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Enhancing Working Memory

Working memory is the capacity to hold information in mind while performing complex tasks. We rely on working memory all the time. It's the ability to run out to the store to buy a few things and remember what they are without having to write them down. When you remember to stop by the dry cleaner on your way home from work, you're using working memory. When you look up a phone number and remember it long enough to make the call, you're using working memory. When your spouse asks you to do something and you say, "I'll do it as soon as I finish loading the dishwasher," and then you actually remember to do it, chances are your working memory is pretty good. Odds are it's not so good, however, if you can't remember anyone's birthday, you tend to return home with only half your errands done unless you have a written itinerary, and you'll do anything to avoid having to introduce people at a cocktail party because you can't remember anyone's name. In that case, be sure to use the tips in Chapter 3 to help you enhance your child's working memory when you have the same weakness.

How Working Memory Develops

Working memory begins to develop fairly early in infancy. When you're playing with a baby and you hide a favorite toy under a blanket, you know the baby is using working memory if he lifts the blanket to retrieve the toy. This is because the baby is able to hold an image of the toy in mind as well as the memory of what you did to hide it.

Children develop *nonverbal* working memory before they develop *verbal* working memory because this skill begins to emerge before language does. When children develop language, however, their working memory skills expand because now they can draw on both visual imagery and language to retrieve information.

We tend naturally to limit our expectations for working memory in very young children. Before the age of 3, we generally expect children to remember only things that are in close proximity—either in time or in space. If we want them to do something, we don't say, "Would you mind putting your toys away after you finish watching *Barney*?" (unless we also expect to cue them once *Barney* is over). And while we might ask them to put all their blocks in the toy box while we're standing in the playroom with them, we generally don't instruct them to go to their bedroom and do a similar task all by themselves.

Gradually we're able to stretch both time and distance in terms of what we expect our children to be able to remember. One caution: In the work we've done with schools for children with complex learning disabilities or dyslexia, those teachers tell us that working memory is particularly challenging for this group of students—and there is a lot of research to support that observation. This suggests that these children may need cues, prompts, and reminders for longer than we think we should have to provide them. There are some children whose working memory skills may never "work" as well as we'd like. In this case, the long-term goal should be for these children to identify those situations where working memory challenges get them in trouble and to develop a compensating strategy (an environmental modification) that works for them.

In the questionnaire on the facing page, you can evaluate where your child might fall on the developmental ladder based on the kinds of tasks children are capable of carrying out independently at various childhood stages. Using this scale will give you a closer look than the scales in Chapter 2 did at how well your child uses the skill of working memory.

A Good Place to Start

Probably the most important thing to understand about working memory is that it allows for the temporary storage of information but is restricted in two important ways: (1) by the length of time information can be held in memory and (2) by the amount of information it can manage at any one time. The research consensus is that working memory develops over the course of childhood, and adult capacity is 4–5 items. The amount of information retained can be increased to some extent by "chunking"—by combining pieces of information into groups. Think of telephone numbers: 10 numbers are a lot to hold on to, so we chunk them into sets of three, each of which has no more than four numbers in it (for example, 708-555-1555).

What this tells us is that working memory is limited in general, so the working memory of a child who struggles with this executive skill is even more limited. A good place to start then is to understand that if we are relying on our children to recall verbal instructions of any appreciable length, more often than not we're going to be disappointed if not frustrated. Below we provide lots of suggestions for how to work around weaknesses in working memory, but our first piece of advice is this: whenever possible, pair the verbal with a visual.

How Good Is Your Child's Working Memory?

Use the following scale to rate how well your child performs each of the tasks listed. At each level, children can be expected to perform all the tasks listed fairly well to very well.

Never or rarely	Does but not well (about 25% of the time)	Does fairly well (about 75% of the time)	Does very well (always or almost always)
0	1	2	3

PRESCHOOL/KINDERGARTEN

- ☐ Runs simple errands (e.g., gets shoes from bedroom when asked)
- ☐ Remembers instructions that were just given
- ☐ Follows a routine with only one prompt per step (e.g., brushing teeth after breakfast)

LOWER ELEMENTARY (GRADES 1–3)

- ☐ Able to run an errand with two to three steps
- ☐ Remembers instructions that were given a couple of minutes earlier
- ☐ Follows two steps of a routine with one prompt

UPPER ELEMENTARY (GRADES 4–5)

- ☐ Remembers to perform a routine chore after school without reminder
- ☐ Takes books, papers, assignments to and from school
- ☐ Keeps track of changing daily schedule (e.g., different activities after school)

MIDDLE SCHOOL (GRADES 6–8)

