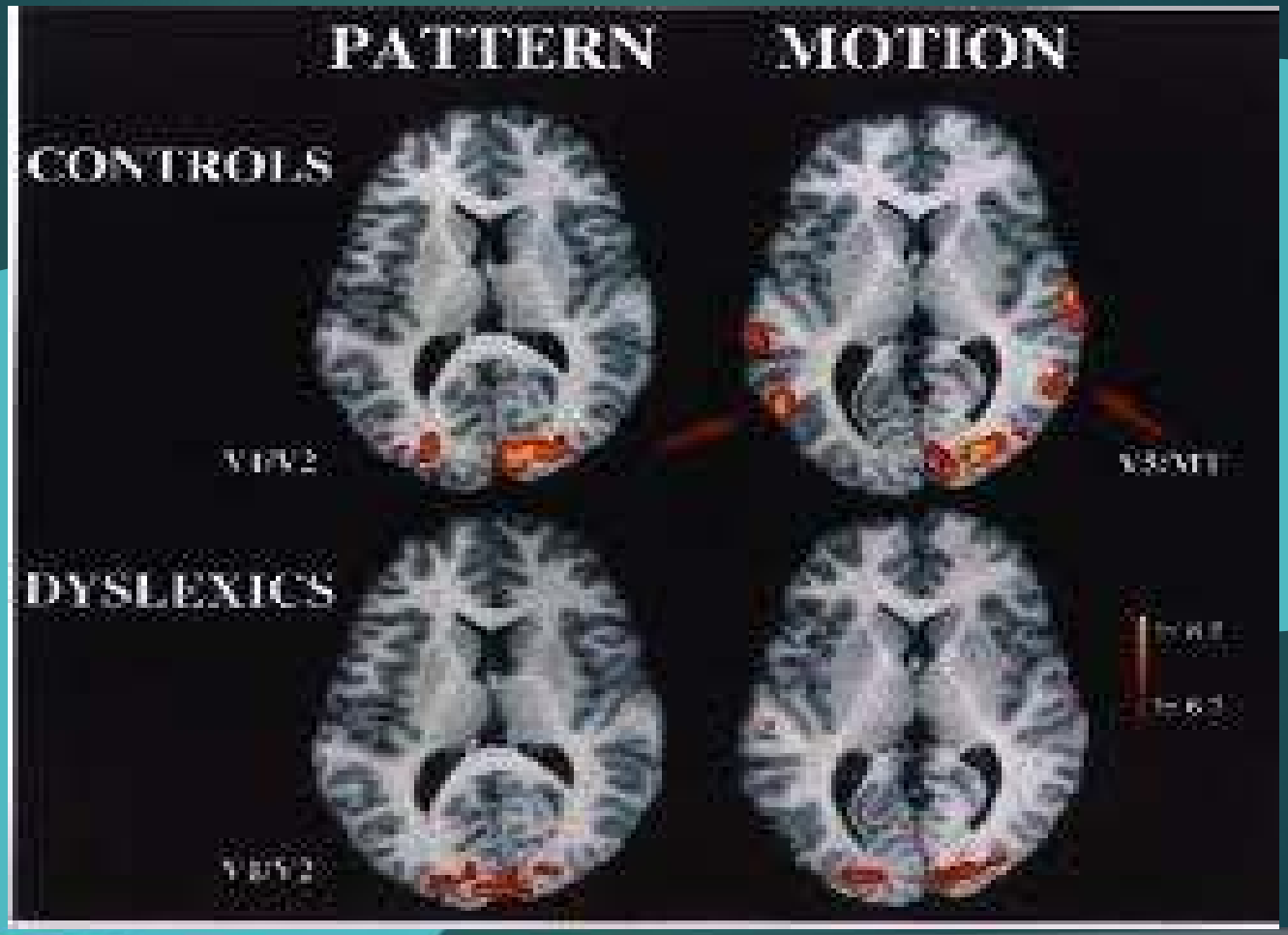
Even more facts...

- Dyslexia occurs in people of all backgrounds and intellectual levels. People who are very bright can be dyslexic. They are often capable or even gifted in areas that do not require strong language skills, such as art, computer science, design, drama, electronics, math, mechanics, music, physics, sales, and sports.
- Dyslexia runs in families; dyslexic parents are very likely to have children who are dyslexic.

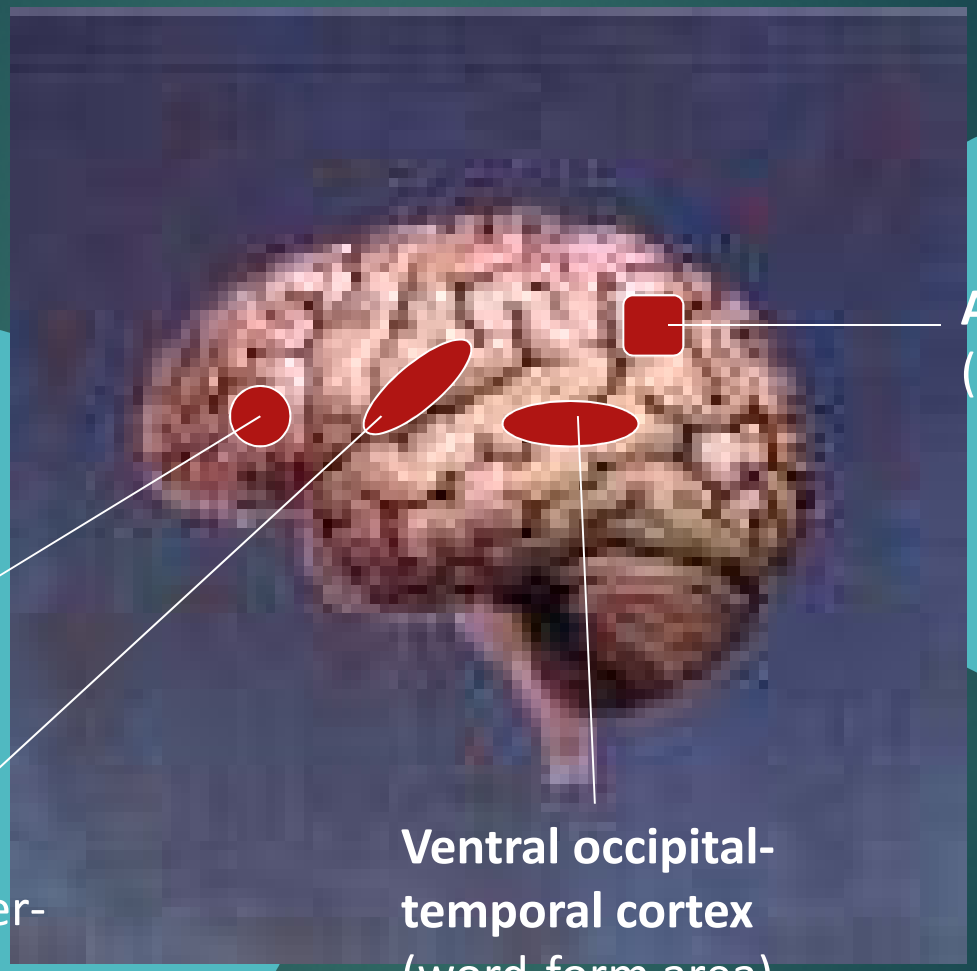
Even some more facts…

- There are at least 6 Chromosomes identified as causal to Dyslexia
- Dyslexia has a neurological signature


DYSLEXIC
NORMAL


PATTERN
MOTION
CONTROLS
DYSLEXICS

Neurobiological factors



Angular gyrus
(relay station)

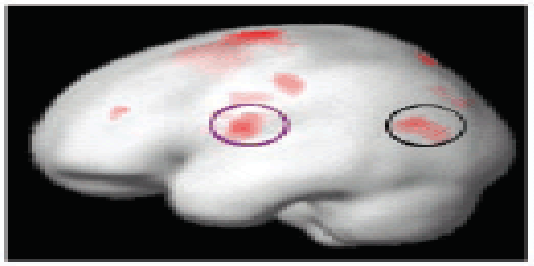
Broca's area
(articulation mapping)

Wernicke's area
(phonological/letter-sound processing)

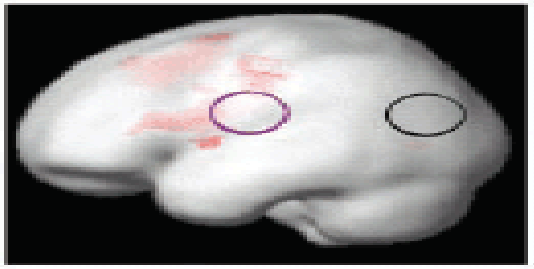
Ventral occipital-temporal cortex
(word-form area)

A Children with no remediation

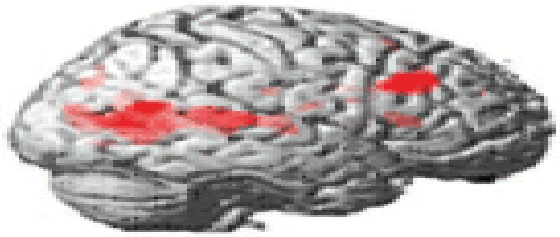
Normal reading children
while rhyming



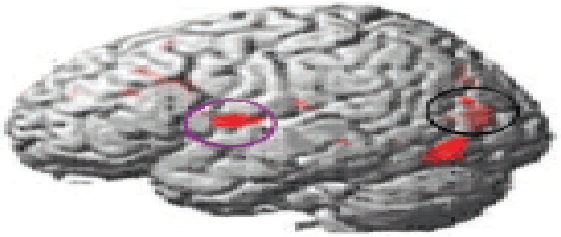
Dyslexic reading children
while rhyming
before remediation



B Dyslexic children
increases after remediation



Right



Left

Fig. 1. Neural effects of remediation in children with developmental dyslexia. (*A*) Left hemisphere activations of control children and children with dyslexia are shown during rhyming (as compared with matching) letters ($P < 0.025$, 20-voxel threshold; ref. 12). (*B*) Brain areas that showed increased activity during phonological processing in the dyslexic group after remediation. Shown at $P < 0.01$, 20-voxel threshold. Black circles highlight left temporo-parietal region, which is disrupted in children with dyslexia and affected by remediation. Purple circles highlight the left frontal region that is active in control children and is affected by remediation in children with dyslexia.

Recognizing The Signs

- The problems displayed by individuals with dyslexia involve difficulties in acquiring and using written language
- It is a myth that dyslexic individuals "read backwards or see letters that are not there." Spelling can look quite jumbled at times because students have trouble remembering letter symbols for sounds and forming memories for words.

Recognizing The Signs

Other problems experienced by dyslexics include the following: (Don't Jump to Conclusions – Be Alert Not Alarmed)

- Learning to speak
- Learning letters and their sounds
- Organizing written and spoken language
- Memorizing number facts
- Reading quickly enough to comprehend
- Persisting with and comprehending longer reading assignments
- Spelling
- Learning a foreign language
- Correctly doing math operations

Diagnosis

Two Questions

Who?

How?

Who Can Diagnose

Informal Diagnosis

Based on 'Concern' and 'Suspicion'

Teachers

- Form an Opinion
- Communicate Concerns Early
- Make Recs/Refer for investigation

Who Can Diagnose

Informal Diagnosis

Based on 'Concern' and 'Suspicion'

Parents

- Confirm Concerns with Teacher and a Secondary Professional Source
- Become and Educated Person

Who Can Diagnose

Formal Diagnosis

Based on 'Evidence, Enquiry and Clinical Judgement'

Brain Imagery

- Neurological Signature
- (f)MRI
- Only Used for Research
- Not in Australia

Paediatrician (MD)

- Uses IQ/Performance Model
- Clinical skills
- Legal Diagnosis

Who Can Diagnose

Formal Diagnosis

Based on 'Evidence, Enquiry and Clinical Judgement'

Educational Psychologist / Special Education

- Cognitive Test
- Academic and Scholastic Tests
- Processing Tests
- Clinical Skills

Who Can Diagnose

- In Australia 'Legally' only a medical specialist can Diagnose Learning Disability – For the Law Courts
- Current Industry Practice Prefers Clinical Educational Psychologists – but they don't treat
- Educational Specialists diagnose for the purpose of informing instruction and designing intervention

Diagnosis

Who?

