Addressing Low Working Memory:

A Journey to Learning Independence.
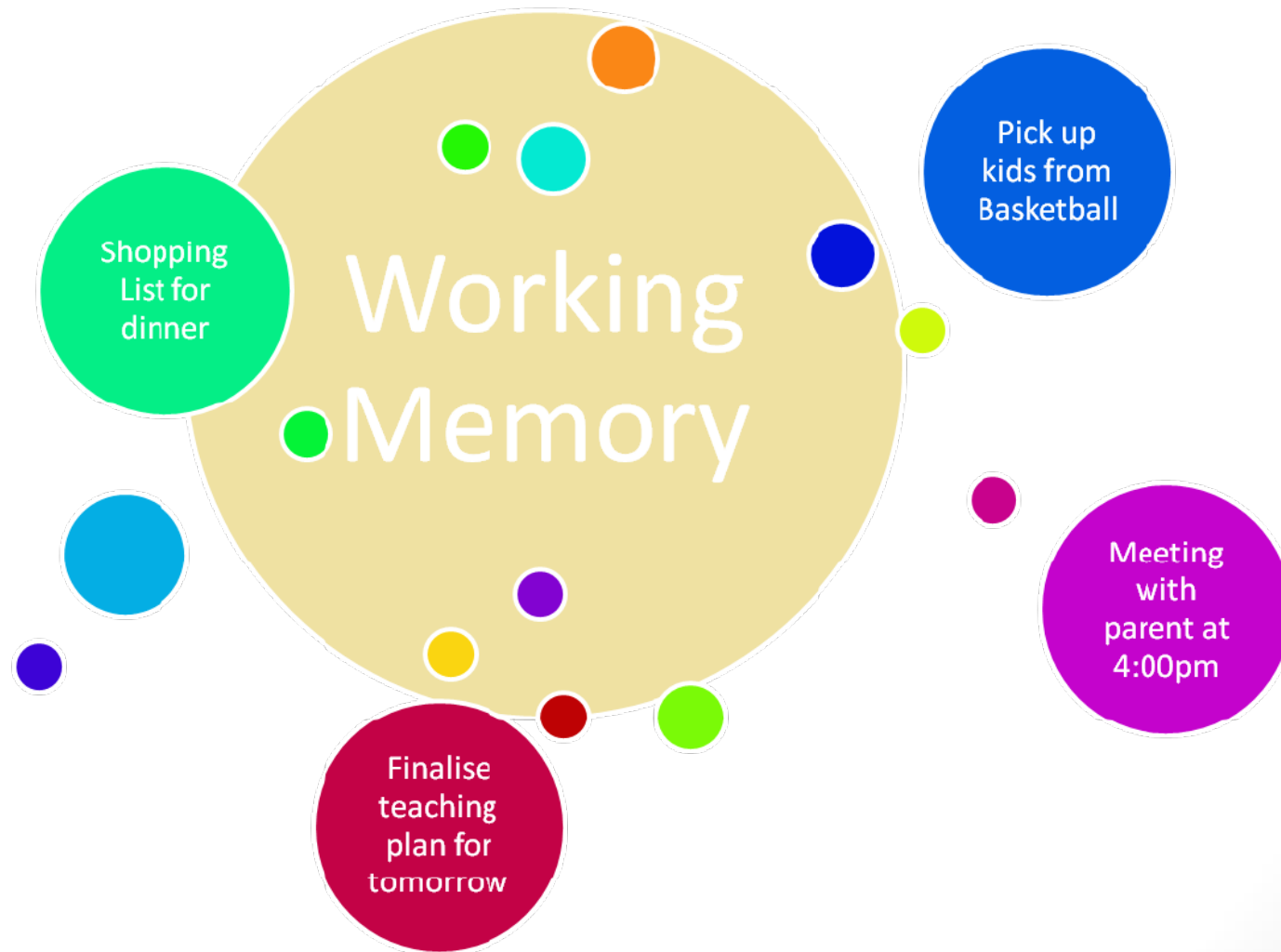
Presented by