- ☐ Able to keep track of assignments and classroom expectations of multiple teachers
- ☐ Remembers events or responsibilities that deviate from the norm (e.g., permission slips for field trips, special instructions regarding extracurricular activities)
- ☐ Remembers multistep directions, given sufficient time or practice

Here's an example: We did some work at the American School in London a while back. At the secondary level, the school uses a co-teaching model, with a support teacher as well as a general education teacher in every classroom. A support teacher for an English teacher reported that whenever the teacher he was supporting began giving verbal instructions for a class activity, the support teacher immediately went to the whiteboard and wrote the instructions in a brief bulleted list. This approach certainly helped the students with learning disabilities he was there to support—but it probably helped many other students in the class as well.

Building Working Memory in Everyday Situations

- ***Make eye contact with your child before telling him something you want him to remember.***
- ***Keep external distractions to a minimum if you want your child's full attention*** (for example, turn off the television or turn down the volume).
- ***Have the child repeat back to you what you just said, so you know she has heard you.***
- ***Use visual or written reminders***—picture schedules, lists, and schedules, depending on the age of the child. Prompt the child at each step to "check your schedule" or "look at your list." Consider keeping packs of sticky notes available so that you can quickly add a visual reminder to verbal instructions. We met a mother who got tired of nagging her son about taking out the trash. He kept putting her off by saying, "As soon as I get to a stopping point in the game I'm playing," but then he'd forget to follow through. She finally took a sticky note and wrote TRASH on it, walked by where he was sitting, and slapped the note on his shirt without saying a word. Not only was this a successful strategy, but the mom reported that he actually told her that the reminder helped.
- ***Use silicone bands that children can slip on their wrist to help them remember.*** We met a teacher who had students select a different-colored band for each subject, then slip a band on their wrist if they had homework in that subject. Her rationale: the students may forget to open their assignment books, but at some point in the evening they'll see those bands on their wrist and be reminded of the work they have to do.
- ***Post a large whiteboard calendar in a prominent place in your house.*** The calendar *can* be used to remind the family of regularly scheduled activities (like dance classes every Thursday) or for special activities (a field trip this Friday). Parents may prompt children to "check the calendar," but if they're worried that a child will glance at it and say they complied with the request, they can ask to child to read aloud what's on today's schedule.

- ***Rehearse with the child what you expect him to remember just before the situation*** (for example, "What do you need to say to Aunt Mary after she gives you your birthday present?").

- ***Help the child think about ways to help her remember something important that she thinks will work for her.*** Children in middle school can use cell phones for text messages or any of a number of reminder apps to remember things they have to do. We've known students who text themselves as a way of remembering something important. It's also possible to arrange for the text to be sent at a specific time (such as just before they have to do what they're trying to remember to do).

- ***With older students, teach them the concept of "offloading."*** This refers to the idea that the brain doesn't have to work as hard when you can find a way to "offload" some of the tasks you're asking it to do. Examples: The brain doesn't have to allot space to remembering homework assignments when we write them down. It doesn't have to work at remembering something we have to do after school if we build an alarm into our smart phone to remind us. This may be a hard sell with some teenagers, especially those with ADHD, who see any extra step as not worth the time or energy. These kids also may have an inflated sense of their own capabilities. In the research this is referred to as *positive illusory bias.* The youngster may think, "I don't have to write down my homework because I'll remember it." They put a positive spin on their working memory skills—but, sadly, it's an illusion.

- ***Beware of computer training programs that promise that children can enhance their working memory by spending a few weeks playing computer games.*** While it's tempting to think there is an all-purpose exercise program that will strengthen working memory, the research on the impact of computer gaming programs yields mixed results at best. The summaries of research that we've seen indicate that while playing video games to enhance working memory may yield positive results, primarily the research shows that kids who play these games get better at playing the games but the evidence that it generalizes to other situations (consistently remembering gym clothes on PE days, for example) is scanty.

Having said this, there's certainly no harm in playing memory games with children. Card games such as Concentration, Lotto, or Memory games (Amazon offers an array of these) are fun to play and may increase children's ability to focus in the moment and remember important information. And you can enhance their benefit by talking with children about what strategies they used to help them remember. I remember (this is Peg talking) my mother playing a game with my brothers and me when we were quite young in which she would place several disparate objects on a tray (spoon, block, toy soldier, and so on), show us the tray for a short period of time, then block our view of the tray and remove a single object. She then asked us to identify what object she'd removed. Again, it was fun to play and may have helped increase our powers of observation and working memory.

