

# BRIDGES FOR LEARNING

Psychological Assessment, Education Services and Training

## Using working memory interventions to raise levels of literacy and self-esteem

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# Bridges for Learning Educational Psychology Service

What we do

Where we work

The Team

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Frequently asked advice regarding students who present ;

- Persistent difficulties in reading and low self-esteem and self-belief which affects motivation to read.

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## Reading Skills

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graph TD; A[Reading Skills] --- B[Visual recognition]; A --- C[Auditory recognition]; A --- D[Semantic Understanding];
```

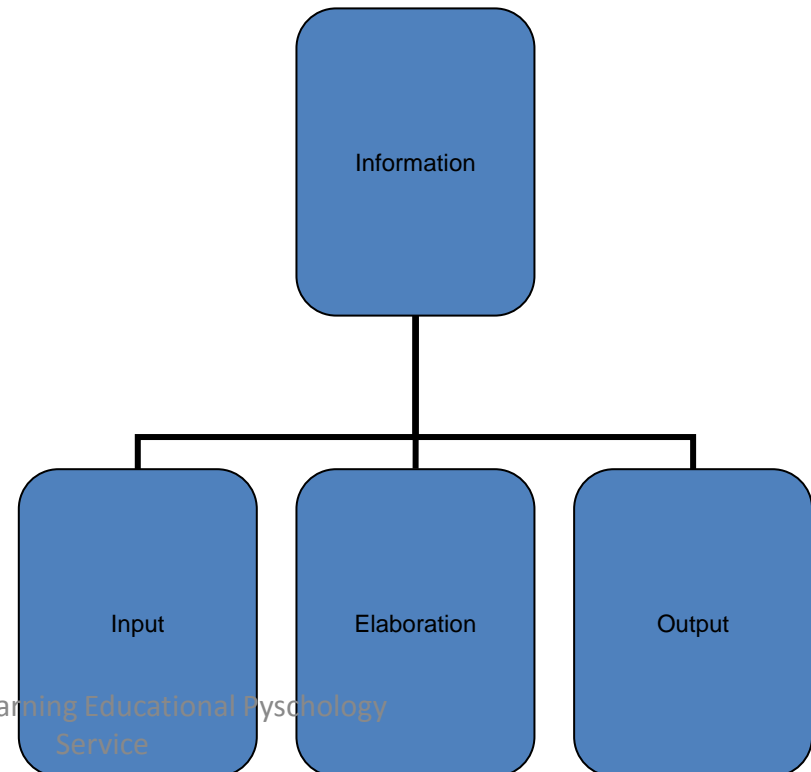
Visual  
recognition

Auditory  
recognition

Semantic  
Understanding

## Information Processing Model

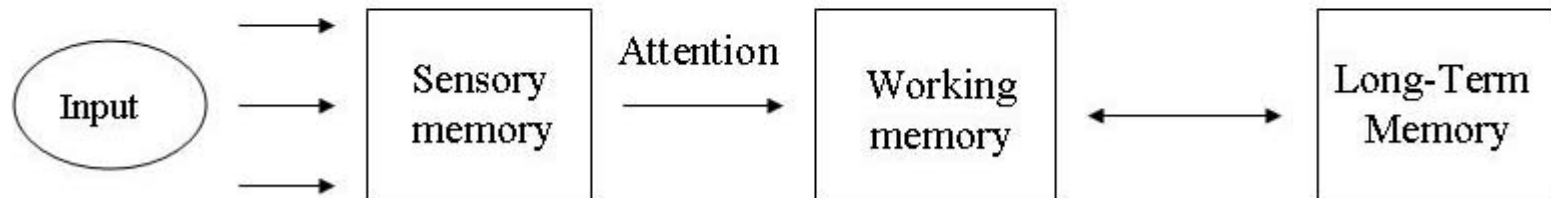
- Input (senses)
- Elaboration (thinking)
- Output (output)
- Information is received and stored in working memory in order to make sense of them.
- They are then transferred to a more long-term store



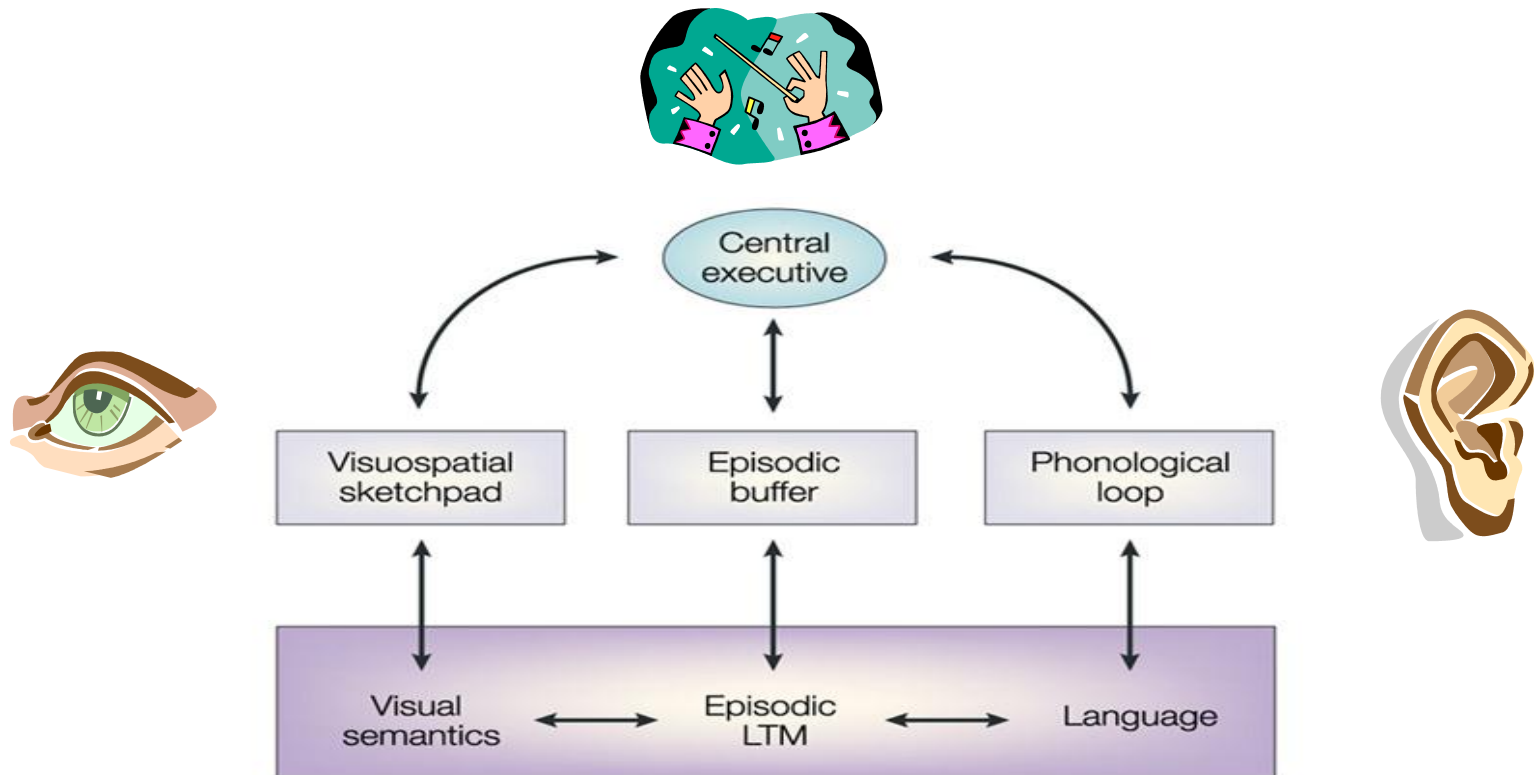
## Working Memory

- The ability to ‘do two things at once’ in tasks involving learning and reasoning.

**Working Memory has replaced STM**



## Baddeley & Hitch's (1974) Model

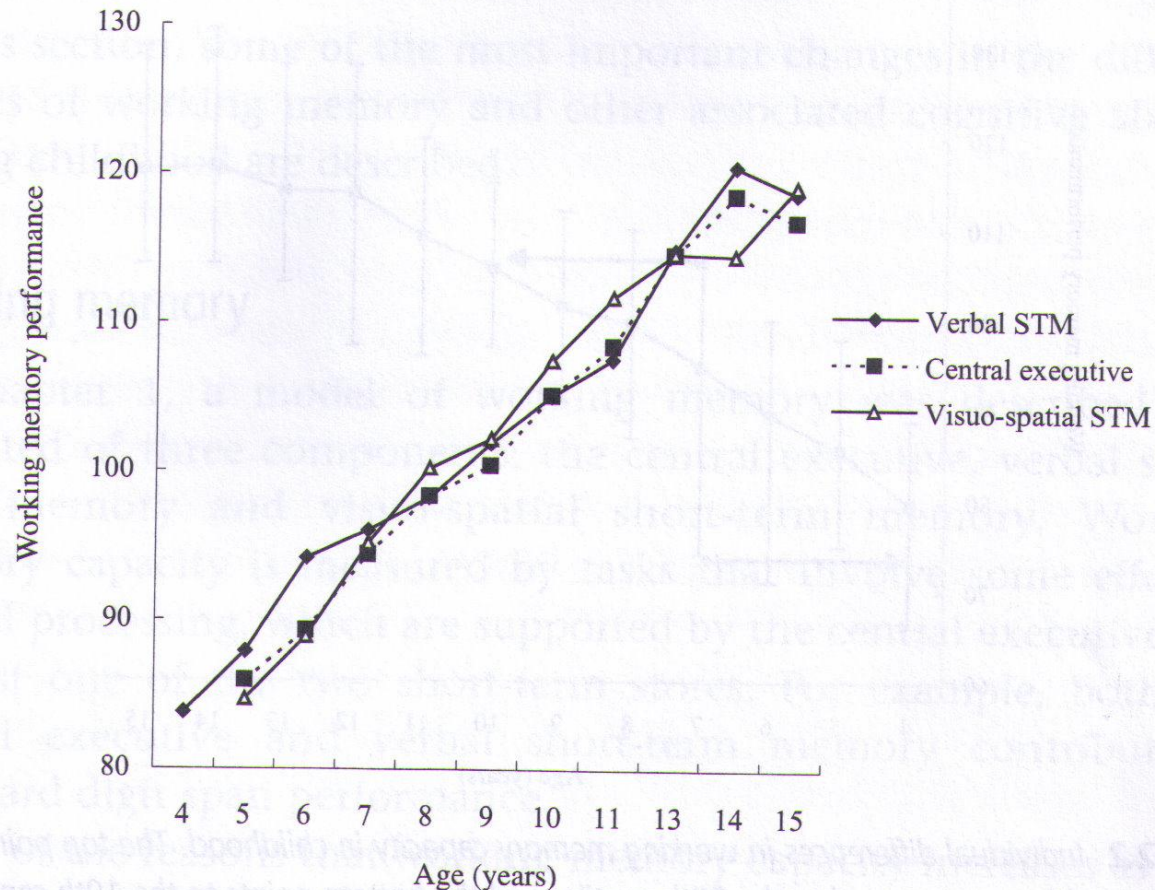


## Effects on learning

- Difficulties in each component lead to a different type of cognitive problem which may result in Specific Learning Difficulties
- Children with poor working memory skills typically make poor academic progress in literacy and mathematics.



# Development of different components of working memory in childhood



**Figure 2.1** *The development of the different components of working memory in childhood*

# How can working memory affect learning?

- Acquisition of letter knowledge
- Reading comprehension
- Mathematical ability
- Attention – linked to central executive function
- Forget instructions
- Lose place in complex tasks

# How can working memory affect learning?

- Children with poor working memory skills typically make poor academic progress in literacy and mathematics.
- Difficulties with verbal short-term memory and central executive associated with dyslexia.

# Research Findings

- Improvements in executive functioning.
- Parents felt improvements in inattention, planning/organising skills, initiation and working memory. (Beck et al., 2010)
