



**Train Your Child's Brain!**

**ALLOWAYS' GUIDE TO  
WORKING MEMORY**

**SPOT THE WORKING MEMORY**  
**BOOKLET 3**

# Where Chalk Meets the Blackboard:

## *Assessing Working Memory in the Classroom*

So far, we've defined Working Memory (Booklet 1), and we've compared it with IQ (Booklet 2). Now we have reached the point in the booklet series where the rubber meets the road, or, in our case, the chalk meets the blackboard. You've read about the theory behind it, but how can we make this knowledge practical and useful? What does it actually look like when a child has a Working Memory problem? How do they behave in the classroom and at home? And what if you do think your student or child may have a Working Memory problem, how can you find out for sure?

In this booklet, you will find out:

- **Three common Behavior Patterns of children with Working Memory issues**
- **The best diagnostic tools for determining if your student or child really does have a Working Memory problem**



# The Bonsai and the Pine:

## *Working Memory in the Classroom*



During childhood, our Post-It Note is constantly growing. But some grow faster than others. The Post-It Note of students with poor Working Memory will grow bigger. But, when you compare these students with their peers, their Post-It Note will always be smaller.

You can think of poor Working Memory like a Bonsai tree. It will grow bigger than the seed that it came from, but it won't grow bigger than a normal Pine tree that isn't pruned back. In the same way, students with poor Working Memory will always find it difficult to keep up with their peers at any age.

These students often fall below the teacher's radar. They might not be disrupting the class or bouncing off the walls. So the teacher may not notice there is a problem—at least not until it's too late. The teacher may not notice until they start failing because they haven't grasped key concepts in the lesson or can't understand what to do and how to do it.

Research to date indicates that teachers' awareness of Working Memory deficits in the classroom is lower than it should be. A recent study on awareness of Working Memory among educators showed that teachers only picked up early warning signs of Working Memory failure in their students 25% of the time.

Also, teachers never listed Working Memory as an explanation for the students' poor grades. Often, teachers consider these students to be just daydreamers.

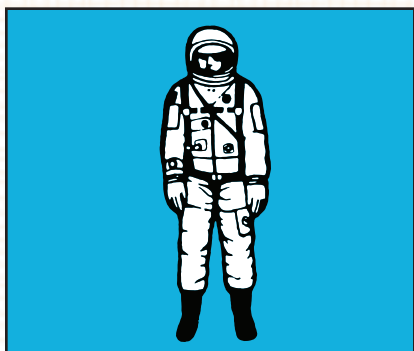
If we want to help students, we need to spot early warning signs of Working Memory problems before they lower their grades. We need to realize that these kids aren't just daydreamers. We need to realize that they are struggling to learn, and they will continue to struggle for their whole academic career, unless they have help.



# Poor Working Memory Behavior:

## *The Three Students*

Every student with poor Working Memory has unique issues, but there are three main behaviors that teachers and parents can recognize. In this section, we will find out what these behaviors are and what is happening with their Working Memory.



### The “Lost-in-Space” Student: Diana

Here is how Mrs. Roberts describes Diana: “Whenever I give the class something to do, Diana never listens to me. I do check to make sure that she is paying attention, but she will end up doing only some of what I asked her to do. I find that I always have to check on her because she usually ends up doing her own thing.”

Although Diana may seem like she is “lost in space” here is what is

really happening with her Working Memory. Diana’s Post-It Note is not big enough for the things she needs to do. She is eight years old, but her Working Memory is the size of a five year old, which leads to difficulties in the classroom and at home.

Her Working Memory space can only keep two instructions in mind. Whenever Mrs. Roberts gives instructions to the class, Diana is always the last one to complete them. For example, Mrs. Roberts asked the class to put their coloring pencils in the packet, pick up their math worksheets from the green folder, get their pencils and rulers, and come and sit on the carpet. Diana remembered to put her coloring pencils away and was sitting on the carpet. But she had forgotten to get her math

## Poor Working Memory Behavior: The Three Students *continued ...*

worksheet and her pencil and ruler.