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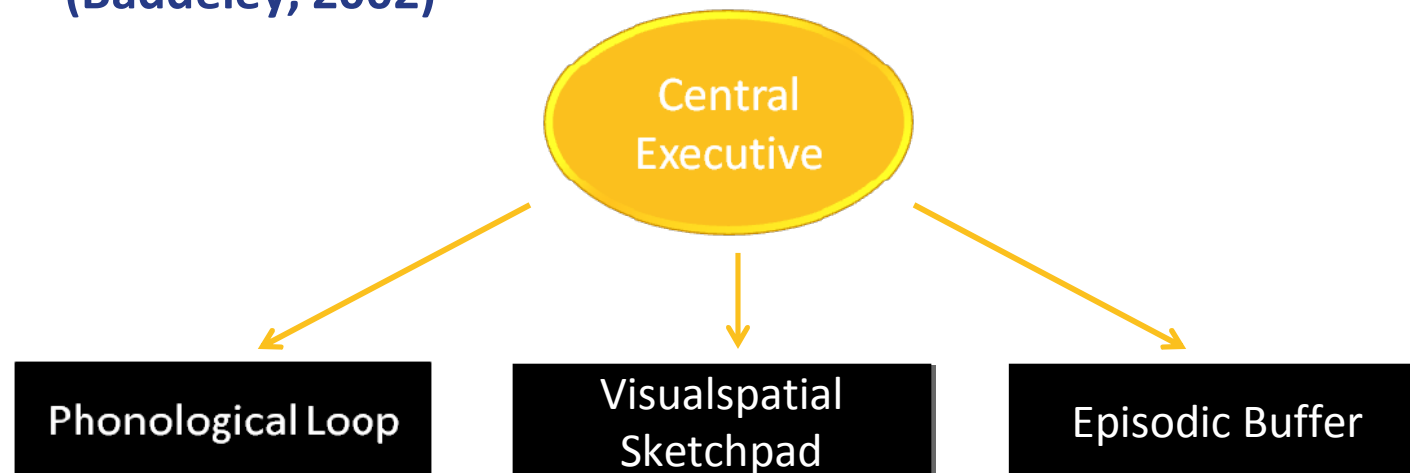
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What is WM?

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(Baddeley, 2002)

A cognitive system for:
- **temporarily maintaining and manipulating information**
- **managing information for complex cognitive tasks (eg. learning, reasoning & comprehension)**

WM Components

4 separate, yet interconnected, parts

CE
- Responsible for a range of complex cognitive activities but is not domain-specific

PL
- A phonological store and articulatory rehearsal system

VSSP
- Responsible for coordinating visual and spatial material

EB
- Interface between the LTM and three components of the WM

WM and Learning

WM uniquely contirbutes to academic attainment, beyond intelligence (Titz & Karbach, 2014)

Low WM is a significant risk factor for low academic attainment (Titz & Karbach, 2014)

WM and mathematics achievement

- Laski et al., 2013 – VSSP important for acquisition, Verbal WM after skill has been learned.

- Meyer et al., 2010 – CE and PL important for younger learners and VSSP important from Grade 3 onwards.

WM and reading

- Gathercole, Brown, & Pickering, 2003 – WM significant predictor of literacy attainment.

WM Function

Is your WM working?

- Items to buy at the shop – mental shopping list (PL)

- Remembering a phone number without writing it down (PL)

- Packing your suitcase to attend this conference (CE, VSSP)

- Solving a math problem (CE, VSSP, maybe PL)

    2(4+7)=

WM is constantly used and relied upon. We only notice it when it overloads/malfunctions.

WM Overload

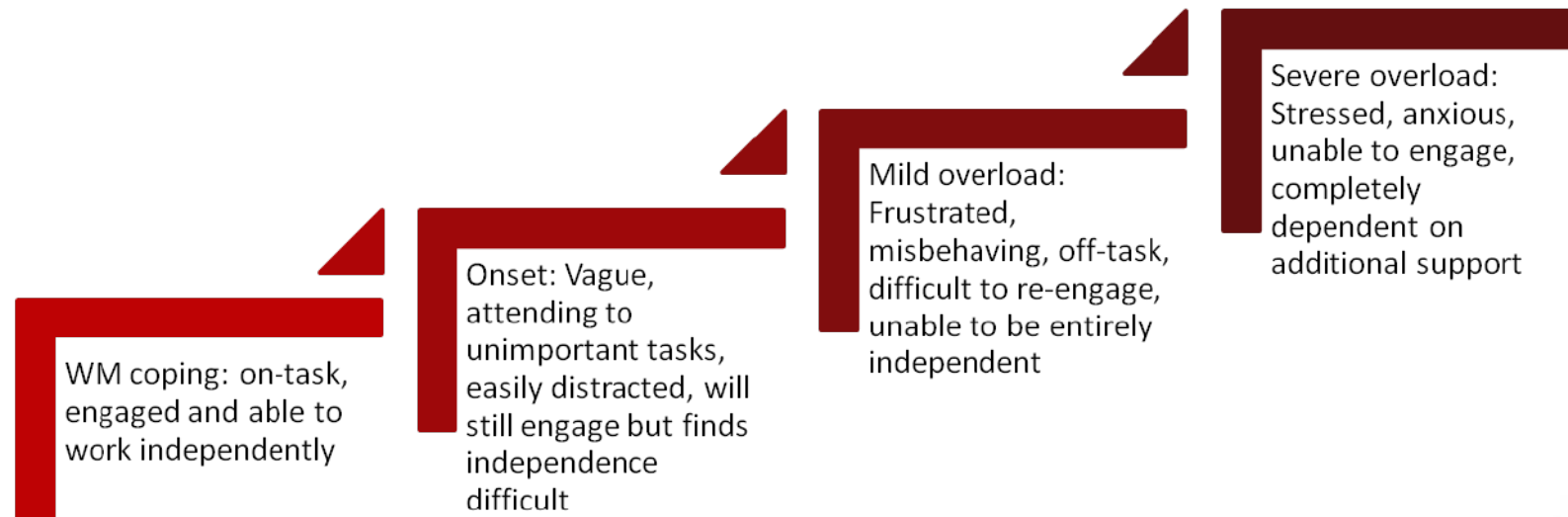**When have you experienced WM overload?**