- Beneficial to reading comprehension development. Working memory measures related to word reading and reading comprehension. (Dahlin, 2010)

# Research Findings

- Holmes & Gathercole (2009)
- Adaptive training lead to substantial improvements in working memory, which had sustained after 6 months.
- Mathematical ability had significantly improved on 6 months follow up.

## What We Provided

Working Memory screening using  
Automated Working Memory Assessment

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## Literacy and Numeracy screening

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Starter session – talk through  
working memory and set goals

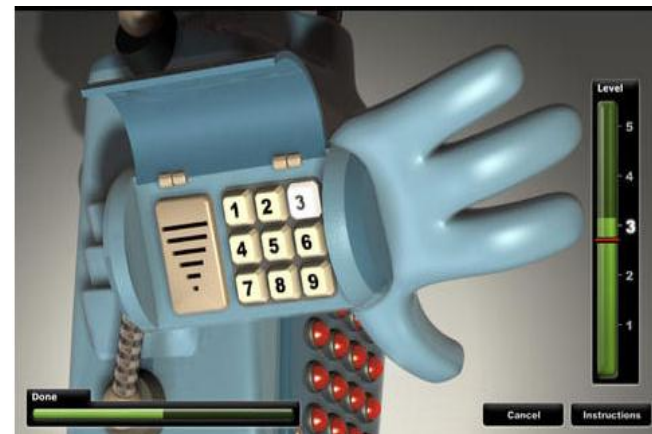
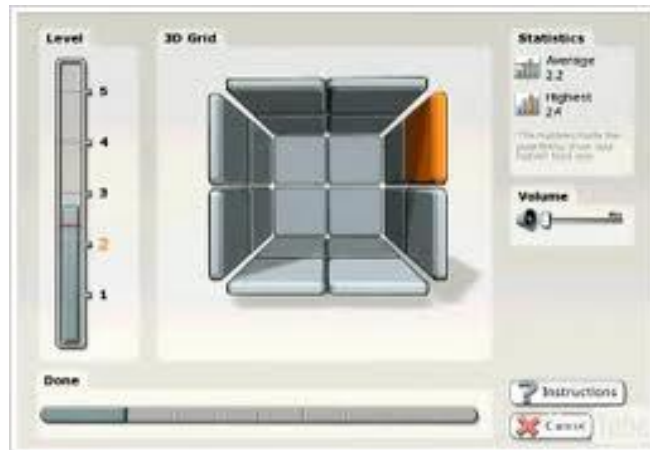


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## Working Memory Training

- <http://training.Cogmed.com>



## Working Memory Training

- 5 week computer based intervention program
- Students had choice of platforms (animated or plain)
- Weekly coaching sessions for exchange of feedback with all involved
- Progress and improvement on program tracked throughout
- Weekly incentives

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## Setting up of Cogmed

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- Coaching by an Assistant Psychologists who was supervised by an Educational Psychologist

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Anxiety Management Strategies to  
reduce pupil's anxious behaviour  
within a learning context

Included Mindfulness, Heartmath  
(bio-feedback ) & CBT strategies

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- Setting of IEP targets following the programme
  - 6 month review

# Automated Working Memory Assessment

## **AWMA: Short Form (AWMA-S)**

This consists of four tests and is recommended to screen individuals who are suspected to have memory difficulties, but the specific area of their difficulties is not known.

## **AWMA: Long Form (AWMA-L)**

This consists of all 12 tests and is recommended for confirmation of significant working memory problems for individuals identified as having working memory problems in the classroom.

# Advice for the classroom

- Task Differentiation
- Task Organisation
- Strategies to support particular memory weakness taking account of learning preferences
- Time



# Break down Tasks

- It may be too much for some children to write an essay on their ‘weekend activities’, but they may in the first instance be able to list four activities they did at the weekend. From this, they may then be able to develop a paragraph about their weekend.