How?

How to Diagnose

Diagnostic Models

1. IQ : Performance Discrepancy Model
2. Phonological Processing and Orthographic Processing Deficit Model
3. "Sea of Strengths" Model
4. Reading Language Spectrum Model

How to Diagnose

IQ : Performance Discrepancy Model

Simply states that there is either a statistically or clinically significant disparity between the child's IQ (overall cognitive ability) and their scholastic performance

Not as "Weighty" as it Use to Be

How to Diagnose

Phonological Processing and Orthographic Processing Deficit Model

Phonological Processing

- Refers to the use of phonological information, especially the sound structure of one's own oral language, in processing written language (i.e., reading, writing,) and oral language (listening, speaking) (Wagner and Torgesen 1987)

How to Diagnose
Phonological Processing

Three Composite Areas

- Phonological Awareness
- Phonological Memory
- Automatic Rapid Naming

How to Diagnose

Orthographic Processing Model

This refers to the visual processing aspect of reading. It does not refer to the eyes or the ocular system. Nor does it refer to Irlen Syndrome (Scotopic Sensitivity Syndrome)

How to Diagnose

Orthographic Processing

Orthographic Errors Fall into Four Categories:

How to Diagnose

(1) Orthographic Choice

This can be thought of in at least four ways.

1. An incorrect choice between vowel-consonant /e/ pattern and vowel-vowel pattern when both are phonologically acceptable. E.g.; ‘bote’ or ‘boat’.

2. A problem choosing between letter order. E.g.; ‘brithg’ or ‘brihgt’ or ‘brigth’ or even Bright

3. Correctly spelling homonyms, homophones and homographs relative to their meaning

4. Spelling the sound ‘k’ on the end of a one syllable word: /ck/, /ke/, /k/

How to Diagnose

(2) ***Semantic (and sometimes asemantic) Whole Word Substitutions***

- This means that the child reads a word that is visually similar with or without the same meaning, e.g.; 'taking' for 'talking' or a word that is visually dissimilar but may have a similar meaning such as 'eight' for 'nine'. "The boy has *eight* books." The boy has *nine* books.

How to Diagnose

(3) Perceptual Analysis

- Perceptual Analysis refers to single letter or whole word reversals.

p/b/d/q/ w/m u/n

A competent 4 ½ yr old who does not yet know the letter /u/ may describe it as an 'upside down' /n/

However, a child with orthographic difficulties will maintain confusion around these symbols

How to Diagnose

(4) Eidetic Memory

- Eidetic memory is literally, 'vivid imprint'. It refers to how readily a child can store and recall the correct whole form of a word from long term memory. It is particularly valid for phonologically implausible and or orthographically unique words like, *laugh, said, yacht, tongue* etc.

How to Diagnose

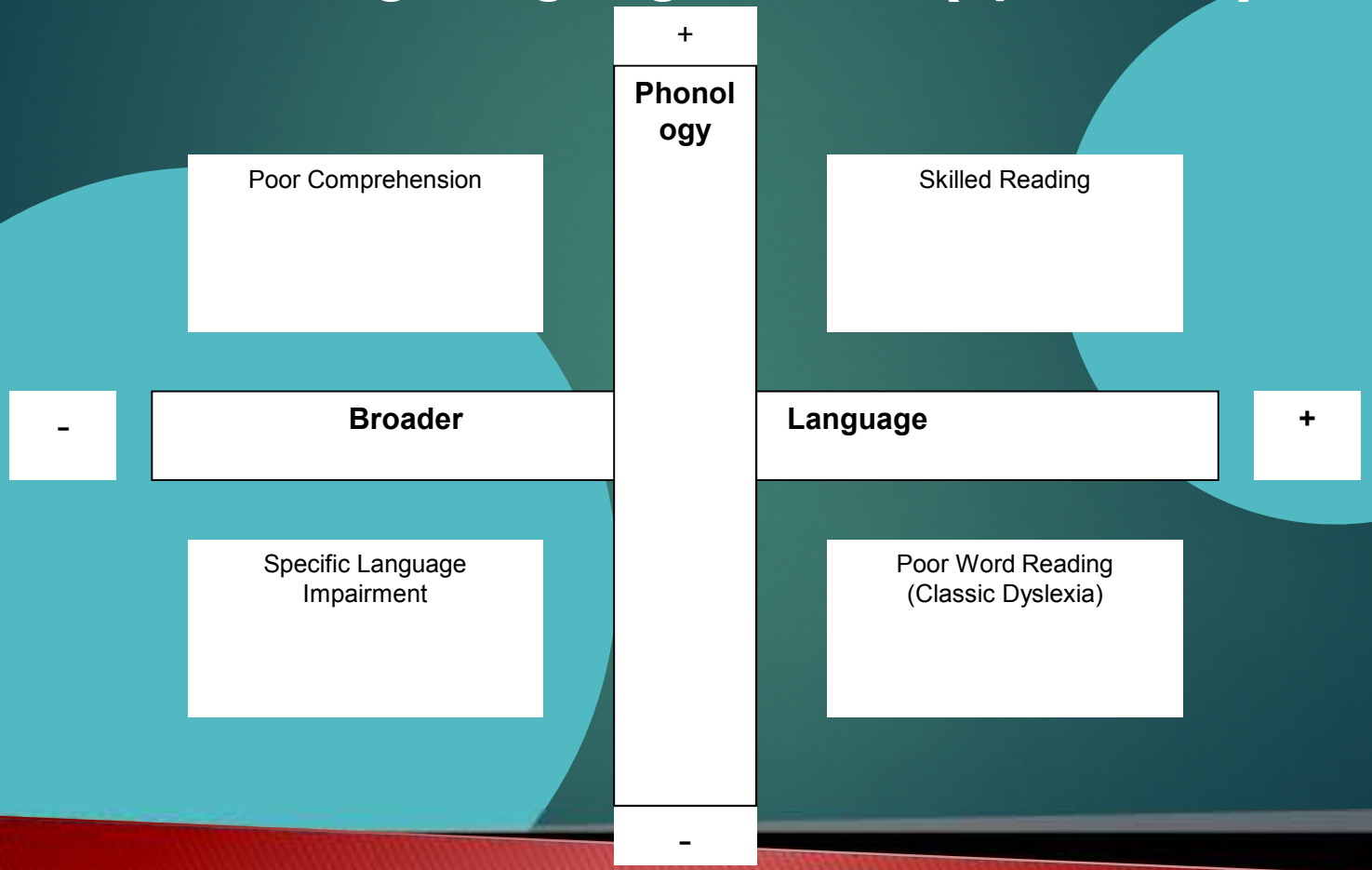
"Sea of Strengths" Model

Certain Strengths are Behaviourally Associated with Dyslexia – Note these do not need to be "Above Average"

Construction	Art
Music	I.T
Drama	Sport
Maths	Drawing
Oratory	Perception and Intuition
Design	Story Telling

How to Diagnose

Reading Language Model (Spectrum)



How to Diagnose

Something to think about……..

Standardized numerical data should always be interpreted in the context of the clinical setting in which it was collected and should be generally interpreted only by the person who collected the data. Isolated test scores that are provided to non testing professionals are therefore usually of minimal value

How to Diagnose

Something to think about……..

Disorders of learning are now considered to be a strictly clinical diagnosis. This means that the patient's history, clinical performance and the practitioner's clinical skills are the essential components that contribute to the conclusions drawn. The type of tests used and the standardized information that such tests provide are of less value

How to Diagnose

Something to think about……..

The purpose of engaging a professional is to obtain that person's professional diagnostic and prognostic opinion. It is unusual and even dangerous for another professional to draw conclusions based on their interpretation of isolated numerical data gathered during a clinical process to which they have not been privy.

How to Diagnose

Something to think about……..

It is vital that the testing professional's interpretations and conclusions accurately reflect the overall profile that that individual scores help to make up.

Treatment And Management

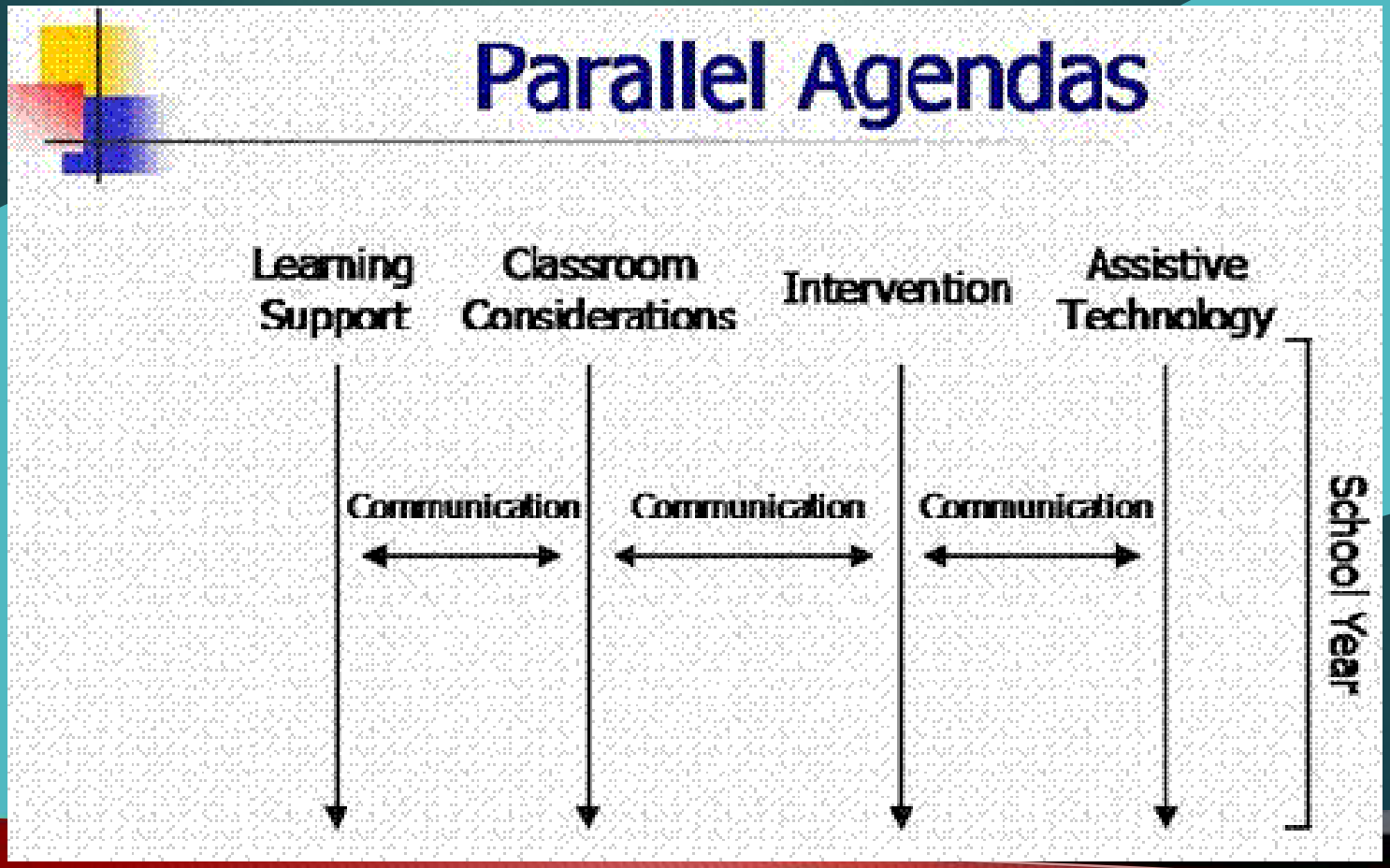
Treatment and Management

Who?

How?