It probably resulted in you doing one of the following:

- Needing to 'take stock' and make list/prioritise/verbalise in order to complete task
- Forgetting to complete a task on your list
- Unable to complete a task effectively
- Difficulty knowing where to begin (for large, complex tasks)
- Feeling overwhelmed/foggy
- Feeling stressed/anxious

WM overload = anxious = unable to learn
Brain is more concerned with perceived 'threat'

Recognising WM Overload

Student Indicators

WM coping: on-task, engaged and able to work independently

Onset: Vague, attending to unimportant tasks, easily distracted, will still engage but finds independence difficult

Mild overload: Frustrated, misbehaving, off-task, difficult to re-engage, unable to be entirely independent

Severe overload: Stressed, anxious, unable to engage, completely dependent on additional support

Working Memory Rating Scale (WMRS)

Alloway, Gathercole & Kirkwood (2008)

WMRS is a behavioural rating scale developed for teachers to facilitate identification of children with working memory deficits.

Standardised assessment: reliable tool for screening.

The WMRS is not used for diagnosis, only an indication of whether there are working memory concerns.

If a student is identified as having low working memory by the WMRS, referral to an Educational Psychologist will be required for further assessment.

Strategies to assist students with Low Working Memory

1. Strategies for the Classroom

2. Strategies for Home

3. Metacognitive strategies for the student

Strategies for the Classroom ("The Principles" – S. Gathercole)

- Be aware of the warning signs of WM failure

- Monitor the child

- Reduce amount of information to be stored

- Reduce difficulty of processing

- Repeat important information

- Encourage the use of memory aids (assistive technology)

- Help the student to implement strategies*

Important: Offer support, but encourage independence

Strategies for Home

- Recognise when WM limits are being reached

- Repeat important information

- Limit distractions when WM is required for use

- Limit WM load by writing information down. Eg. mini whiteboard, mobile phone notepad/photo

- Reminders to take breaks when employing a heavy WM load

- Encourage and prompt identification of experiencing a high WM load – refer to memory-relieving strategies if required

Strategies for Home cont...

- Use gesture and stress when you can

- Limit 'tricky sentence structure', especially during times of discipline

- Acknowledge the frustration of the problem

- Engage in board games such as Memory, Guess Who and Snap

- Make time for engaging in activities with no pressure on WM

Metacognitive Strategies for Student

- Recognise reaching WM limitations and adjust accordingly or ask for help (monitor processing speed, anxiety etc)

- Limit distractions

- Take breaks at regular intervals to rest WM

- Limit load on WM by utilising assistive technologies (students may need to 'upskill' in this area)

- Refer to external memory-relieving strategies if WM load is becoming too high.

- Engage in word games such as "I went shopping…" as a fun way of engaging and developing WM. This game can be varied: "I spied on my brother and saw him…" "I had a midnight feast and I ate…"

Visual Cue Strategy

Is my brain feeling overloaded?	Ways to tell if my Working Memory is getting overloaded	Working Memory help strategies	Now my brain can manage the task ahead
	I having trouble: 1. Remember what I'm meant to be doing 2. Work out what to do next 3. Get started on the task in front of me I feel: Stressed/worried Blank/spaced out Overwhelmed	If this happens I can: Take a deep breath Have a go Take a short break Write down each step Read back over the information Ask a teacher/family member for help	

For More Information

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Online:
● Working Memory and Learning (S. Gathercole) http://www.learning-works.org.uk/susan-gathercole-keynote-pdf
● Understanding Working Memory: A Classroom Guide (Gathercole & Alloway) https://www.mrc-cbu.cam.ac.uk/wp-content/uploads/2013/01/WM-classroom-guide.pdf