One day, her mom, Karen, asked her to put her clothes in the drawer, vacuum the hallway, and dust her dresser. Diana started off well and picked up her clothes from the laundry room, but when she made it to her room, she looked at her goldfish Freddie and thought he looked a little hungry, so she set down her clothes to feed him. When Karen came in a half-hour later, Diana was drawing. The clothes stayed on the bed, the hallway wasn't vacuumed, and the dresser was dusty. When her mom asked her why she hadn't done anything, Diana replied, "I fed Freddie, and I forgot the rest of the stuff, I guess."

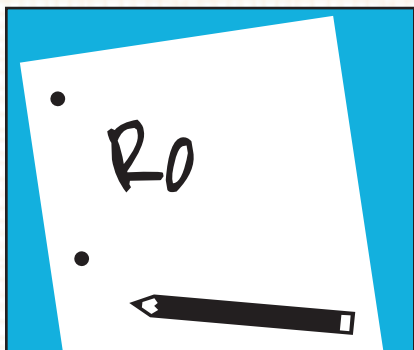
There is a fixed limit to Working Memory at each age. The average eight year old can remember about three instructions. But for someone like Diana, her Working Memory space can only keep two instructions in mind. Her Post-it Note is not big enough to remember and work with all the Information she needs to succeed in the classroom. This means that she will struggle to keep up with

her teacher's instructions and find it hard to keep in mind all the words she is reading. Even simple activities like doing her chores can be difficult for her.

When asked if she ever forgets what the teacher said, Diana said, "Yes, she talks a lot and I can't remember it all." Diana starts off listening to the teacher, or her mom, but her Working Memory space gets overloaded, and as a result, she can't take in any more information.







### **The “Never-Finisher” Student: Rob**

When asked about Rob, Mrs. Lewis says that he is a quiet student but could use some extra motivation in the classroom. “Rob is a sweet boy. I know he tries hard, but he often hands in incomplete work. He needs to finish his assignments.”

Rob, ten years old, doesn’t really cause the teacher much trouble in the classroom. He isn’t boisterous or noisy. He doesn’t even disturb his classmates. Just the opposite! He is usually sitting quietly at his desk. Often, he is doodling or staring out the window. But he is not doing the assignment.

Rob’s mother, Jan, had a long day at work and a long drive home and just wanted some time to relax.

She sent him to the kitchen to paint. She told Rob to get some water, wet the brushes, and paint a picture of a bird. Rob is artistic and really likes to paint, so he was excited. Just when he was getting the water and some paper, his mom remembered a paint mess she had to clean up a month ago. So she shouted to the kitchen: “Don’t forget to lay out a plastic sheet!” When she came back refreshed from her rest a half-hour later, she found him dipping the paper in the water cup, with the paints unopened and the brushes scattered over the plastic sheet. Rob hadn’t even started painting.

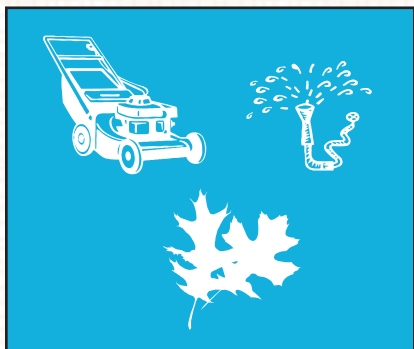
Children with poor Working Memory need extra time to process information. But in a busy classroom, this is a luxury that they don’t always have. For Rob, Mrs. Lewis is speaking fast, and when he tries to keep up, it is time for the next activity, and he is left trying to process the first thing she asked the class to do. At home, when his mom gives him an extra instruction, everything else is forgotten.