# Provide a framework

- Structure and planning: use of headings and sub-headings helps to provide a structure for oral as well as written responses.

# Limit Multi-tasking

- ‘Multi-tasking’ will be difficult for pupils with poor working memory skills– especially, listening and writing at the same time can be very hard; please allow for this.

# Break down instructions

- Understanding and following a sequence of instructions can be disproportionately difficult – give instructions one at a time, and offer to repeat information.

# Allow extra time

- Activities such as copying from a page can require additional time, as this activity can place a burden on short-term memory and working memory, as the transfer of information may have to be completed in more steps.
- Allow time for answers to oral questions – remember that a pupil may not find it easy to marshal and organise their thoughts.

# Think about the task

- Allow plenty of time for mental operations – especially such things as mental maths, where there is an enormous working memory load – and encourage the use of a jotting pad/scratch pad to help retain information temporarily during mental operations.

# Overlearning takes time

- The *overlearning* which is often necessary for children with working memory difficulties means that the learning processing can be more time-consuming:

# Be Compassionate

- Children with a difficulty in working and short-term processing can often expend more effort than other children in completing a task.
- They will often become very tired with the sheer effort. Allow for short breaks between tasks to rest.
- Let the pupil know you are aware of her difficulty, and that you are sympathetic – but that you have high expectations.



# Motivate by using praise

- Be specially generous with praise and cautious with criticism. Praise can be a natural motivator as long as the child feels the praise is genuine and deserved.
- Extrinsic rewards such as stickers or points, the child can easily see why she is being praised. This can be an effective motivator, as long as the rewards are meaningful and appropriate.
-

# Homework diary

- Ensure that there is an agreed format for a personal homework diary.
- An electronic personal organiser can store vast amounts of data and can be synchronised with laptop and desktop computers. Used regularly, this can be extremely beneficial for the older pupil with memory difficulties.