- The Classroom and or learning Support Teacher
- Interventionalist (literacy Intervention)
- Assistive Technology Specialist

Treatment and Management



Classroom Teacher

Special Considerations:

The basic and essential premise of Special Consideration is the concept of **'Empathetic Insight'**. The hope is that a proper level of insight into the child's difficulty will lead to an empathetic based policy that governs how the child will be managed in the classroom. It is a way of painting a series of 'do's' and 'don'ts' around the child in order to give him a profitable school day academically and a safe day in relation to mental health.

6 Key Areas of Special Consideration should be investigated:

"Level The Academic Playing Field"

"By-Pass The Problem"

"Navigate Not Remediate"

'Put Do's and Don'ts around the Child'

- Academic and Scholastic (This further breaks down to Classroom work and Homework)
- Tests and Reporting
- Mental Health
- Learning Support
- Home Agendas
- Peer Group

Specialist's Intervention

Commercial or Customized

Evidenced based

Efficacy (5 Levels)

Research suggests that the most important factor in the management of Dyslexia is the quality of the human instruction. It is important to have state of the art resources and of course the child must be willing. However, above all of this is the vitally important issue of ongoing high quality instruction from a dedicated and experienced specialist.

Treatment and Management

Who?

How?

Intervention
Two Broad Approaches

Prefabricated (On the Market) Programs:
(Barton, Hickey, Wilson, Alpha and Omega, The Sound Way, Reading Horizons, Lindamood (etc)

Eclectic Yet Prescriptive:
Individualised (customized) programs that progress on the principle of Response to Intervention (RTI)

Prefabricated (On the Market) Programs

Could be Administered by Teachers or Schools

The following points are a guide when considering which program is best

1. ***Cost:*** This includes cost of resources to be delivered to the school. Cost of ongoing updates. Teacher training costs.
2. ***Teacher Training Time***
3. ***Lesson Preparation Time***
4. ***Accessible Human Support for Technical and Pedagogical Troubleshooting***
5. ***Suitability for Students Relative to Age and Degree of Problem***
6. ***Suitability to Wider Group***
7. ***Potential Use in Future Years***

Eclectic Yet Prescriptive

Individualised (customized) programs that progress on the principle of Response to Intervention (RTI)

1. Schools use RTI to establish that a child has a legitimate disability (Dyslexia) and not merely a delay or difficulty

In Other Words:
Commence Intervention
Not Testing

Eclectic

2. Ed. Specialists use it (RTI) as a measuring tool that not only provides feedback on student progress but helps inform instruction on an ongoing basis

Remember we teach children NOT programs

Eight Evidenced Based Principles

1. Multisensory
2. Alphabetic and Graphophonemic
3. Direct, Explicit, Repetitive, Drill-like Instruction
4. One on One
5. High Intensity, High Frequency, Moderate Duration
6. Systematic and Cumulative
7. Goal Driven
8. Response to Intervention (RTI)

