

Executive Function

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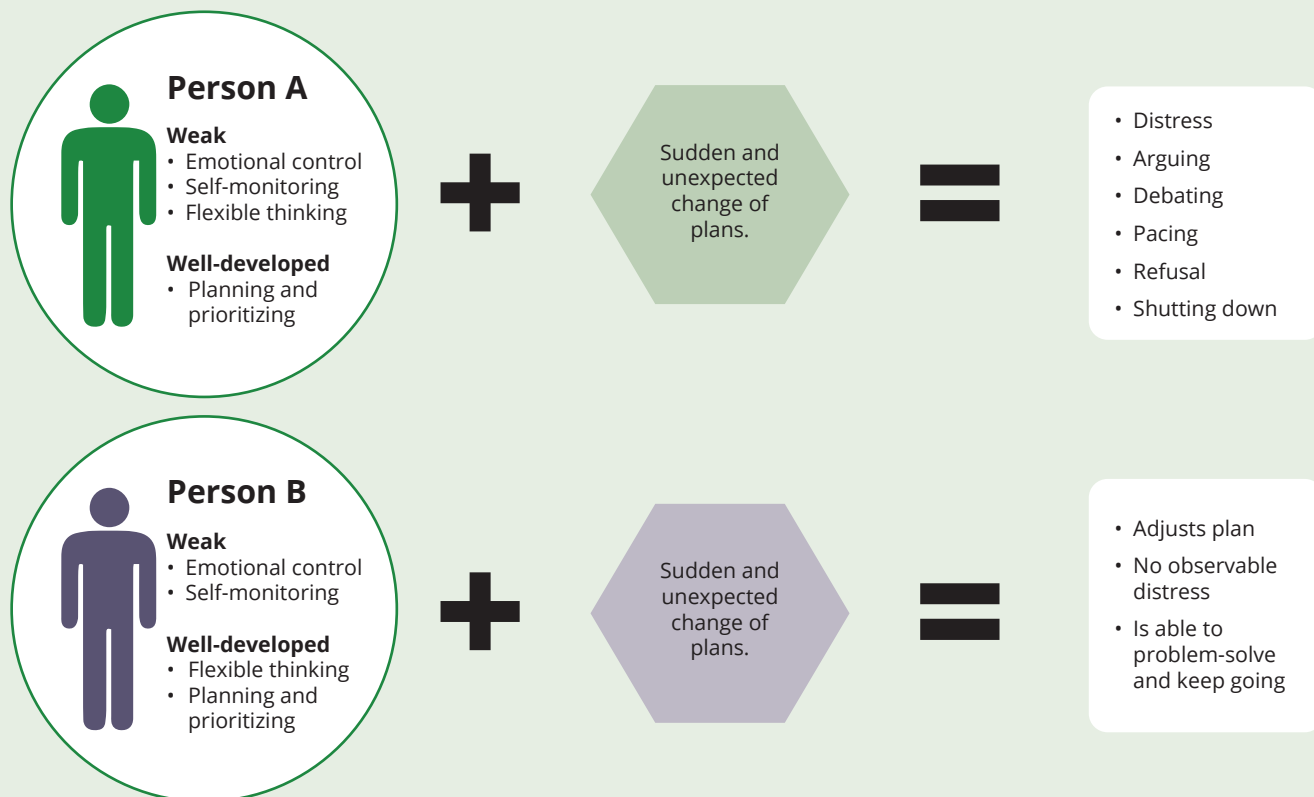


Executive functions are various systems in our brain that allow us to regulate and control our behavior as we seek to accomplish goal-directed tasks. Executive functions include impulse control, working memory, emotional control, self-monitoring, planning and prioritizing, task initiation, organization, and flexible thinking.

Impulse Control	The ability to inhibit responses.
Working Memory	The ability to store and use information in one's memory to perform a task or make decisions based on past experiences.
Emotional Control	The ability to manage emotions in order to achieve goals, complete tasks or direct behavior to interact effectively with others.
Self-monitoring	Being aware of one's own behavior, feelings and thoughts.
Planning and Prioritizing	The ability to envision the steps needed to achieve a goal/complete a task, as well as to make decisions about what items should be the focus of attention in pursuing a goal or completing a task.
Task Initiation	The drive required to get started on a task.
Organization	The ability to create and maintain systems to keep track of information and materials needed to communicate or complete a task.
Flexible Thinking	The ability to think about multiple concepts simultaneously, to consider many aspects of a complex situation, and to reflect on different perspectives and solutions.