# School's responsibilities

- Ensure that all Anne's teachers know about the difficulty and understand its implications.
- Consider requests to examination boards for use of formulae sheets in examinations, and allow these in classroom situations, if appropriate.

# Varied classroom environment

- Pupils with working memory difficulties may respond better in a mixed environment that would involve both a closed, formal environment and a more casual, informal learning environment.
- It is therefore preferable to vary the environment from time to time, and this can depend on the task.

# Quiet Environment

- A quiet environment would help with concentration in most cases and certainly cut down on distraction.
- A pupil may prefer to work in a quiet environment. This should only be of short duration, however, as it is important that she becomes acclimatised to working with some level of background sound.

# Emotional style

- Emotional security can be achieved through interaction with others – either positive interaction with peers, or interaction with the teacher.
- Pupils may have low outward emotional awareness and may need some support to help her fit into some types of group activities.

# Cognitive style

- A pupil's cognitive style will likely reflect the need for visual and kinaesthetic learning.
- They will require over-learning and additional time to complete tasks.
- It is unlikely that they will have an auditory style, so teacher talk should be kept to a minimum and instructions should be short.
-

## OUTCOME

- Over 300 pupils have completed working memory training
- Results (2011-2012 cohorts) showed:
  - 88% of pupils made at least 6 months progress in literacy
  - 72% of pupils made over 6 months progress in numeracy
  - 88% of pupils increased their standard score by 5 or more in reading



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## Commission from secondary school for students with complex needs

## Cohort of 9 Students

- Year 12 Students
- All experiencing complex learning difficulties
- All attended mainstream primary schools
- All taking entry level GCSEs

## Project Outline

- Standardised and qualitative assessments used to benchmark progression
- Measures include effect on students' confidence in own learning
- 3 phases- designed to improve literacy, numeracy and approaches to learning