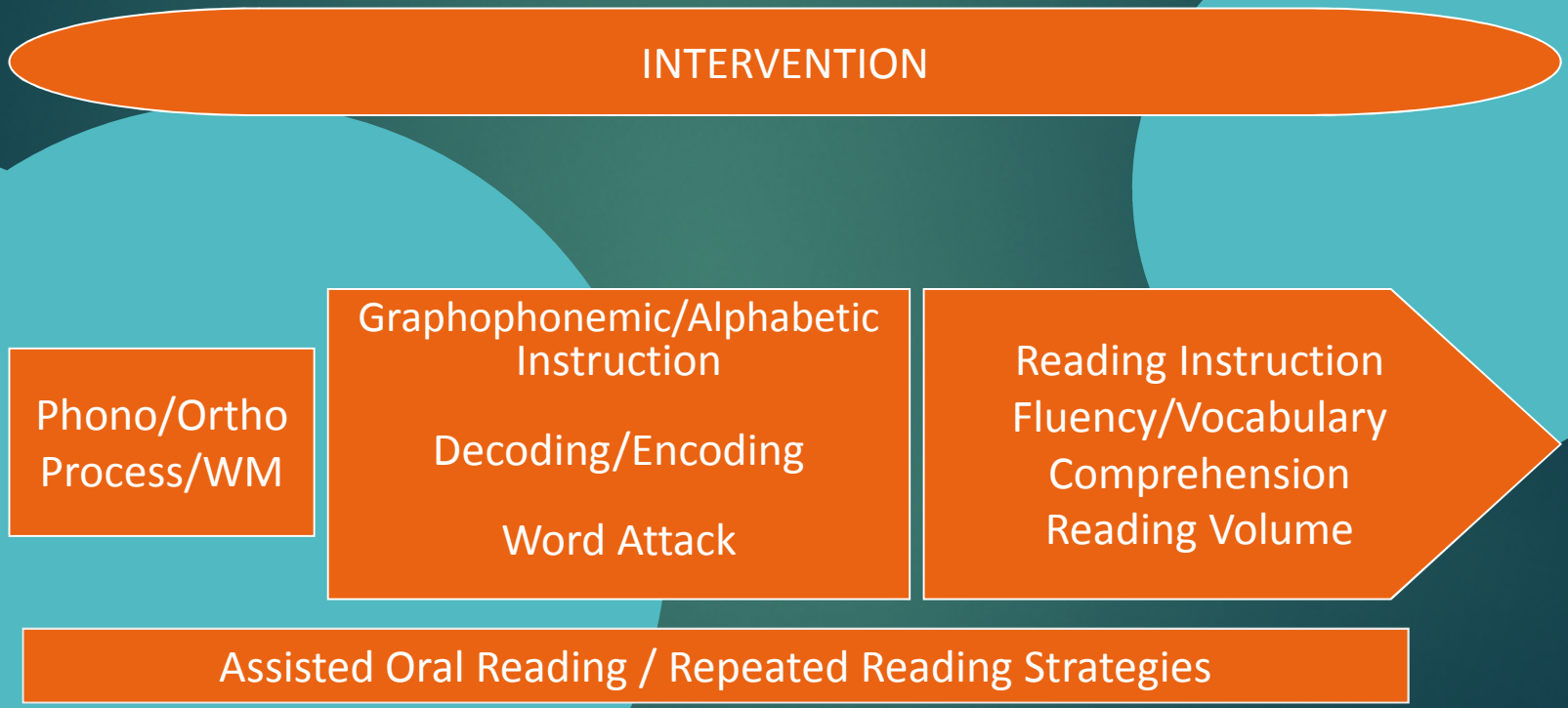
Three Treatment Models

Multi Stage Model

Multi Plan Model

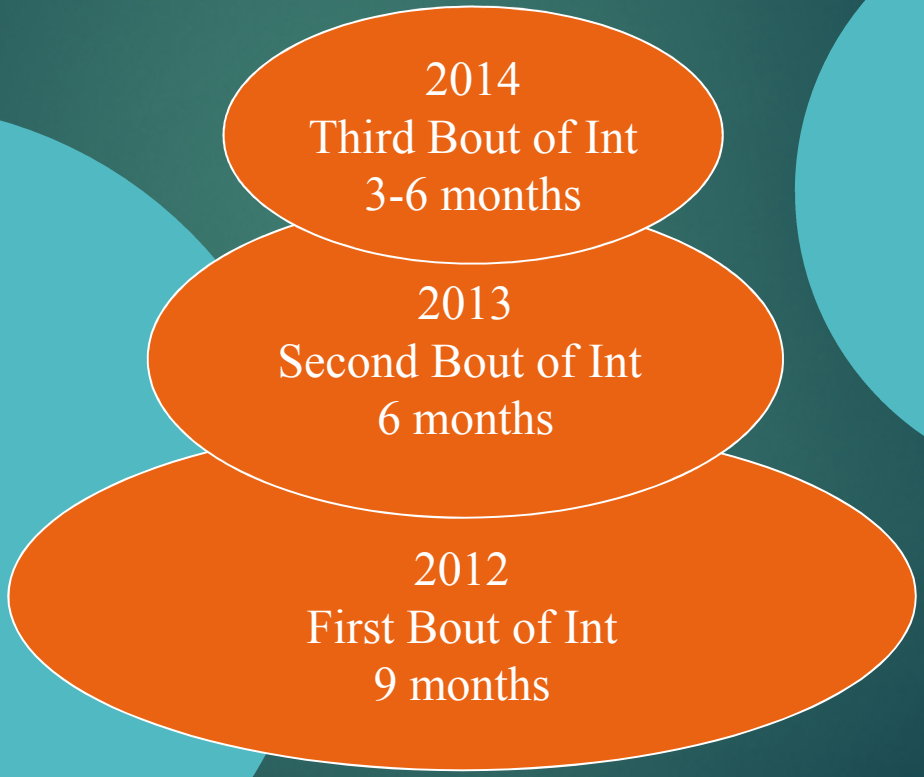
Multi Test Model

Multi-Stage Model

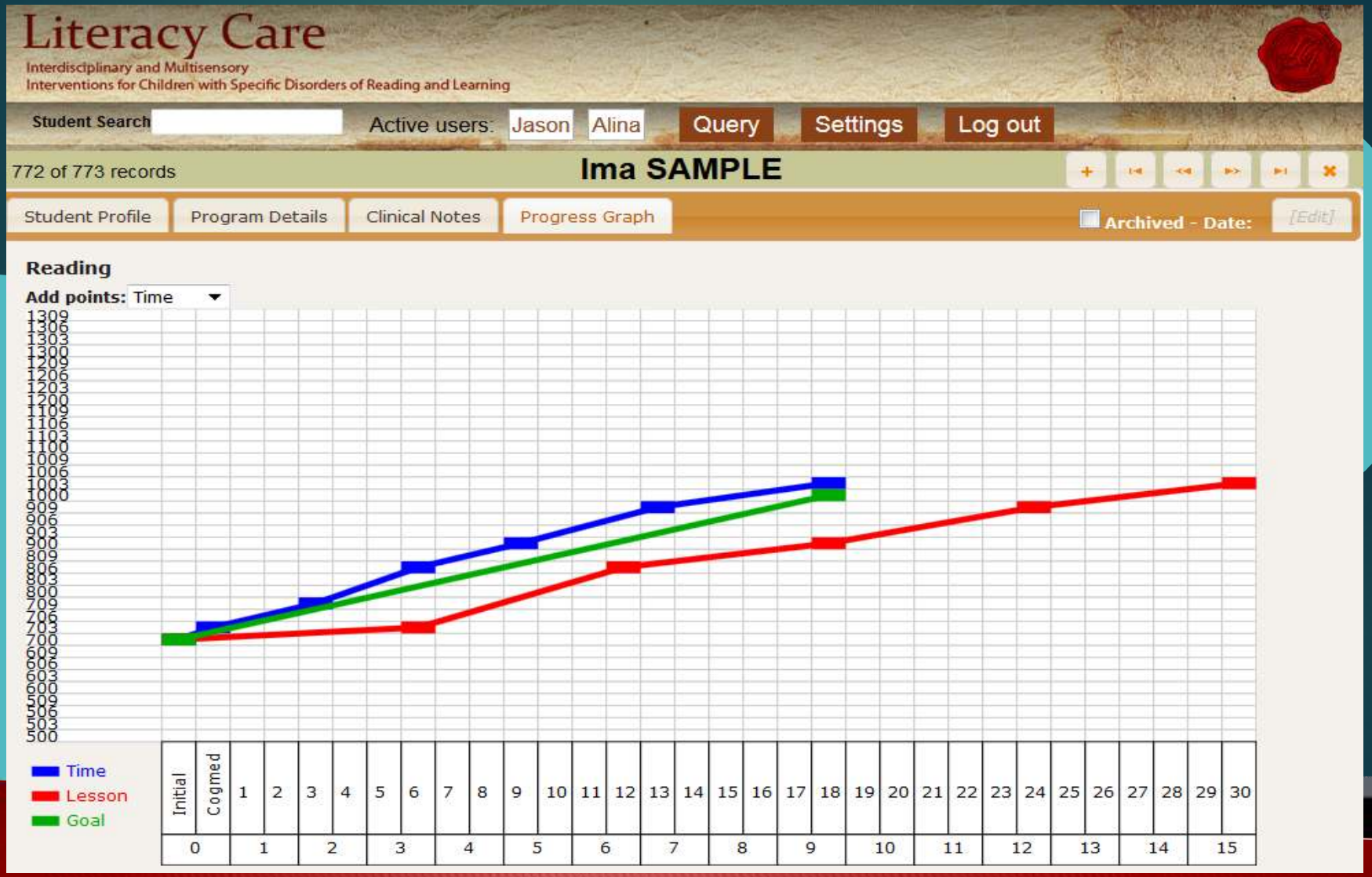


Multi-Plan Model

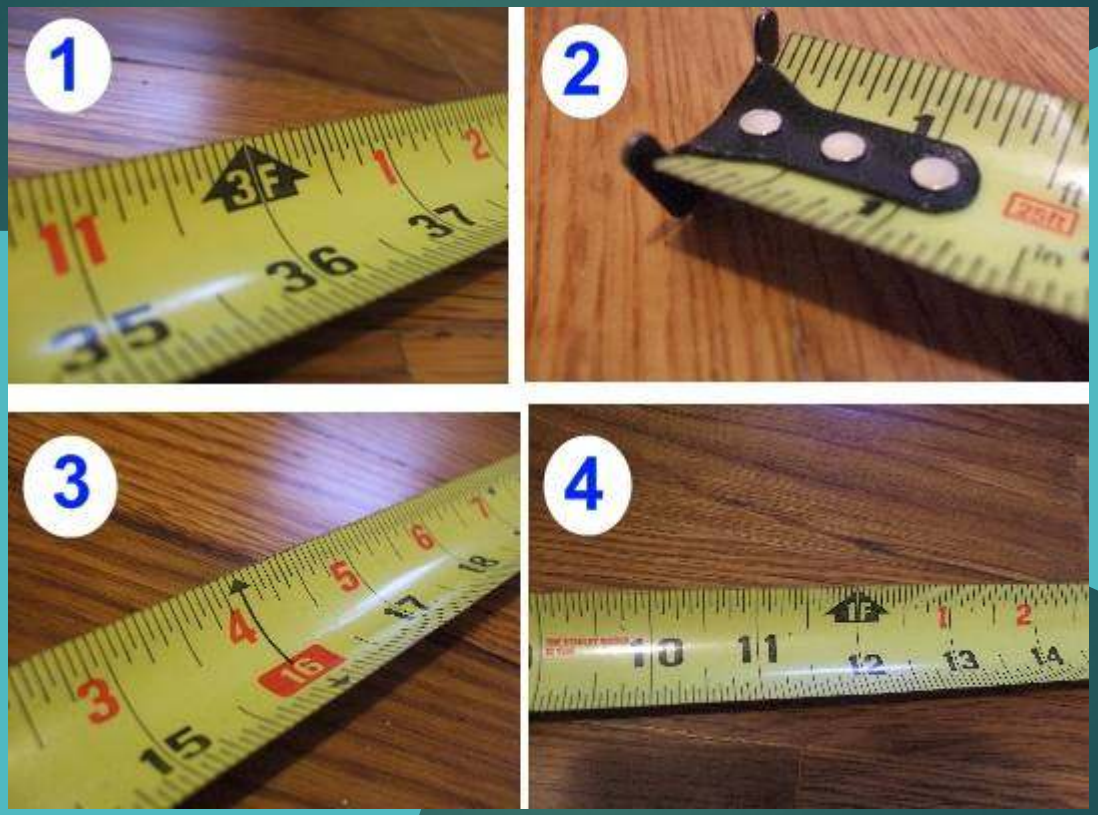
Plans or 'Bouts' of Intervention



Multi-Test Model



Treatment / Management
How to Measure Efficacy



Treatment and Management

Program Efficacy

- Educational interventions should be subject to the same level of scrutiny and there should be the same requirement to prove the efficacy of educational interventions as there is for medical treatments. They are too important not to require this.
- So how do I evaluate a treatment?

Treatment and Management

Program Efficacy-Levels

- *Level 1.* Follows current theory and research. Treatment efficacy is supported by randomised control trials (RCTs). Example: Hatcher, Hulme & Ellis (1994).

- *Level 2.* Follows current theory and research but not supported by fully RCTs. Example: Wright (*in prep*).

Treatment and Management

Program Efficacy-Levels

- *Level 3.* Follows current theory and research. Supported by little or no empirical evidence. Example: THRASS.

- *Level 4.* Makes no conceptual sense in terms of current research and may claim empirical evidence for efficacy.
Example: FastforWord, Cellfield, DORE, Reading Recovery

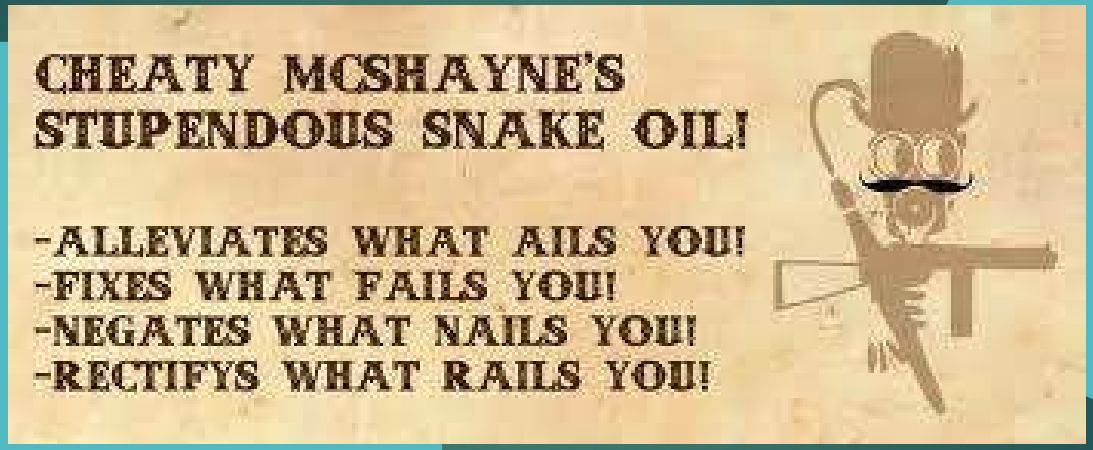
Treatment and Management

Program Efficacy-Levels

- *Level 5*. Based on assumptions counter to substantial scientific evidence. Any data on efficacy should be viewed with considerable skepticism.

  Example: behavioural optometry.

Controversial Therapies



Controversial Therapies

- **Process-focused therapies** are based on the theory that what underlies a given learning disorder is a deficit in a simple sensory or motor process. (Eg: If you learn to crawl again balance better etc, you will then read better)

- **Performance-based therapies** targets symptoms directly and treats them. For example, performance-based therapies for dyslexia would provide instruction and guided practice in reading itself.

Controversial Therapies Process-Focussed Therapies

It is easier to provide evidence of effectiveness for performance-based therapies than it is for those that are process-focused.

Controversial Therapies
Process Focussed Therapies

Controversial, *process-focused therapies* for learning disorders (including dyslexia) have a common logic: they claim that:

- … a disorder in some higher aspect of cognition, such as reading, language, attention or social cognition, is caused by a lower-level deficit in a modality of perception (auditory, tactile, or visual); or in some aspect of motor skill;

Controversial Therapies Process Focussed Therapies

- that the lower-level deficit is present in children with the learning disorder
- that the lower-level deficit can be remediated with practice because of brain plasticity
- that fixing the lower-level deficit transfers and thus improves the deficit in higher cognition.

Controversial Therapies Process Focussed Therapies

- Training in a particular skill rarely transfers to other skills.

Be wary of prefixes such as ‘neuro’

Controversial Therapies
Performance Focussed Therapies

- By definition, a *performance-based therapy* is:
  - Theoretically plausible
  - Directly associated with the problem
  - Training effect demonstrates transferability

Controversial Therapies
Process Focussed Therapies

The following groups of therapies have not passed the empirical tests. They should not be used to treat children.

- Speed of word processing interventions
- Vision efficiency interventions (Vision Therapy)
- Exercise-based interventions
- Food-based

Controversial Therapies
Process Focussed Therapies

- The further away the proposed cause is from reading itself, the more skeptical you should be. So, a new theory that says the cause of dyslexia is — say — in the balance system of the brain, is much less plausible than the established theory that dyslexia is caused by a problem in the phonological aspect of language development.

Controversial Therapies What To Avoid

- DORE
- Kinesiology
- Behavioural Optometry
- Sensory Motor Based Programs
- Computer Programs that claim to be remedial
- Physical Exercise Based Programs
- Special Diets

Case Study – Typical Dyslexia

Ben Eleven 11 yrs

Good things

- IQ 110 (high Average)
- Good at art, drama, drawing, maths and music
- No wider developmental problems
- Average expressive and receptive language skills
- Clear sound production skills

Worries

- Working memory problems
- Reading age 7 yrs
- Spelling age 6 yrs 6 months
- Reading rate 6 yrs
- Oral literal comprehension 7 yrs
- Limited writing skills

Literacy Profile

Phonological Profile…..

- Phonological Awareness — Low Average
- Phonological Memory — Low Average
- Auto. Rapid naming Skills — Average

Literacy Profile –Orthographic Profile

Composite Area	WBA	BA	A	AA	WAA
VV/VCe	X				
Letter Order		X			
Homographs		X			
CK/K/Ke	X				
Sem/Asem	X				
Perceptual			X		
Eidetic Memory	X				

Diagnosis

- Orthophonological (but Orthographically Dominant) Reading Disability

Remember

- Practice the ‘thing’ you wish to be better at
- Reading is a taught skill not a biological Awakening
- Working Memory Can be trained
- The single greatest factor in the recovery of a child’s literacy is the quality of the human instruction
- Teach children NOT programs
- Empathetic insight is as necessary as excellent Instruction

Working Memory

Introduction

- What is it?
- Why is it Important
- How to Manage

What is Memory?

How Many Terms Are There?

How Does Your List Compare?

Auditory
Episodic
Explicit
Implicit
Long Term
Rote
Semantic
Sensory

Short Term
State Dependent
Visual
Eidetic
Working
Image
Photographic
Really Bad

The Memory Process

- Memory is a highly complex process involving multiple components working simultaneously.
- Our description of isolated components is only a representation because in reality our brains process information in an integrated fashion.