## Poor Working Memory Behavior: The Three Students *continued* ...

Rob says he has trouble listening to what Mrs. Lewis says and writing it down at the same time. If he is just finishing one task while she is telling the class what they need for the next activity, he gets flustered and often throws his book down.

He says, “I just can’t keep up!”

This is a common reaction from students with poor Working Memory—when they are given too many things to do in a short space of time, they can’t process the information fast enough, and they ultimately feel frustrated and unable to do it.



### The “I Can’t” Student: David

Mr. Moore teaches David in high school. David likes group activity best, but Mr. Moore comments that David seems very forgetful when he has to work independently. “Even simple things, like following all the requirements for an activity, seem hard for David. I often notice

him asking his classmates what he needs to do. I tell him to write it down in his notebook, but I don’t think that he does.”

David is 15 years old, and he knows that he has trouble remembering things, but he often feels too embarrassed to ask Mr. Moore for help. He knows he is supposed to write it down, but he thinks: “Why should I bother trying? I’m just going to get it wrong anyway.”

A student like David finds it hard to switch between different things. If a task requires a student like David to juggle multiple pieces of information, it is likely that he



## Poor Working Memory Behavior: The Three Students *continued ...*

will abandon the task because his Working Memory can't cope.

One activity in particular that David finds difficult is writing. He has difficulty organizing his work and structuring his sentences in order to convey his intended meaning. His written work is littered with missing letters, incorrect spellings, and disjointed sentences. When asked what he finds difficult, he says that he can't write and listen at the same time: "Teachers talk while we are supposed to write stuff down, and I can't do it."

David's dad asked him to help out with the yard work. He told David to rake the leaves, cut the grass underneath, and then water it. While his dad was telling him what to do, David was busy getting out the rake, lawnmower, and water hose. He was having trouble getting out the yard equipment and listening to the instructions.

David began by watering the grass with the leaves still on top of it. He then started up the lawnmower, which resulted in chopped up leaves and torn-up grass, and soon after decided to quit the work altogether, without ever raking the leaves.

Because David has Working Memory problems, he finds listening to instructions and getting on with the task to be very effortful. When writing, the tasks of organizing his thoughts, putting together the right words, and then checking his spelling, while listening to the teacher as well often overwhelms him, and he gives up on the activity.



# Assessing Working Memory in the Classroom

How can you tell how good a student's Working Memory is? The best way is to use the Automated Working Memory Assessment (AWMA). The AWMA is the world's leading diagnostic tool for assessing Working Memory skills and is suitable from 5 to 80 years of age. This tool provides a practical and convenient way for educational professionals to screen individuals for significant Working Memory problems.

Here is an example of a Verbal Working Memory test:

## STEP 1

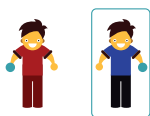
Ask a friend to read out these numbers to you:  
**6 2 9 5 7 1**

## STEP 2

Now, can you remember them in backwards order?

*This test is known as Backward Digit Recall and is an excellent measure of Verbal Working Memory.*

Here is an example of a Visuo-Spatial Working Memory test:



## STEP 1

Is Mr. Blue holding the ball in the same hand as Mr. Red?



## STEP 2

Now, can you remember the location of Mr. Blue's ball?

Each of these examples requires the students to do two things. First, they must process some information (like reversing the number sequence or figuring out which hand Mr. X is holding the ball in). Then they have to remember something—the numbers in the correct order and the dot locations.

# Benefits of the AWMA

- **Quick to Administer:** The Screener version takes less than ten minutes to administer and is made up of two Working Memory tests (one verbal and another visuo-spatial).
- **Highly Accurate:** The AWMA is effective in identifying students at risk and will provide you with a profile that outlines your student's strengths and weaknesses in Working Memory. In Tracy's own research, she has used the AWMA in thousands of students and found that 1 in 10 students have Working Memory difficulties that lead to learning problems.
- **Culture fair:** Performance on the AWMA is not affected by the student's cultural or financial background. The AWMA provides an excellent measure of a student's capacity to learn, regardless of where he or she are from or how much their parents make.
- **Compare with peers:** The AWMA is a standardized test battery. Standard scores are a way of describing a student's performance relative to the performance of others the same age. For example, if you are testing a child aged five years, their performance will be compared with other five-year-olds.
- **Automated scoring and report:** With time at a premium, the automated presentation of tests and automatic generation of a report with standard scores and percentiles make it easy for psychologists and educators to use.