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If that word is not understood, confident readers shrug and skip over it: less confident readers may attack it again and again, and then give up

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## Phase One: Working Memory Training



## Working Memory Training

- Screening carried out in late Summer term 2013 & early Autumn term 2013
- Students' working memory skills assessed using AWMA (Automated Working Memory Assessment) and short reports produced
- Students put forward for a 5 week computer based intervention based on results
- 'Myself as a Learner Scale' completed with students to ascertain views of themselves as learners/ confidence in learning

## Working Memory Training

- 5 week computer based intervention program
- Students had choice of platforms (animated or plain)
- Weekly coaching sessions for exchange of feedback with all involved
- Progress and improvement on program tracked throughout
- Weekly incentives

## Initial Results

- 89% students increased program score
- Average score improvement 42%
- Highest improvement 152% (*this student had started to use strategies useful to transfer to other tasks e.g. Maths*)
- Students made improvements in ‘pure’ activities: highest increase 143% for ‘following instructions’.



## Phase TWO: Phonological Skills Training



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- Screening completed December 2013
- Phonological processing skills assessed using standardised assessment (CTOPP)
- Students completed Phonological Awareness Training in January/ February 2014- to help develop literacy skills
- Groups identified from screening

## Improvement in Reading Age

Cohort of 9

- 1 student increased reading age by 6 years
- 1 student increased reading age by 4 years
- 7 students reading age increased at least 12 months

Fluent readers process individual letters rapidly by eye movement from left to right as well as the rapid processing of functional, familiar whole words.

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Less fluent readers stop at unfamiliar words and apply a particular strategy – decoding or ‘sounding out’ individual letters, using the picture as a cue, reading back and forth to gain an understanding of where the word fits in syntactically in the sentence, or drawing on their knowledge of the world outside the text to make sense.

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Once the word is understood and placed within its sentence level context, the reading speeds up again