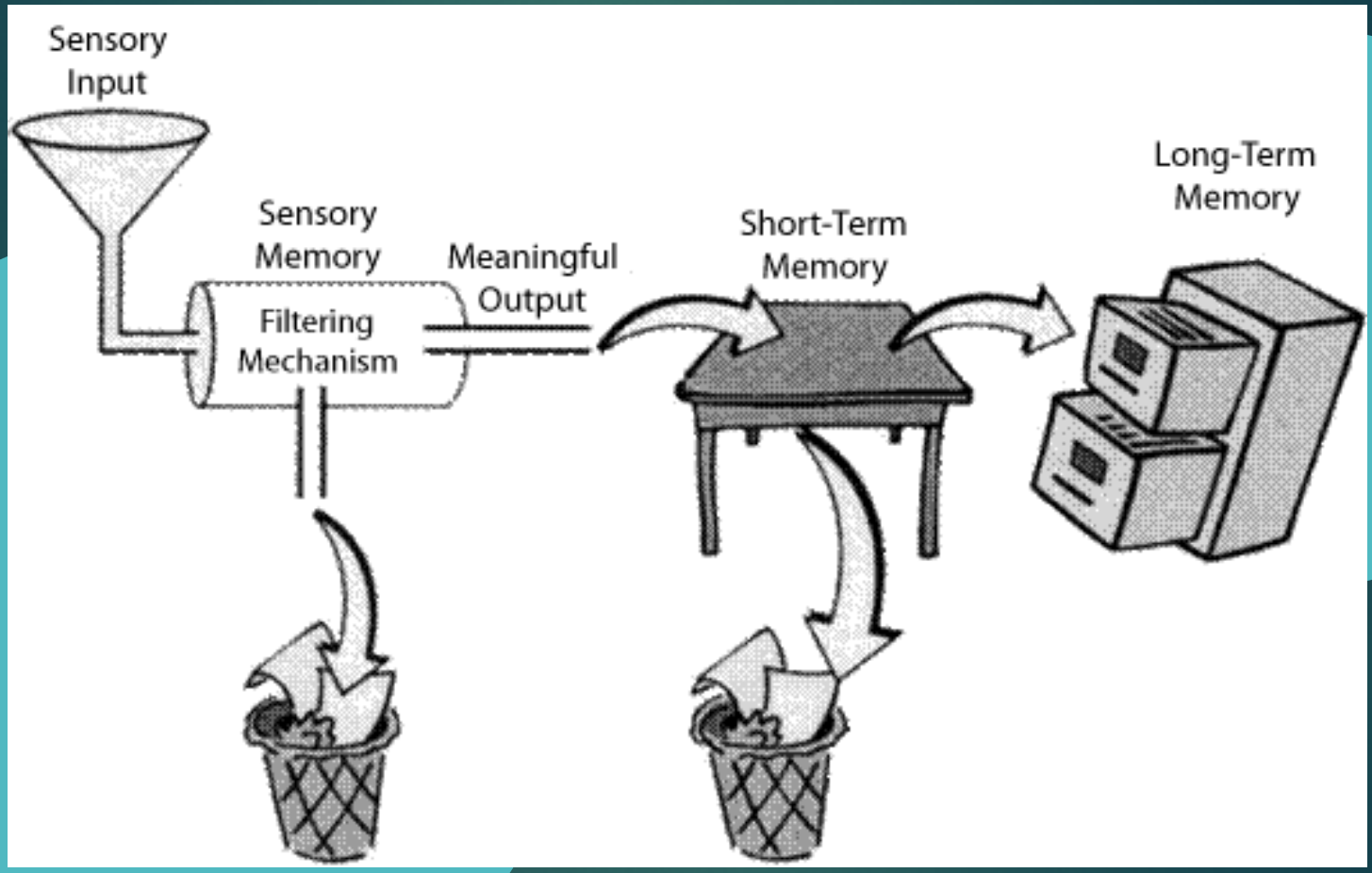
The Memory Process … Cont'd

- Everything begins as sensory input from our environment. Using our sensory systems, we see, taste, hear, or feel a sensation or experience a stimuli
- We have a mechanism to filter out and discard irrelevant or unnecessary data, such as the feel of the carpet as we walk or the sound of the air conditioner.

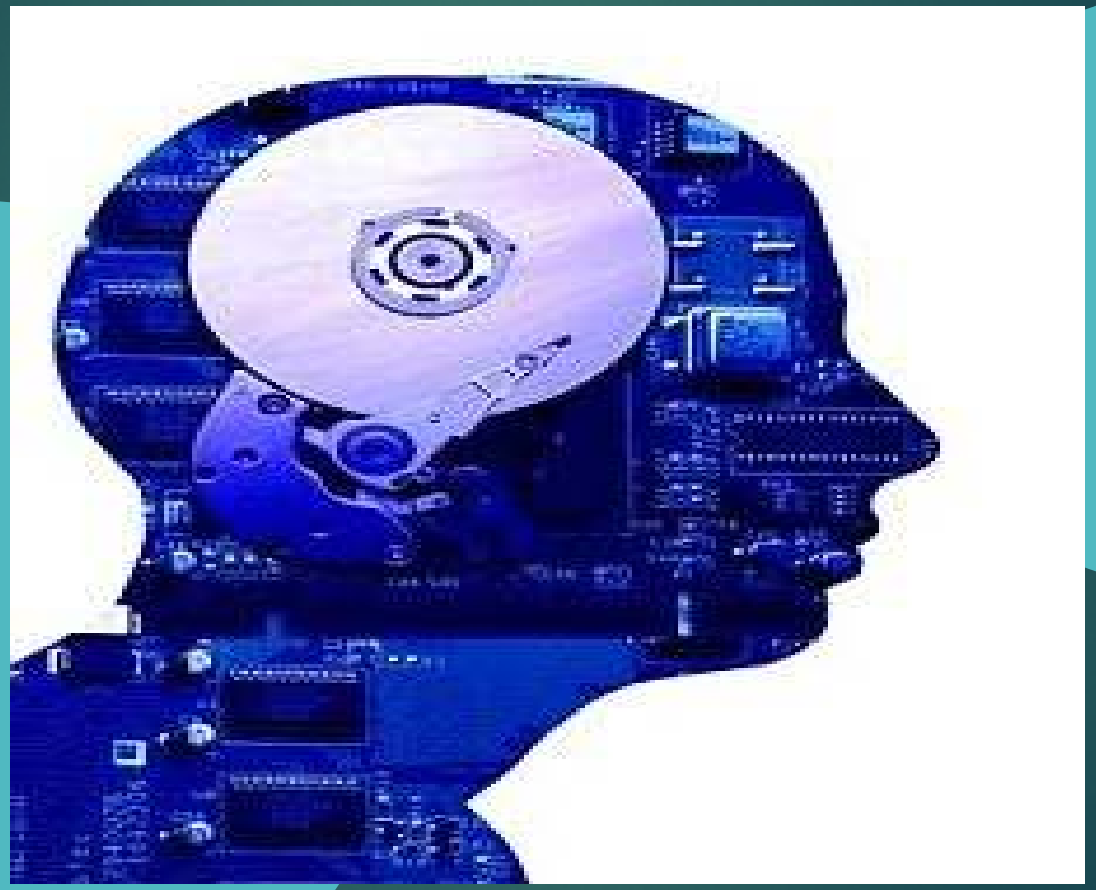
The Memory Process … Cont'd

- This same filtering mechanism organizes relevant data into meaningful patterns.
- In figure 1, the funnel and the filter represent these processes: sensory input and sensory (Working) memory.

Memory Process Schema



Computer Analogy



Computer Analogy

Computer = Mind?

- Computers take a symbolic input, recode it, make decisions about the recoded input, make new expressions from it, store some or all of the input, and give back a symbolic output. (Lachman, 1979)

Compare the above quote with the way the human mind operates:

- Humans code information, remember it, make decisions based upon it, change their internal levels of knowledge and turn all this into a behavioural output.*(Pennington, 2002)*

Computer Analogy

- The computer analogy is a useful one but it can only be carried so far. Computers are electro-mechanical devices whose operation is entirely predictable.
- Any information stored on a computer can be transferred to any other computer with relative ease. Can the same be said of human knowledge?
- Humans are self-aware and conscious, how does this compare with computers?

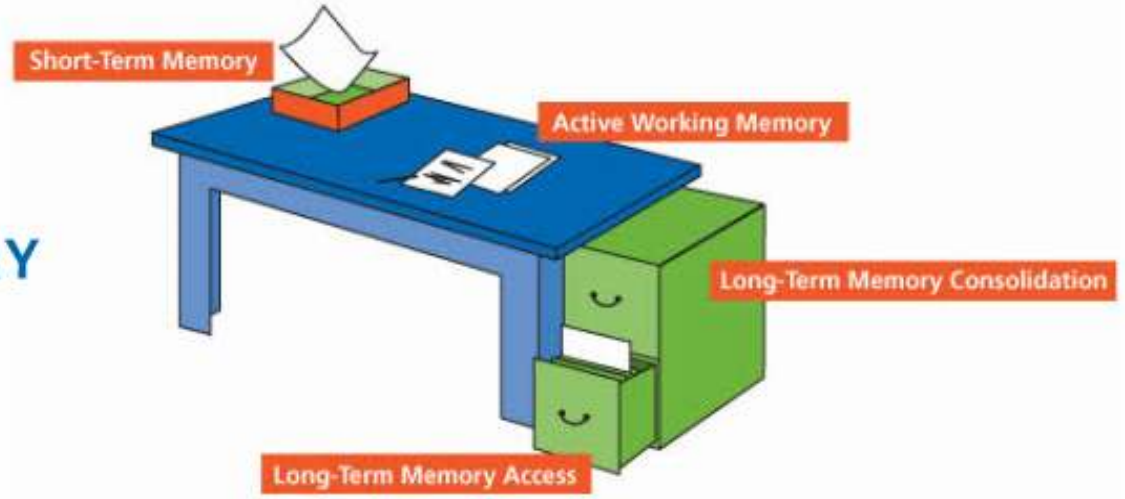
Three Main Terms

- Long (and Archival)
- Short
- Working and or Active

Memory: What is Memory?

All Kinds of Minds®

MEMORY



Long Term Memory

LTM

- Permanent Storehouse
- A system for permanently storing, managing, and retrieving information for later and ongoing use. Items of information stored as long-term memory may be available for a lifetime.
- Information which has been registered, encoded, rehearsed, and stored for future retrieval; Material and information retained in LTM underlies cognitive abilities.