Executive functions all work together and can be thought of as resembling an orchestra. Each of these areas controls a different section of the orchestra, but all sections must work together to create a cohesive performance. The songs that the orchestra plays are comparable to executive functioning skills. **Impulse control** allows us to inhibit our responses or to stop ourselves from blurting something out or acting without thinking. **Self-monitoring** is being aware of our own behavior, feelings and thoughts. **Flexible thinking**, or cognitive flexibility, is the ability to think about multiple concepts simultaneously, or think about many aspects of a complex situation. It can also mean being able to switch a behavioral response according to the context of a situation. These three areas of executive function work together in order to produce the executive functioning skill of **waiting**.

Everyone has varying abilities of executive function, as well as unique strengths and challenges. Executive functions must work together to produce the observable skills and tasks that we use every day to manage our behavior and relationships. The variation in skill level, however, results in a wide range of individual differences. For example, one person could be proficient at planning and prioritizing abilities, but weak in flexible thinking. If such an individual also had weak emotional control and self-monitoring, he or she could be prone to meltdowns when things don't go according to plan. Another individual who is good at planning and prioritizing, as well as flexible thinking, may be able to remain calm and adjust in situations that don't go as planned, even if that person has weak emotional control and self-monitoring abilities.



Autism Spectrum Disorder and Executive Function

Some individuals have executive dysfunction, which means that they have deficits that consistently and routinely interfere with their ability to be independent or successful. Although data in this area of research can be hard to measure, some reports suggest that up to 80 percent of individuals with autism spectrum disorder (ASD) have significant deficits in the areas of executive function. It is important to note that Attention Deficit Hyperactivity Disorder (ADHD), a commonly co-occurring condition with autism, is closely associated with executive dysfunction. These three conditions are all genetically and behaviorally intertwined.

Executive function plays an important role in developing independence, and deficits in this area can pose a serious challenge. Parents and caregivers need to address any patterns of weakness in their children's executive functioning so that they can fulfill their full potential for independence. We often focus on improving executive functioning skills because they tend to be more concrete, and because these skills make it easy both to observe and to measure tasks and behaviors. While this is a good approach, parents and individuals working on executive functioning should also try to understand their children's unique strengths and weaknesses within their areas of executive function. This can help predict and prepare for potential challenges in future tasks. Returning to the orchestra analogy, working on specific executive functioning skills is like noticing that a violin player is missing notes in a specific piece of music and having the violinist then practice the piece over and over until able to play it without a mistake. In the end, improving the area of executive function responsible for the weak skill is comparable to replacing the struggling violinist with a more skilled musician so that every piece will likely be played without errors.

Executive Functioning Skill	Areas of Executive Function Involved
Waiting	impulse control; self-monitoring; emotional control; flexible thinking; working memory
Following multi-step directions	working memory; planning and prioritizing; task initiation; self-monitoring; emotional control; organization; flexible thinking
Completing and turning in an assignment on time	working memory; planning and prioritizing; task initiation; self-monitoring; emotional control; organization; flexible thinking; impulse control
Tolerating frustration	impulse control; emotional control; flexible thinking; self-monitoring
Adjusting to a change in routine	flexible thinking; self-monitoring; emotional control; working memory
Transitioning from one activity to another	emotional control; flexible thinking; working memory; self-monitoring; planning and prioritizing; task initiation

Overcoming Executive Function Challenges

As you seek to help your child with executive function challenges, you may find the following four-step strategy helpful.

STEP ONE

APPRECIATE THE COMPLEXITIES

The first step to overcoming challenges in executive functions is being able to appreciate their inherent complexity. Consider for a moment the following classroom situation. The teacher is giving a lesson about the ocean. As the class learns about the ecosystem of the ocean, a student raises her hand and begins relating a family vacation to the Pacific Ocean. Another student tells the class that his family went to Hawaii last year where he saw a butterfly fish while he was snorkeling in the ocean. The class is briefly sidetracked from learning about the ocean to talk about family vacations. After a very brief discussion about vacations, the teacher takes a long breath, turns to the blackboard, points and then continues with her lesson about the ocean's ecosystem. Most children will understand that, at this point, the class will stop talking about family vacations and will focus back on the lesson. However, these signs may not be obvious to a child with executive dysfunction.

A wide range of executive functions are at play in this scenario. The children displayed cognitive flexibility by understanding that it was okay to briefly go off-topic. They also monitored social information and were able to respond to the teacher's cues to return to the lesson by recognizing priorities. After the teacher refocused on the lesson, the children used impulse control, flexible thinking, working memory, and prioritizing by focusing on the lesson and not on personal experiences related to family vacations.