## Phonological Knowledge

- Phonological awareness is the ability to hear the different sounds in speech.
- Students may not recognize the written letter that accompanies the sounds.
- He or she recognizes it in speech.
- Therefore, phonological awareness comes before phonetic skills.

## Phonological Awareness Training

- The PAT programme teaches children to read, spell and write phonically regular single syllable words by making analogies.
- There are no lists of words to remember, no spellings to learn. PAT is based on research identifying the importance of phonological awareness in learning to read.
- The programme includes photocopiable worksheets and record forms, reading lists and sentences for dictation.
- After the early stages of use, a very small amount of adult input is needed. The PAT programme takes only 10-15 minutes daily. The materials are structured to ensure progression and consolidation.



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## Phase Three: Metacognition



- An individualised programme aimed at developing meta-cognition (awareness of own approaches to learning and ‘thinking about thinking’)
- Raising self-esteem in regard to reading

## Metacognitive Principles

- The knowledge of how you learn ‘best’
- The knowledge about strategies you could use to help your learning
- The knowledge of personalised learning

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# Cognitive Learning Principles

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# Affective Learning Principles

## Setting up Personalised Learning Plans

Things that I do well

Things that I need to work harder at

## Entry Level GCSE Grades

Cohort of 9 students

- 2 achieved 2 grades higher than predicted
- 5 achieved a grade higher than predicted
- 2 achieved grades predicted

## Outcome of Myself As a Learner Scale

- All pupils demonstrated an increase in score when MALs re-administered
- All pupils recorded comments which indicated that they felt they were more successful at learning



## Additional Outcomes

- Transfer of skills to Mathematical Ability
- Students 'bolder' and willing to have a go
- Students attention control increased
- Students self-esteem increased generally not only in relation to learning

## Where now ?

- The school presented findings to Governors
- Governors commissioned further intervention including the training of school staff
- The intention is encourage sustainability through the training school staff

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