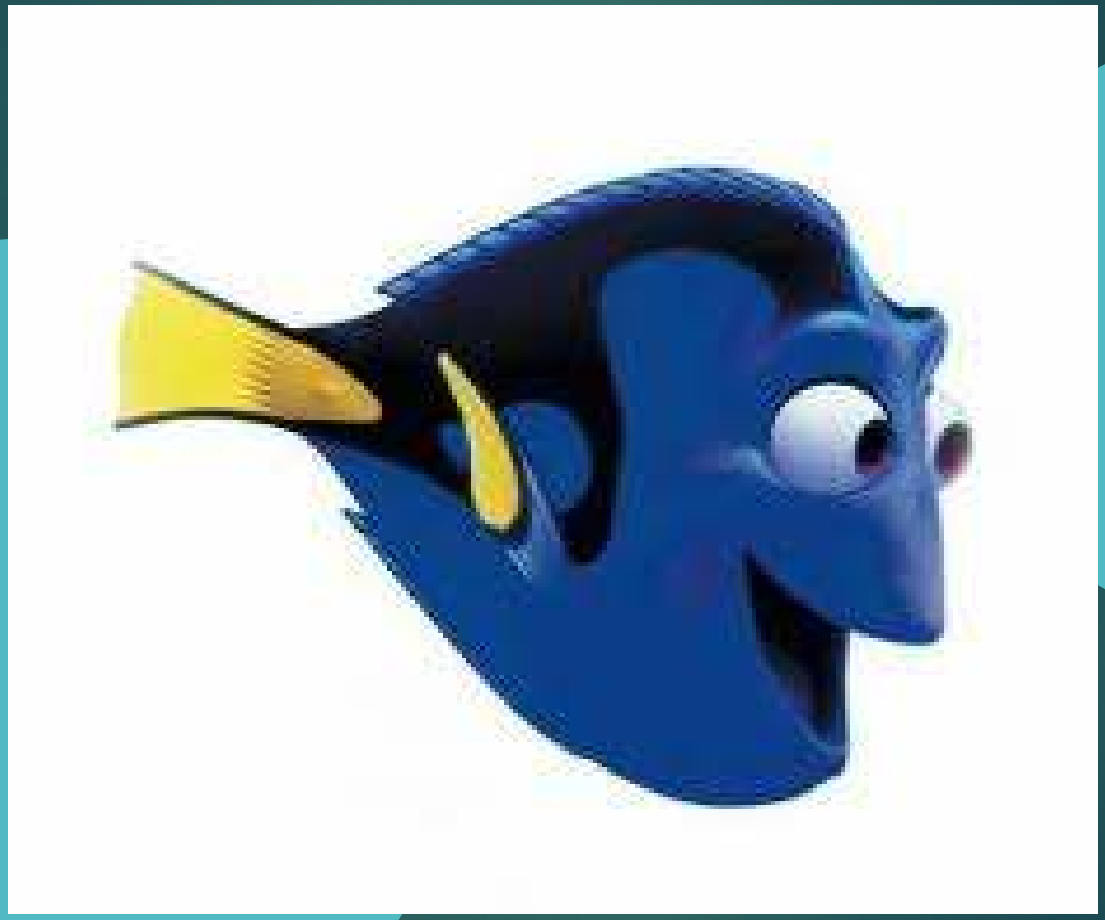
Associated Learning Problem with LTM

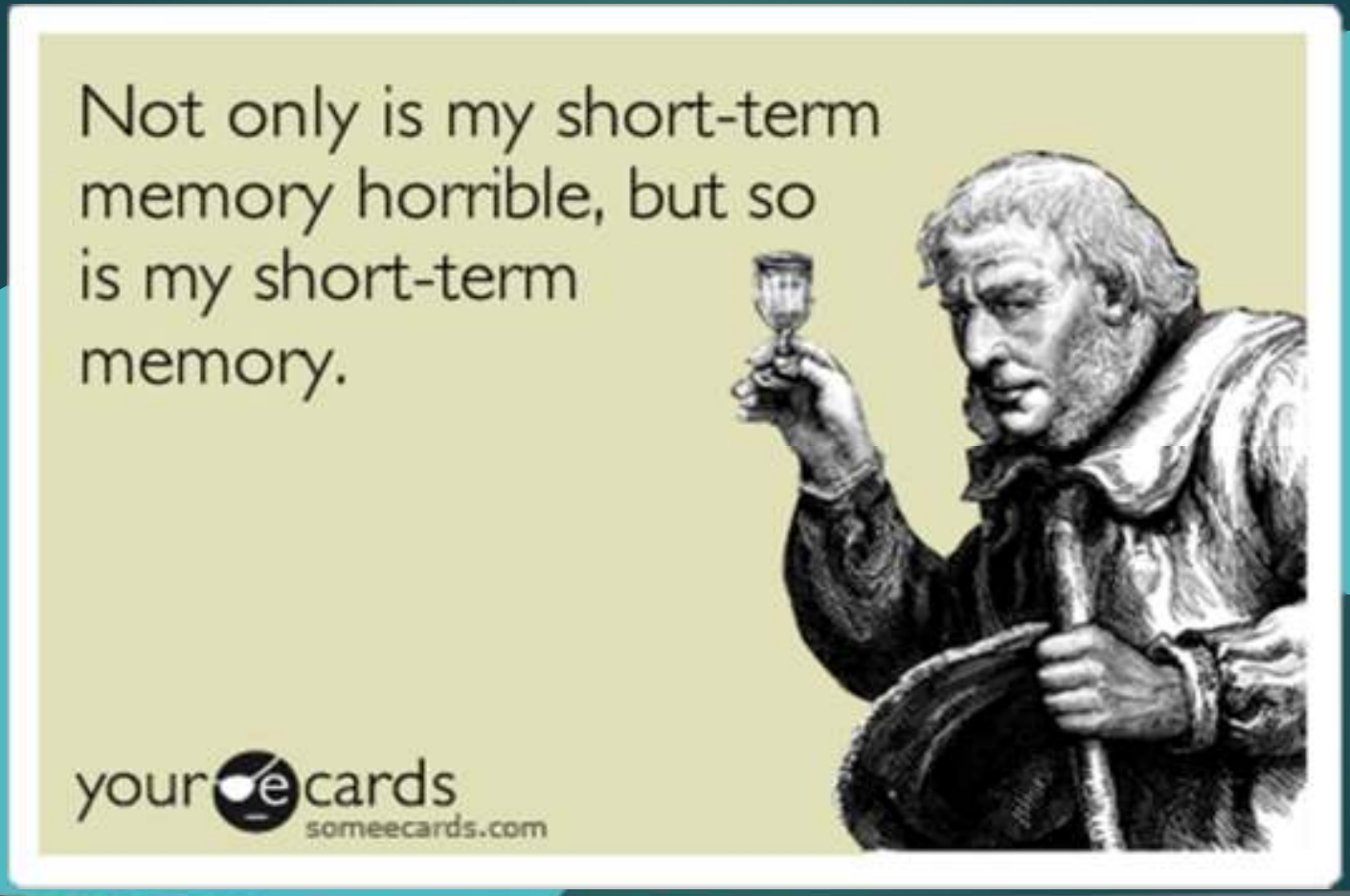
"Black Hole" Brain

A Real (but not serious) Term

- Loss of Knowledge and/or Skill despite Rehearsal
- Inability to Access Knowledge
- Are these the "Treatment Resistors"

Short Term Memory




Not only is my short-term memory horrible, but so is my short-term memory.
yourecards
someecards.com

STM

- Temporary Storehouse
- Small amounts of information in an active, readily available state for a short period of time
- Not stored because of Rehearsal or Association
- Only for seconds or small amount of minutes (debatable). Estimates of short-term memory capacity limits vary from about 4 to about 9 items

Associated Learning Problems with STM

- Disorganization
- Dis-prioritization (aware of what needs doing but can't stay on track)
- Procrastination

All these can be evident in the context of otherwise normal intellect and behaviour

Working Memory

WM

- Manipulation of Presently Active Information
- Receive and Use or Receive and Lose
  (What are my senses telling me?)
- A Form of Multi-Tasking Without Prioritizing

Working Memory – 5 Purposes

1. Holding an Idea in mind while developing, elaborating, clarifying or using it

2. Recalling information from long term memory while holding related information in short term memory

Working Memory – 5 Purposes … Cont'd

3. Holding the components of a task together in memory while completing the task

4. Keeping a series of pieces of information together so that they remain meaningful

Working Memory – 5 Purposes … Cont'd

5. Holding a long term plan while thinking about a short term need – Starting with the End in Mind

- Which ball is the most important?

Associated Problemswith WM

- Inattention
- Distractibility
- Impulsiveness
- Immediate Forgetfulness
- Excess Movement (an attempt to stay alert)
- Fatigue
- Sense of Being Overwhelmed or Overloaded
- Frustration
- Anxiety

Sub Systems of WM

1. Phonological Loop
2. Visual-Spatial Sketchpad
3. Central Executive

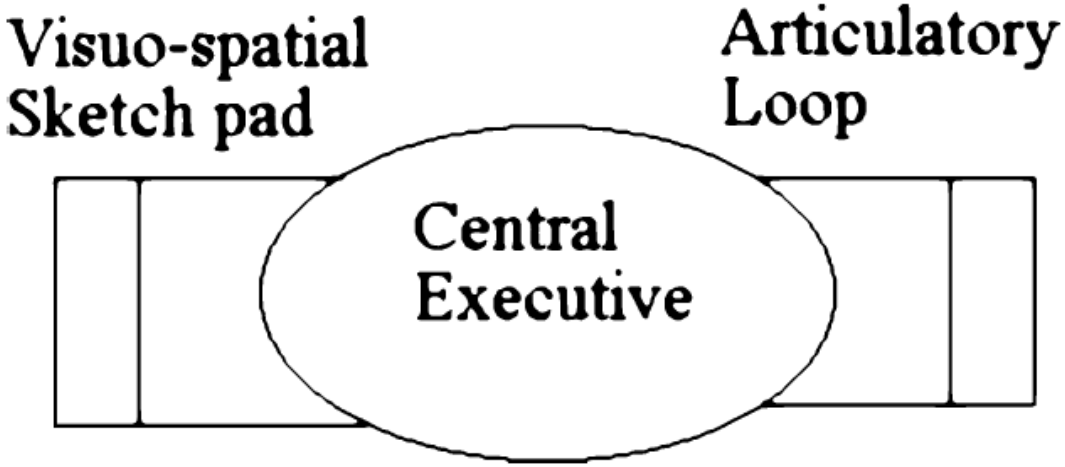


Fig. 1 Baddeley & Hitch's (1974) working memory model.

Phonological Loop

- Phonological memory refers to coding information phonologically in working memory for temporary storage in short-term memory. When you attempt to remember a phone number you have looked up, as you make your way to the phone, you are storing the number temporarily in working memory. You probably do so not by storing a visual representation of the sequence of digits (although you may be able to do this if you try), but rather by storing a phonological representation of the sounds of the digit names.

Phonological Loop ...Cont'd

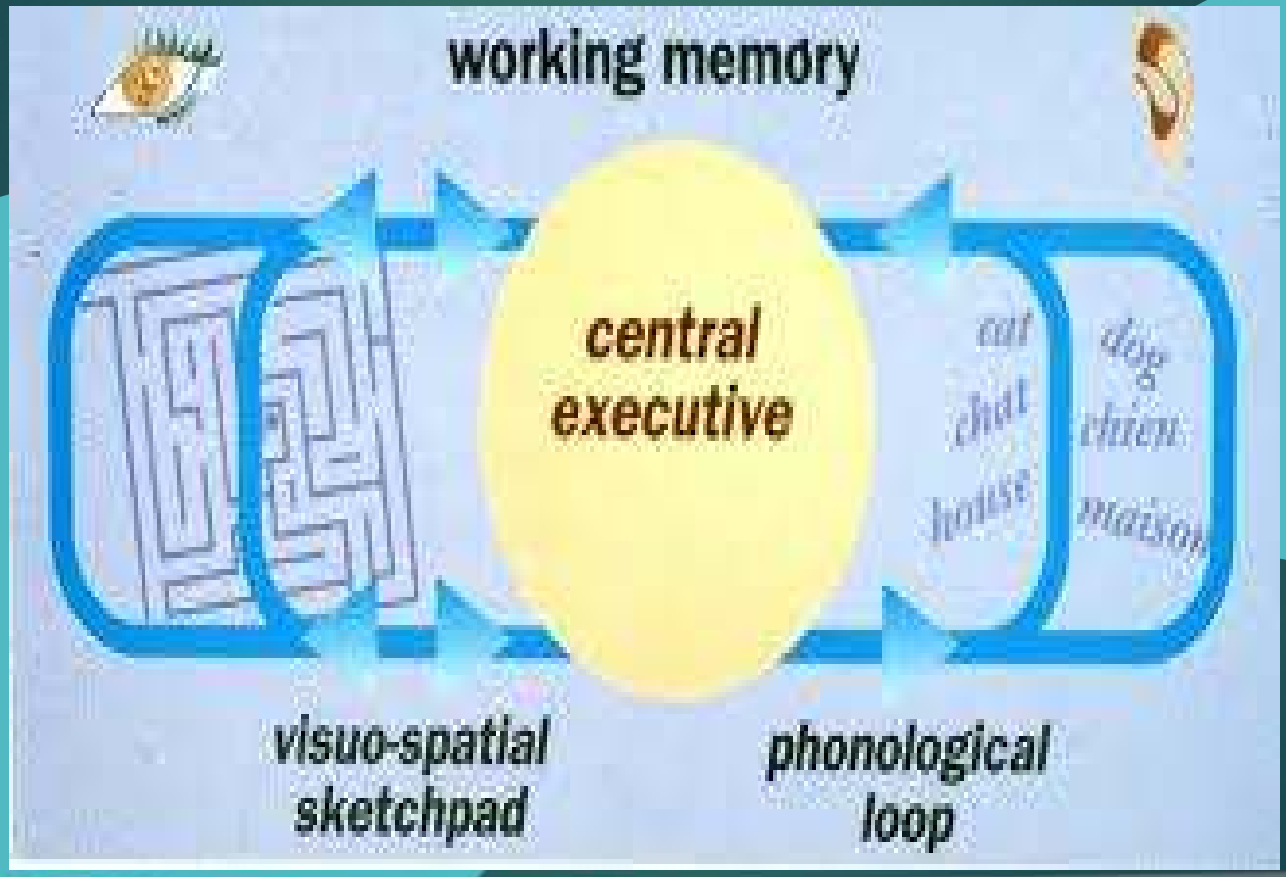
- It is the part of memory most involved in storing, phonological information. The phonological loop provides a brief, verbatim storage of auditory information (Baddeley, 1986, 1992; Torgesen, 1996). The phonological loop consists of two parts working together. The first is a phonological store, which can be thought of as a tape recording loop that retains the most recent 2 seconds worth of auditory information that has been recorded. The second is an articulatory control process that provides input to the phonological loop initially and also can refresh information already in the loop so that it can be stored for longer than 2 seconds.