- ***Consider using a reward for remembering key information or a natural or logical consequence for forgetting.*** For example, a child might be allowed to earn time on a video game for each day he brings home all his homework materials. Rewards and consequences are useful when your child's working memory is only mildly underdeveloped. If a child has more significant working memory weaknesses, then compensatory strategies and rewards may be necessary. Our rule of thumb is that an intervention (including one that employs rewards) should yield the desired result 75–80 percent of the time to be considered successful.

- ***Remember to praise your child for remembering something or for using a strategy to remember something.*** Here are some examples: "I like the way you remembered to put everything in your backpack as soon as you finished." "You remembered to get your teacher to sign off on your assignment book every day this week—what strategy did you use to help you to remember?" "You remembered to check your work before putting your math homework in your homework folder. I see that you were able to fix a couple of mistakes."

Ending the Waiting Game: Teaching Your Child to Get Dressed without Dawdling

Annie is a bright 8-year-old second grader who can be absent-minded at times but is one of the more advanced students in her class. She has a variety of interests and is a good friend to her peers. Her mother would like to see her develop more independence, particularly around recurring tasks such as picking out clothes and getting dressed for school. Because Annie's best friend, Sarah, has been managing the dressing process for the better part of a year, Mrs. Smith doesn't think this is an unrealistic expectation for Annie. She and Annie have talked about it, and Annie has said she'd like to do it, particularly because she'd like to choose her own clothes.

However, each morning a familiar pattern unfolds: "Annie, it's time to start getting dressed." "OK, Mom," Annie says as she heads upstairs. Mom busies herself getting ready for work and after about 10 minutes calls to Annie. "Annie, how's it coming?" "OK, Mom," comes the reply. After another 5 minutes, Mom calls out, "Annie, you need to move it along." "OK" comes the reply again. Shortly after that Mom goes upstairs to find Annie sitting on the floor drawing, still in her pajamas. "Annie!" says Mom with great frustration while grabbing some clothes. Annie begins to protest the choices, but her mom silences her and stays long enough to see that Annie is well into getting dressed before telling her to be downstairs "in 1 minute!"

In a calmer moment, Annie and her mother talk it over and decide that Mom will watch Annie go through this task to decide what might help. Although a bit slow, Annie is able to pick out her clothes and get dressed without major problems. However, in spite of her good intentions, when Annie tries to manage the task on her own, her mother still ends up frustrated at having to give Annie repeated reminders.

They decide to try another approach. If Annie agrees to work with her on a plan, Mom agrees to let Annie pick out some new clothes she has wanted. First they make a list of the steps in the dressing process and Annie writes these down. Annie says that sometimes it's hard for her to choose what to wear, so they decide to put out a choice of two outfits the night before and Annie picks out a place where they will be kept. They then do a pretend walk-through, and Mom takes a digital photo of each step. Annie matches the steps she wrote to the pictures and hangs the "picture board" next to her closet. (If you think your child would struggle with a two-choice option, let her pick one set of clothes.)

In the beginning, Annie thinks that besides cueing her that it's time to get dressed, it would help if Mom came upstairs with her to watch her get started and then left. Mom reluctantly agrees, provided that it's temporary. The final issue is time. Morning is usually rushed, and when Annie is slow, her mother gets upset. They buy an inexpensive digital timer, and Annie feels like 12–15 minutes is plenty of time to finish. Mom agrees. Because Annie sometimes gets lost in the process, she sets the timer for 5-minute intervals; that way, even if she gets involved with something else, the timer can be a cue. As an added check, when her mother hears the timer, she yells to Annie, "What step?" and Annie says where she is in the sequence.

Over the first few weeks, Annie has one or two mornings where Mom has to prod her, but overall they're both pleased. Annie feels comfortable with Mom not going upstairs with her, but she still likes the verbal check-ins and the praise from Mom when she does a good job. They also plan a shopping trip together.

Intervention Steps

Step 1: Establish a Behavioral Goal

Target executive skill(s): Working memory

Specific behavioral objective: Annie will complete her morning dressing routine within 15 minutes with no more than one adult prompt.

Step 2: Design Interventions

What environmental supports will be provided to help reach the target goal?

- Advance selection of clothes
- Timer
- Parent observation and prompts in early stages of the plan

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What specific skill will be taught, who will teach the skill, and what procedure will be used to teach it?

Skill: Working memory (follow a daily morning routine)

Who will teach skill? Mother

Procedure:

- Mother and Annie meet to discuss the problem and desired outcome.
- They make a list of steps, and Annie writes them down.
- Two outfits are selected the night before.
- Annie does a walk-through, and Mom takes a picture of each step.
- Annie matches the written steps to the pictures and posts the sequence next to her closet.
- Annie decides on the time needed, and they get a timer.
- Mom agrees to cue her and watches her start for a week or so.
- Mom checks in when the timer beeps at each 5-minute interval.
- Mom keeps track of the number of reminders needed each day.