# AWMA: A Reliable Measure of Working Memory



How do we know that the AWMA is a reliable measure of Working Memory?

Psychologists use a method called “test-retest” to find out how reliable an assessment is. Here is an example of how it works.

**Monday:** Tom is tested.

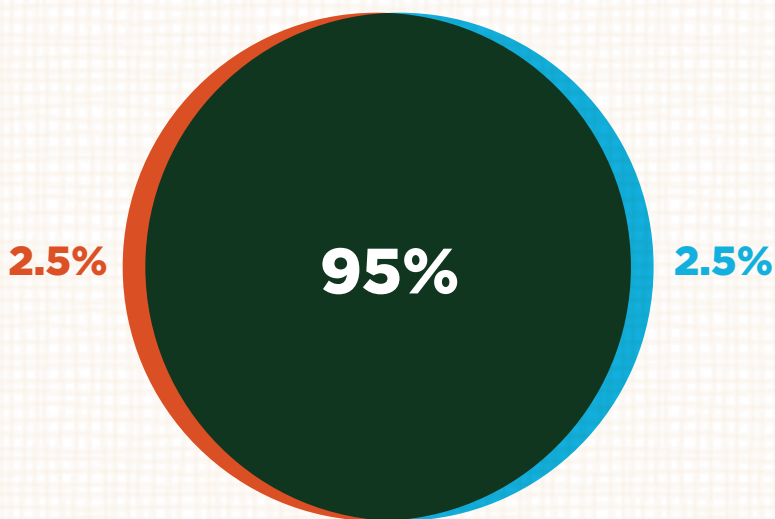
**Friday:** Tom is tested again.

If Tom receives a similar score when tested multiple times, then it is likely that the assessment is measuring what it should.

If Tom’s score changes from Monday to Friday, then we have to ask why his score changed. Did his score change because he learned how to do the test and so he was able to do better on Friday?

Did his mood change, helping him to perform better? Or was it the time of day—does Tom work better in the morning?

Because we wouldn’t expect his skills to fluctuate from day to day, the assumption is that, since Tom’s scores changed, the assessment is not very reliable.



In a study using the AWMA, students were given Working Memory tests on two different occasions—six weeks apart and even one year apart.

Look at the two circles. They show how similar the students' scores were from the first testing time to the second testing time. When students were retested, they had a similar score 95% of the time. Studies such as these confirm that the AWMA provides a reliable measure of Working Memory.





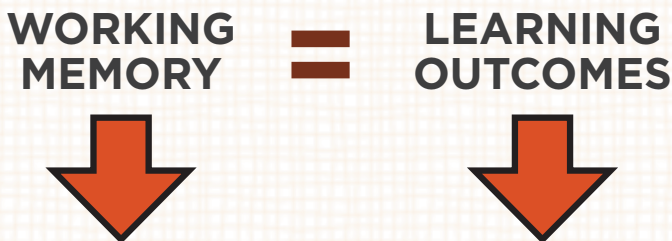
# AWMA: A Valid Measure of Working Memory

This brings us to the next question: How do we know that the AWMA is a valid measure? When we measure Working Memory, how does it compare with other assessments like learning outcomes?

## Learning Outcomes

The value of the AWMA can be gauged by what it is telling us. For example, what do poor Working Memory scores mean? Tracy addressed this question in a study of school children. She looked at thousands of students and found that 1 in 10 students had poor Working Memory.