Visual Spatial Sketchpad

A parallel system akin to an artist's sketchbook for stimuli that cannot be verbalized, such as spatial information.

Central Executive

A system responsible for supervisory attentional control and cognitive processing. This last system, though poorly defined, is most alluring because it represents the very stuff of thought.


working memory
central executive
visuo-spatial sketchpad
phonological loop
cat
chat
house
dog
chien
maison

Why is WM Important?

Students who struggle to learn academically will almost certainly have working memory difficulties

Problems are best defined in terms of **Capacity** and **Time**

The Theories of Capacity and Time Decay

Working Memory problems can be divided into:

1. Capacity – (The Neurological Scratchpad)

2. Time – one, four, what oh, nine oh I forgot.

How Long can you hold info while you work on it?

Capacity Decay

Neurological Scratchpad

The Post-it Note Analogy

How Big is Your Mental Scratchpad?

Time Decay

Time

Individual pieces of Information are presented too far apart

Example

- Instructions
- Sounds Within a Word – Resynthesis Problems

How To Manage

Teaching And Strategies

Teaching and Strategies

Working Memory Can be Trained/Improved

Phonological Processing

- Phonological Awareness
- Phonological Memory
- Automatic Rapid Naming

Orthographic Processing

- *Orthographic Choice*
- *Semantic (and sometimes asemantic) Whole Word Substitutions*
- *Perceptual Analysis*
- *Eidetic Memory*

Principles

- Algorythmic Repetition – One Step after another repeated (Drill-Like Repetition)

  1 2 3 – 1 2 3 – 1 2 3, 3 2 1, 3 1 2

- Cumulation - 1, 1-2, 1-2-3, 1-2-3-4

Almost everything that requires algorithmic repetition and cumulation will exercise working memory

- Overload and Adapt

a greater than normal stress or load on working memory is required for training adaptation to take place. What this means is that in order to improve the capacity of working memory we need to increase the workload accordingly

Example of Cumulation

2.1.4 CVC Words

"a" words

1	2	3	4	5	6	7
bad	dad	pad	had	sad	mad	lad
lab	dab	cab	nab	ham	jam	ram
Sam	bag	sag	tag	gag	pat	fat
sat	hat	mat	rat	cap	map	tap
lap	sap	ran	pan	can	fan	man

CCVCC Words

block	black	blend	blunt	blush	blank
flock	slack	spend	stunt	crush	flank
crock	crack	trend	grunt	flush	crank
stock	stack		brunt	slush	stank
chock	smack		shunt	plush	spank
knock	knack			brush	shank
frock	track				
brick	bridge	bright	bring	grant	chunk
flick	fridge	slight	sling	slant	flunk
quick		flight	sting	chant	drunk
slick	fresh	plight	string	plant	stunk
trick	flesh	fright	fling	scant	plunk
prick	thresh	knight	cling		trunk
click			bling		clunk
chick			swing		skunk

Brain Changes Through Cumulation & Rhyming

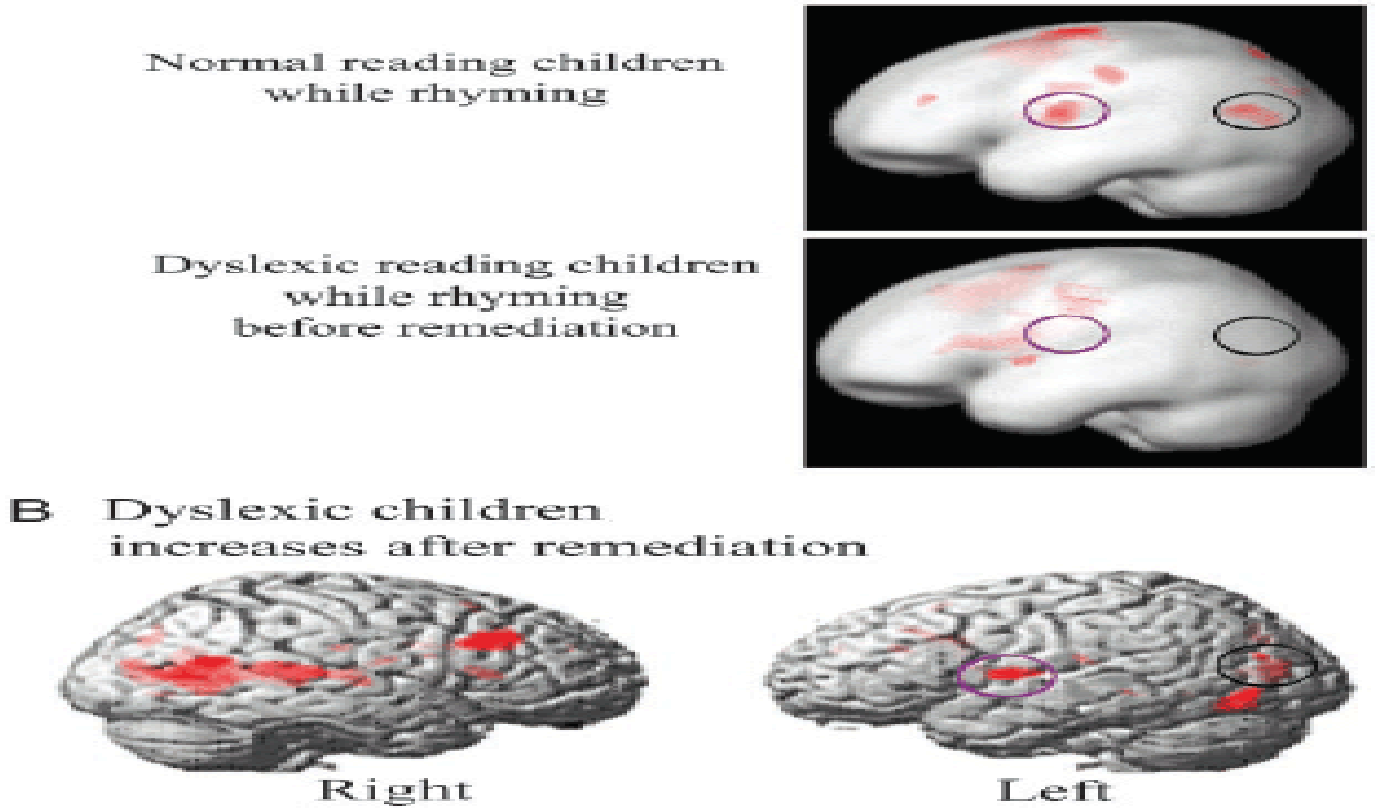


Fig. 1. Neural effects of remediation in children with developmental dyslexia. (*A*) Left hemisphere activations of control children and children with dyslexia are shown during rhyming (as compared with matching) letters ($P < 0.025$, 20-voxel threshold; ref. 12). (*B*) Brain areas that showed increased activity during phonological processing in the dyslexic group after remediation. Shown at $P < 0.01$, 20-voxel threshold. Black circles highlight left temporo-parietal region, which is disrupted in children with dyslexia and affected by remediation. Purple circles highlight the left frontal region that is active in control children and is affected by remediation in children with dyslexia.

Strategies (1:1) - DVD

- Sequential Repetition
- 3SW
- Tactile Elision Drill
- Coloured Arrows (Brain Skills Program)
- Automatic Rapid Naming
- 8 Step Cumulative Reading Drill
- Graphophonemic Rhythm
- Blending and Segmenting Words and Non-Words
- Phoneme Reversal
- Repeated Reading

Sequential Repetition

1 2 3 – 1 2 3 – 1 2 3, 3 2 1, 3 1 2

b m t

b m t

b m t

t m b

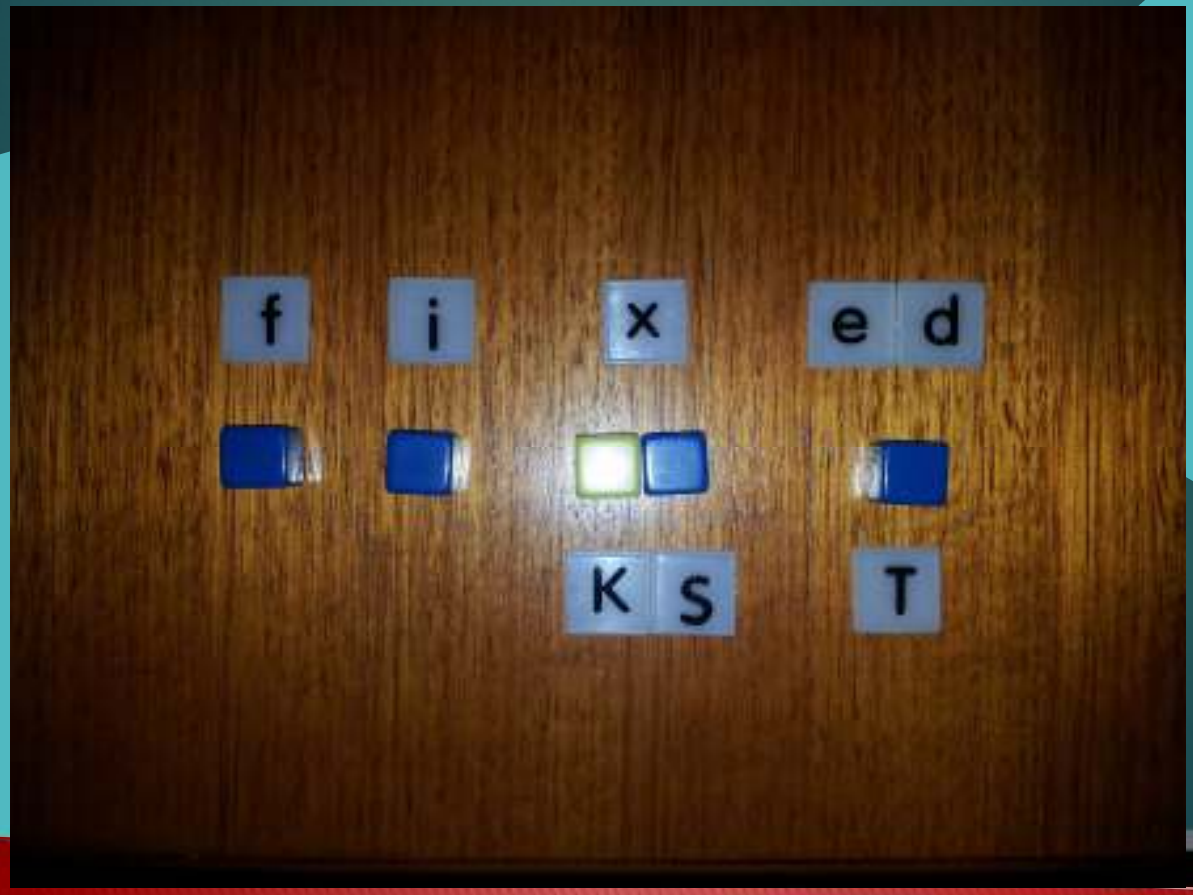
m b t

3SW

- Say
- Sound
- Spell
- Write

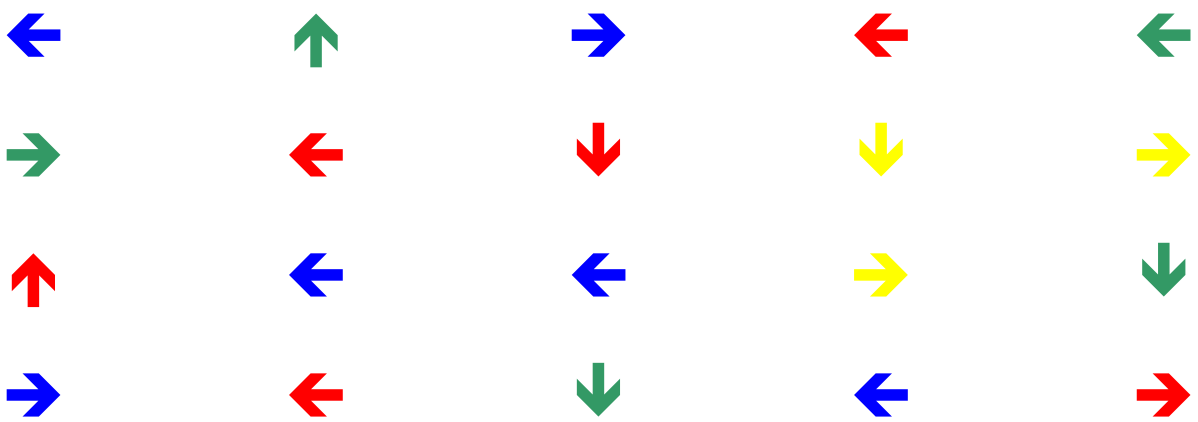
- Eg: Say ‘mat’ – oral step
- Sound out ‘mat’ – one sound at a time (oral step)
- Spell ‘mat’ – oral step
- Write down ‘mat’ – say letter names as you write

