

Understanding Working Memory

And How it Affects Learning



What is Working Memory?



Definition of Working Memory

An executive function that plays a major role in how we process, use, and remember information on a daily basis.

It's keeping in mind anything you need to keep in mind while you're doing something.

Working Memory is like your brain's task list or sticky notes. As information is coming into your brain, you are both processing it and, simultaneously, storing it.

When do we Use Working Memory?

Remembering a new phone number, PIN number, or address

Following spoken directions

Calculating grocery bills without paper or calculator

Remembering unusual names

Measuring recipe ingredients, etc

The Development of Working Memory

Increases with age

Increases at different rates

Is relatively fixed



Are There Limits to Working Memory?

Distraction

Trying to hold in too much information

Engaging in a demanding task

**Once information has been lost from working memory, it is gone for good.

What Causes Low Working Memory?

Not yet well understood

It is NOT related to:

- a child's background
- inadequacies in pre-school experience or education
- quality of social or intellectual stimulation in the home
- IQ

Signs of Working Memory Weakness

Have difficulty remember facts or procedures

Have slow retrieval of information

Fail to follow instructions

Poor attention to detail

Make place-keeping errors

Have difficulty starting work

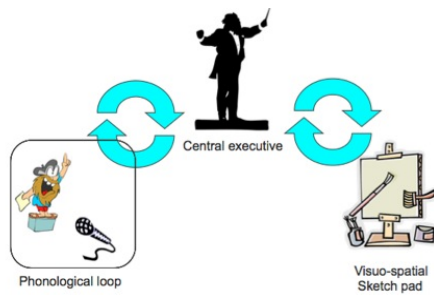
Hav difficulty staying on task

Lose track of belongings

Learning Disabilities and Working Memory

Kids with learning disabilities have a smaller working memory capacity because adjusting for the difficulties that come with issues like dyslexia, or processing weaknesses takes up a considerable amount of their "cognitive workspace".

Working Memory & Dyslexia



Working Memory and ADHD

Students with ADHD are 4x more likely to have working memory problems compared to peers without attention problems.

Researchers are trying to tease out the exact connections between all of these areas: processing efficiency, attention, working memory.

Working Memory and Processing Disorders

Working memory weaknesses share many parallels with processing issues.

All learning disabilities are neurologically based processing problems.

Scientists are trying to tease out these differences and what their implications are. The brain is very complex and the connections are definitely interwoven.

Why is Working Memory Important

For learning to be effective and efficient, students need a strong working memory.

Working memory strength is by far a better indicator of school success than IQ.

Working Memory and Learning



Reading

Writing

Math

Working Memory and Accessing Information



Kids need to be able to keep all the numbers in their head, figure out what operation to use and create a written math problem at the same time.

Working Memory and Remembering Instructions

Kids with weak working memory skills have trouble keeping in mind what comes next while they're doing what comes now.



Working Memory and Paying Attention



The part of the brain responsible for working memory is also responsible for maintaining focus and concentration.

Working Memory and Reading

Auditory working memory helps kids hold on to the sounds letters make long enough to sound out new words.

Visual working memory helps kids remember what those words look like so they can recognize them throughout the rest of a sentence.

Working Memory and Math



Learning math requires a child to be able to remember, sequence and visualize information—all of which can be difficult for a child with weak working memory skills.

Testing for Working Memory Capacity

A standard sub test in most IQ tests and are given in any in depth neuropsychological or psycho-educational testing.

Helping Kids With Working Memory Weaknesses



Two Ways:
Reduce the memory load
Improve working memory function with training

**Reducing the Memory Load:
Accommodations for Weak Working Memory**

Reduce the student's working memory load

- Break tasks into smaller chunks
- Provide written directions
- Keep information brief and to the point

**Reducing the Memory Load:
Accommodations for Weak Working Memory**

Encourage Memory Aids

- Use graphic organizers
- Provide multi-sensory instruction
- Help them make lists

**Reducing the Memory Load:
Accommodations for Weak Working Memory**

Color-Code Information

- Color-code when introducing new information
- Use highlighters for important learning
- Use color-coded sticky notes as a way to org

**Reducing the Memory Load:
Accommodations for Weak Working Memory**

Repeat and Review

- Provide opportunities to repeat information
- Have the student teach the information to a parent/sibling
- Use short instructional sessions

Accommodations for Weak Working Memory

Multi-sensory Learning

Increase the meaningfulness of the material by providing examples students can relate to.

Provide information in multiple ways: speak it, show it, and create opportunities to physically work with it or model it.

**Reduce the Memory Load
by Creating Consistent Routines, Systems & Strategies**

When we're able to automate a task it no longer requires working memory to function.

Build habits by being:

- Consistent
- Patient
- Using verbal and visual cues

Let Assistive Technology Pick up the Slack

Tools like to-do lists, organizers, and reminders free up vital “workspace” and make it easier for kids to remember important information by taking some of the pressure off working memory.

Medication for Working Memory

ADHD medications don't treat working memory issues, but they do reduce distractibility and increase focus, which makes it easier for kids to access their working memory.

Can Working Memory be Improved?



While working memory does increase with age, its relative capacity remains constant.

Can Working Memory be Improved?

Neuroplasticity and Brain Training

Your brain can change, at any age, due to daily experience. The brain doesn't just absorb things; it rewires itself. Life experiences – everything from a conversation and physical exercise to playing a game – can change the circuitry of the brain in formative and helpful ways.

Working Memory Training



More Strategies for Improving Weak Working Memory

Teaching Meta-awareness Skills

4 Questions about successful strategies:

1. What did you do?
2. Why did you do that?
3. How will it help you?
4. When can you use it again?

**More Strategies
for Improving Weak Working Memory**

Encourage Deeper Understanding

Think aloud

Talk aloud

**More Strategies
for Improving Weak Working Memory**

Teach Memory Skills

Semantic Associations

Creating a Bridge

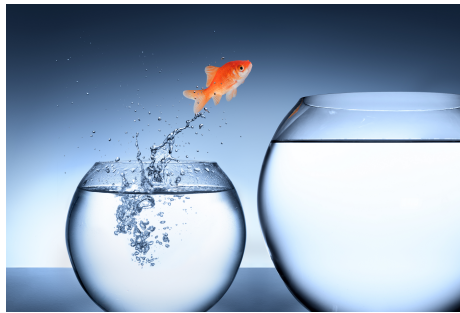
The Journey Method

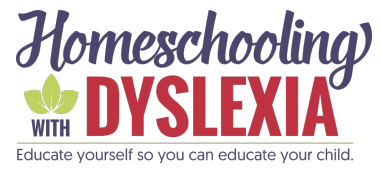
The Bottom Line in Improving Working Memory

Computer memory games, apps and memory strategies can be used alongside other strategies, but it's important to stick with established supports as well.

For now, one of the best ways to help kids with working memory issues is to focus on creating and practicing healthy, effective coping strategies.

Final Thoughts





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