Those children with well-developed executive functions can recognize social cues, adjust their behavior, and transition smoothly and intuitively from the lesson to the sidetracked discussion and back to the lesson again. Autistic children with executive dysfunction, on the other hand, may have great difficulty in navigating moments like this. They may be concerned about the lesson interruptions or annoyed that they weren't able to share their own personal experiences. They may also have difficulty returning to the lesson, focusing instead on their memory of a personal experience or on their annoyance that they didn't have a chance to share it. For autistic students with executive function deficits, some or all of these skills must be taught directly.

STEP TWO

DETERMINE THE UNDERLYING EXECUTIVE FUNCTION

While some children may be labeled "disruptive" or "unmanageable" at home or at school, these labels do not actually give insight into the underlying issue. It is important for parents and therapists to determine the underlying executive functioning skill that needs to be addressed. Do they have difficulty waiting? Do they act without thinking? Do they lack the ability to see the big picture or other people's plans and intentions? Parents should determine the specific behavior that is disruptive, and then seek to understand the executive dysfunction that is at the root of the behavior. Doing so will help determine the intervention and strategies to overcome the challenges.

STEP THREE

CAPITALIZE ON A CHILD'S STRENGTHS

It is well known that children with autism have many strengths. We can teach executive functioning skills by taking into consideration what we already know about autism and using the most common learning styles for children with ASD. Some suggestions are listed below.

Use Visual Strategies

Since children with autism tend to be visual learners, using visual aids will help your child address difficulties with organizing. People who are good at organizing and planning must be able to picture themselves in different future scenarios. For example, if you are getting ready to leave the house to run some errands, go to work, and then go to the gym, you need to prepare for a long day away from home and to remember multiple items. If you have well-developed executive functioning, you may not even realize how much is happening in your brain to get you through this day. Whether you realize it or not, you imagine yourself as you move through the day. You imagine the errands you plan to run and can picture where you need to go and which routes to take. You will keep in mind the items that you'll need throughout the day. This could include your wallet, purse, receipts, packages to mail, shopping list, a change of clothes for the gym and a briefcase. You might even go to the bathroom before you leave the house because you just finished your third cup of coffee and won't be at your office for another hour. If you're aware of weaknesses in your planning and prioritizing, working memory or organization, you might put some things in place to help you be successful. For example, you might make lists or keep the items you need to remember in a specific location so that you won't forget them.

We can help autistic individuals strengthen their planning and prioritizing, and organization by using visual maps or picture mapping. If your autistic child has trouble planning what he/she will need or want when away from home or routinely forgets to take needed items, print out pictures of these personal items. These could include a lunchbox, coat, electronic devices, a backpack, a water bottle, a guitar, headphones, and book. You can also print out pictures of the settings and destinations, such as the car, a doctor's office/waiting room, school, a sibling's soccer game, or a music lesson. Next, print out a picture of your child and discuss various scenarios like riding in the car, waiting for an appointment, going to school, or going to a lesson. Help the child imagine details related to the situation, as well as your child's experience of that situation. For example, you can take a picture of the interior of your car and practice helping your child figure out what it will feel like to ride in the car on the family road trip. Prompt your child to consider aspects of a long car ride that you know can be difficult for your child. If your child is disturbed by a sibling who sings or eats a snack in the car, ask what your child should bring to address this situation. Your child might then point to the picture of the headphones and bring the headphones to the car. Move through these situations by helping your child to plan and anticipate items he or she may want. You can then move towards prompting your child to think about or imagine how to remember these items and how to pack them, thereby helping to create systems of organization. Of course, you will need to adjust these strategies based on your individual child's abilities. Not all children will be able to work through the verbal components of this strategy and may rely more on the visual aspects.

Use Special Interests

Use a special interest, or something meaningful, to help an individual with autism make plans. Using meaningful and important items will help children be invested in learning. Imagine that your child's special interest is superheroes, and that he/she is going to a comic book convention. Your child is really excited about this convention, keeps talking about it, and shows you that it's on the calendar. This is a prime opportunity to help your child with planning skills. Get a picture of the convention room, or the layout of the convention center. Help your child visualize walking around the convention. Ask what your child wants to do at the convention and what items to bring. Your child might want money to buy souvenirs, or a sharpie to get an autograph. When children create a plan around something they enjoy, the concepts they learn will stay with them.