Tactile Elision Drill




f
i
S
T

Coloured Arrows



green	blue	red	yellow	black
blue	black	yellow	red	blue
yellow	green	yellow	red	red

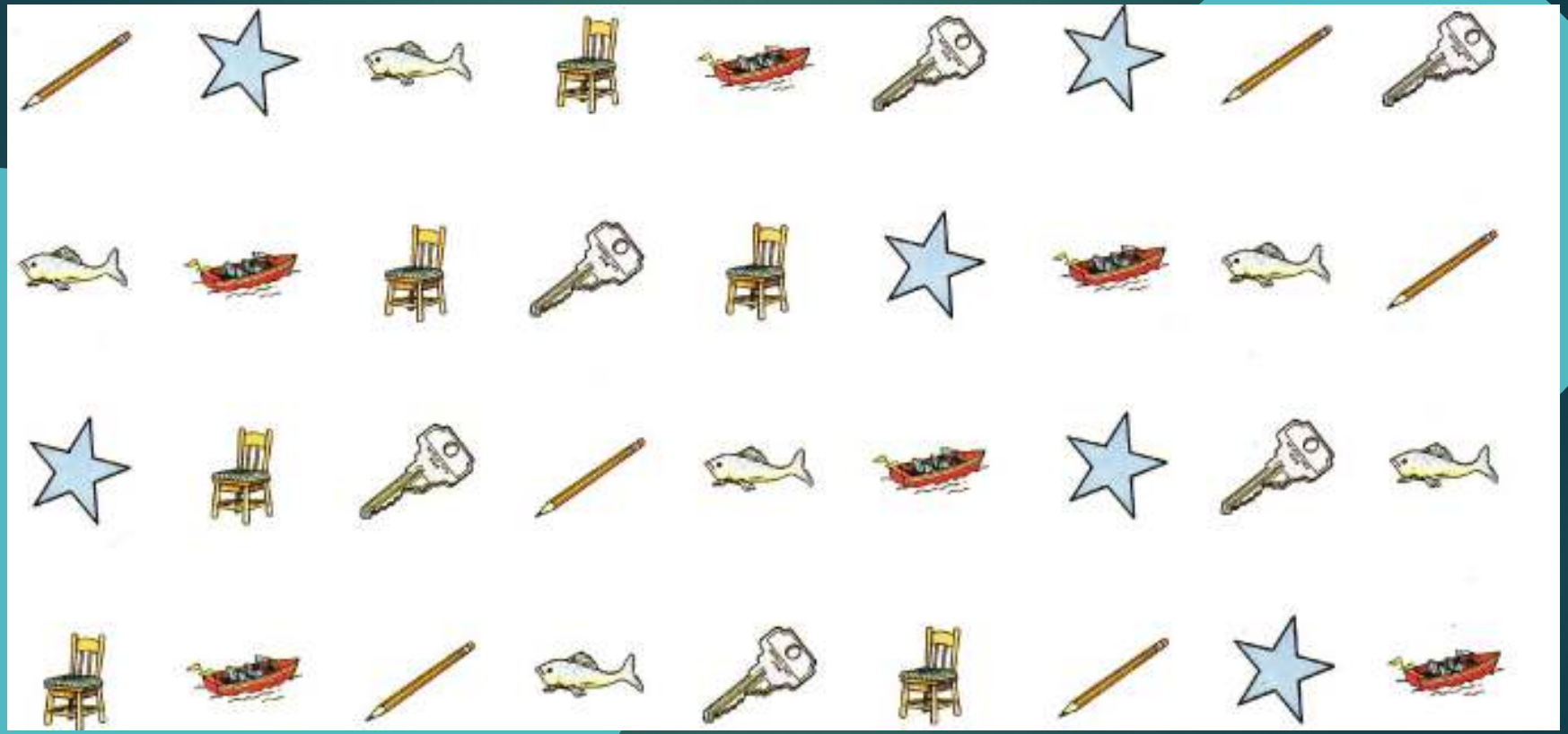
Automatic Rapid Digit Naming

2	9	4	6	3	8
4	9	6	8	3	2
9	2	8	3	9	3
3	4	2	4	9	8
2	8	9	2	8	3
4	6	3	9	2	9

Automatic Rapid Letter Naming

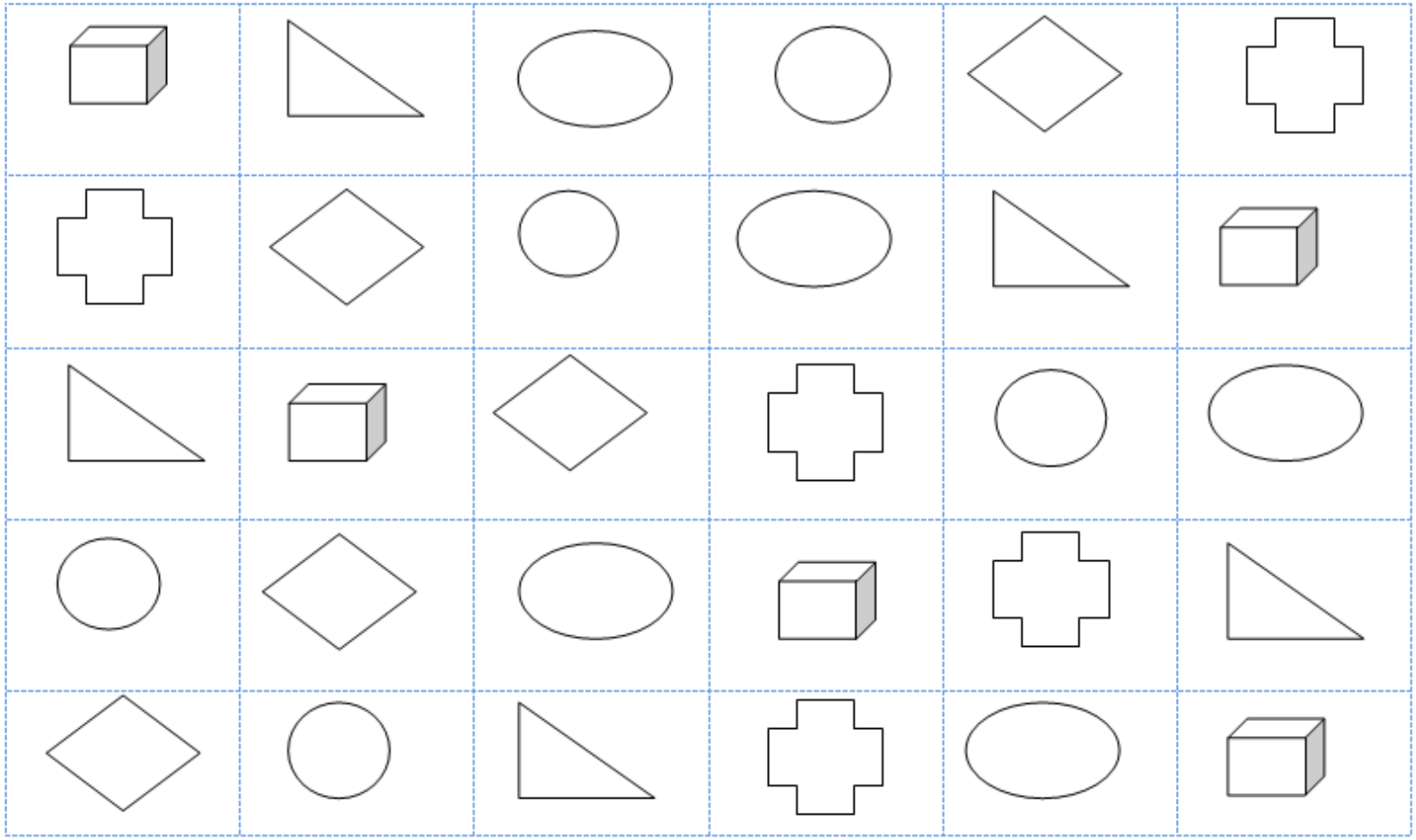
a	d	e	c	g	t
d	e	g	t	d	c
c	t	d	e	t	g
g	a	e	a	c	t
t	g	c	e	d	a
e	t	a	c	e	d

Automatic Rapid Object Naming



Automatic Rapid Shape Naming

Automatic Rapid Shape Naming



Automatic Rapid Naming Words

of	for	from	off	of	for
of	from	off	of	for	from
off	for	of	for	from	off
from	of	for	from	off	of
for	off	from	of	for	from
of	for	from	off	of	from

Automatic Rapid Naming HFW

a	I	at	as	do	go
he	in	is	it	if	Mr
my	no	me	of	oh!	on
so	up	we	to	be	and
all	ask	are	can	car	big
but	dad	for	day	did	get

Graphophonemic Rhythm 60 bpm

3 in 3	4 in 5	4 in 6	5 in 7	7 in 7
W L R	M / D H N	X G / F / U	Q /E T Y/ G	W P N F Y H R
P G K	K O S / L	R / L U/ H	A /K /V R C	
D J B	A B / F X	O / P /K G	F D /S / W L	

Blending Words and Non Words

What word do these sounds make?

Mum – ble	**Mumble**	**Ch – a – b - o**	**chabo**
scr – a - p	Scrap	c – l – igh - t	clight
s – p – l – a - sh	Splash	b – a – s - p	basp

Segmenting Words and Non Words

Sound out these words one sound at a time

feast	**f – ee – s - t**	**shap**	**sh – a – p**
loaves	l – o – v – z	biffoo	b – i – f – oo
later	l – ay – t – a	mivep	m – i – v – e - p
baboon	b – a – b – oo - n	cobed	k – o – b – d

Phoneme Reversal

- Say tã (as in tap). Now say tã backwards
- Say oot (as in boot). Now say oot backwards.
- Say noops (as in loops). Now say nööps backwards
- Say zmitmus (as in mite-must). Now say zmitmus backwards.

Repeated Reading

Four Steps Over Four Sections of Text

1. Model
2. Choral
3. Individual
4. Cumulative

Programs

- Brain Skills
- PACE
- GREAT LEAPS
- Cogmed

Cogmed WM Development Program

- Evidenced Based – Significant Research
- Computer Software (Not Assistive but Interventional)
- Controlled Intensity, Frequency and Duration
- 5 X 45 mins per week for 5 weeks (25 sessions)

Cogmed Continued

- Results under 'normal' conditions peak at 6 months post program
- Results after scholastic intervention can be noticed within 6 weeks
- An index improvement of 15 equals one SD away from the norm

Cogmed Outcomes (Documented)

Functional Changes

- Emotional Control
- Time Management
- Following Directions
- Settled Behaviour
- A Sense of Engagement with Learning

Academic Changes

- Higher Work Volume
- Neater Work
- Processing Speed Increases
- Faster Response to Intervention Practices

Treatment Resistors

1-2% of Learning Disabled children will resist most forms of treatment and management

Not Your Fault and Certainly Not Their Fault

Take Away Messages

- There is a lot of research on WM – So become more educated
- WM can be trained – So learn how
- WM is essential in the remediation of Learning Disabled Children – so include it in your programs
- WM is not everything. Children still need to be taught, to be skilled, to be nurtured

Remember We Teach Children Not Programs

Thank You

Are there any Questions?