How did this influence their grades? She also gave them standardized tests of language, reading, and mathematics. Their scores showed that 98% of students with poor Working Memory underperformed in these learning assessments. Their scores were below average compared to their peers. Their Working Memory difficulties meant that they were struggling to keep up and couldn't perform as well as the rest of their class.



Colleagues in Europe also found that students who had low Working Memory scores using the AWMA had learning difficulties. Four-year-olds with poor Working Memory were at the greatest risk for failure in school, especially in subjects that involve language.

These studies described here, as well as other published research, demonstrate that scores in the AWMA provide a clear picture of how the student will perform on learning outcomes.





# Working Memory Rating Scale (WMRS)



It is not always easy to spot the student with poor Working Memory. But classroom teachers are probably very familiar with their students' behavior patterns. The WMRS is a behavior rating scale that allows teachers to use their knowledge of a student to determine whether the student has Working Memory difficulties.

The WMRS is based on interviews with educators and is useful in illustrating those classroom situations that are difficult for those with Working Memory problems. The WMRS is made up of 20 short descriptions of problem behaviors that differentiate students with low Working Memory from those with average Working Memory abilities.

Here is a description of behavior from the WMRS:

*Mixes up material inappropriately, e.g., incorrectly combines parts from two sentences rather than reading each one accurately.*

Teachers rate how typical this behavior is for a particular student, ranging from *not typical* to *very typical*.

The manual provides a color-coded guide in red, yellow, and green, so teachers can match up their student's score with others in that age group. For example, if a student's score falls in the green category, it is unlikely that the student has a Working Memory problem.

If a student's score falls in the yellow category, then their behavior shows potential Working Memory difficulties.

If the student's score falls in the red category, their classroom behavior is typical of someone with Working Memory problems that have a negative impact on their learning.

# Benefits of the WMRS

- **Quick to Administer:** With only 20 questions, the WMRS takes just a few minutes to complete.
- **Based on Classroom Behavior:** The WMRS provides a snapshot of a student's Working Memory behavior patterns. It lets you as a teacher match your observations of your students' classroom actions with patterns that are associated with Working Memory difficulties.
- **Highly Accurate:** Multiple scientific studies confirm that scores on the WMRS provide an accurate assessment of the Working Memory profile of students. The WMRS increases the chances of the detection and subsequent support for children with Working Memory problems.
- **Compare with peers:** The WMRS is a standardized test battery. When you are testing a five-year-old, the WMRS tells you how they compare to other five-year-olds.
- **Easy to score:** The manual provides you with a color-coded reference (red, yellow, or green) to help you determine whether your student has a Working Memory problem.



# WMRS: A Valid Measure of Working Memory



**What does the WMRS score tell you about your student? And how is it different from other assessments of classroom behavior?**

Let's look at the first question: What does the WMRS score tell you about your student?

Tracy compared WMRS with other standardized assessments of Working Memory like the AWMA and the Working Memory Index in the Wechsler Intelligence Scale for Children. The question was: Would classroom behavior that characterizes Working Memory difficulties match a student's scores on cognitive assessments of Working Memory?

That is exactly what she found: A student with a WMRS score in the "Red Zone" also has low scores in cognitive tests of Working Memory. A student with a WMRS score in the "Green Zone" also has high scores in cognitive tests of Working Memory. This means that a student's classroom behavior is an excellent predictor of their Working Memory profile.

Now to the second question: How is the WMRS different from other assessments of classroom behavior?

Tracy addressed this question by comparing scores on the WMRS with other behavior rating scales like the Conners' Teacher Rating Scale (for ADHD) and the BRIEF (for executive function) in students with a diagnosis of ADHD and those with learning difficulties.

Behaviors associated with poor Working Memory are very different from other types of behavior associated with ADHD (measured by rating

scales like the Conners' and the BRIEF). Behaviors linked with ADHD are often more impulsive and disruptive. In contrast, behaviors linked with poor Working Memory are more inattentive and frustrated.





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