What incentives will be used to help motivate the child to use/practice the skill?

- Praise from mother
- Purchasing new clothes

Keys to Success

- *Be enthusiastic and thorough in the early stages.* This system is usually successful when first implemented because it's novel and provides systematic cueing as well as an incentive. When it breaks down, it's often because parents haven't monitored the system closely enough in the initial stages.
- *Err on the side of cueing for too long.* In our experience, many kids need ongoing cueing, and when parents are reluctant to provide it, initial gains often disappear. If your child "relapses" when you start to pull back on cueing, step it up and fade out of this role very gradually, in baby steps.

The Absent-Minded Athlete: Teaching Your Child to Keep Track of Sports Equipment

It's 7:30 Monday morning, and Jake, a 14-year-old eighth grader, is on his phone texting his friends. Because he is dressed, has eaten, and says his stuff (school backpack and soccer bag) is ready, his dad is OK with him doing this until the bus comes at 7:45. He has a soccer game today, and to be on the safe side Dad says, "Jake, check your soccer bag to make sure you have everything." "No problem" comes the reply as he continues to text his friends. A couple of minutes before the bus comes his father cues Jake and his sister to get ready. When Jake comes into the hall, his father asks if he has checked his soccer stuff, and he quickly opens the bag and rummages through it. "What did you do with my shin guards?" he accuses his father in a panic. Irritated and unable to resist the urge, Dad replies that he wore them to work. Jake, frustrated, says, "My coach will kill me, and I won't be able to play." The bus arrives, and Dad tells him they'll try to work something out, although he's not sure what. At the game his coach is upset with him and tells him that he can't play. Just before the game starts, his father meets a parent who has an extra pair of shin guards. He debates whether to let Jake suffer the consequences of not playing, but because this has happened before and it hasn't solved the problem, he doesn't want to see him in more trouble with his coach. He gives the guards to his son, but they agree that this will not happen again.

That night they talk about a system to help Jake organize and remember equipment. Because he is a three-sport athlete, this is basically a year-round problem. Dad suggests a list that he can use to check off equipment as he packs his bag. While this might help him know if he has what he needs in his bag, it doesn't solve the problem of organizing his equipment so that it is readily available when he needs it. His father jokes that maybe he should just sleep with his equipment on the night before a game so he can just pack it in the morning and know he has everything. Jake says that maybe they should make a cutout of Jake that wears the sports gear. That's a lot of work, so they settle on using a coat rack, with a designated spot for each item. This gives him a place to store his equipment and easily see what's missing. They agree to put labels on the rack for each piece of equipment needed, and Dad agrees to cue Jake the night before to check the rack and pack. For his part, Jake agrees that when Dad cues him to do this the night before, he will do it and not wait until the morning. They also agree that if he doesn't follow through and forgets something, Dad won't rescue him.

Intervention Steps

Step 1: Establish a Behavioral Goal

Target executive skill(s): Working memory

Specific behavioral objective: Jake will organize his sports equipment

before each game and have the equipment he needs for each game with no more than one adult prompt.

Step 2: Design Interventions

What environmental supports will be provided to help reach the target goal?

- A coatrack that will be labeled with equipment needed for practice and games
- Reminder from his dad the night before a game to check and pack his equipment

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What specific skill will be taught, who will teach the skill, and what procedure will be used to teach it?

Skill: Working memory (remember all required sports equipment for practice and games)

Who will teach the skill? Father

Procedure:

- Jake and Dad meet and agree on a plan for organizing the equipment.
- Dad supplies Jake with a coatrack.
- Jake makes labels and hooks for all equipment and puts them on the coatrack.
- He tries one practice run with his father watching.
- Dad agrees to cue him to get equipment ready the night before.
- For 2 weeks, Dad checks with him after he has given the cue to ensure that he has followed through.

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What incentives will be used to help motivate the child to use/practice the skill?

Jake will be able to participate in sports without experiencing consequences from coaches for not having equipment.

Keys to Success

- *Don't rely on your child's statement that they have acted on your cue.* In this example the coatrack served as a reminder and an organizing

tool for Jake. While this may be enough in most cases, children with working memory weaknesses, when asked about or cued to remember something, will often indicate that they have done what they need to do or will take care of it and then proceed to forget. Therefore you'll need to follow up the cue with a check to see if your child has in fact acted on the cue. Acting at the time that the cue is given is key, which may involve your checking on a more frequent basis until the desired behavior is established.