STEP FOUR

TEACH A SKILL AND THEN BROADEN ITS APPLICATION

I once evaluated a preschool-aged boy who had been characterized by an experienced teacher as “the worst student” in the class. When his mother brought him for an evaluation based on the teacher’s reports, she noted that she didn’t have many problems with him at home. As she and I were speaking, her son was playing in the next room. At one point, he came into the room to ask her a question. As he entered, she continued talking to me while handing him a hair tie from her wrist. He fiddled with the hair tie while she finished her thought. She then turned her attention to him and took the hair tie back. He asked his question, which she answered, and she then continued her conversation with me as he left the room. What had just happened?

The mother explained that her son often interrupted her while she was on the phone, speaking with her husband, or writing an email. She tried to come up with something that would signal to him that it was *not* his time to talk. Rather than a “talking stick,” it would be the equivalent of a “waiting stick.” She decided to use a hair tie instead of a stick because she always had one around her wrist. She taught him that when he was holding the hair tie, he had to wait quietly for her to be ready to listen and help him. They practiced this procedure many times. She may not have realized it but she included several important components to the plan that likely contributed to its success. First, by giving him the hair tie, she ensured he had something tangible to fidget with, which served as a visual reminder of the need to wait. Second, she only made him wait for a brief period of time. In this case, it was no more than 10 seconds, which is in line with what he could reasonably be expected to do given his development. Third, she reinforced his compliance by giving him the attention that he wanted, after he waited. She found a simple and age-appropriate solution to teach her child how to wait.

Skills that are taught in a very controlled and specific way, such as in the example above, must eventually be expanded to allow for their application to situations and settings that are similar. How could this practice be expanded to the classroom and to other authority figures? The mother could teach the use of other non-verbal cues, such as holding up one finger to signify wait. She could begin to vary the wait signals she gives, sometimes giving the hair tie, sometimes using the hand signal. She could also work towards having him wait for a longer period of time. Start by teaching a skill in a specific scenario, and then consider how to generalize and expand its use.

Conclusion

There will be times when you work on specific executive functioning skills very intensely, especially when specific behaviors are causing a problem at home or at school. This was the case for the mother with the hair tie. However, it can become overwhelming as it is not possible to target every skill in such an intense manner. As a result, it’s important, on occasion, to see the big picture and determine the value of focusing on a particular skill and its contribution to the goal of independence.

Caregivers should not wait for a problem to arise before working on executive function. Given how common executive dysfunction is for children with autism, caregivers should be proactive. Most, if not all, types of therapy for children with autism, including speech, occupational and behavioral therapy, address executive function, because progress in any area of therapy is difficult without these skills.

Parents and caregivers should recognize that improving executive function is a work in progress. Typically, significant changes do not occur overnight. Periods of intense focus should be interspersed with breaks to reflect and take stock. Don’t be discouraged if change is slow. When parents are able to take a step back and evaluate the progress their child has made over a span of time, they will see that change **is** happening. Be patient. Look back and celebrate the steps your child has taken, and look forward to a bright and successful future.



Meghan Barlow, Ph.D., is a pediatric psychologist specializing in the assessment and treatment of children with autism spectrum conditions, anxiety, attention deficit disorders, depression, behavioral concerns, developmental issues, and chronic medical problems. She earned her Bachelor’s degree from Denison University where she majored in Psychology and then earned her Ph.D. from Kent State University in Clinical Psychology. She received specialty training in the area of child clinical/pediatric psychology during her internship through the University of Louisville School of Medicine and Kosair Children’s Hospital. She continued her training with the Cleveland Clinic Children’s Hospital where she completed a post-doctoral fellowship. Meghan was hired to remain on staff at the Cleveland Clinic. During her time at the Cleveland Clinic, she developed a pediatric primary care consultation service, completed comprehensive assessments in the Lerner School for Autism, and maintained a clinical therapy practice serving children and adolescents with a variety of concerns. After several years on staff at the Cleveland Clinic, Meghan opened a private practice where she is passionate about providing excellent clinical care to children and adolescents

who are experiencing emotional, behavioral, or developmental challenges, as well as educating the community about these topics. Meghan uses a cognitive behavioral approach to therapy and a variety of evidence-based therapeutic interventions in treatment. She served as a member of the Board of Directors for Connecting For Kids, a non-profit dedicated to providing support and education for families with concerns about their child’s development, and she earned the 2017 Board Member of the Year Award for her service. Meghan enjoys public speaking and has formed a partnership with the Lake Erie Nature and Science Center where she presents on The Preschooler’s Perspective. Additionally, she speaks to many local organizations and provides training for school students and staff. Meghan travels nationally and internationally to provide continuing education for professionals who work with students on the autism spectrum. In her personal life, Meghan enjoys spending time with her husband and children and especially loves vacationing at their family cottage in northern Michigan.

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