



# Executive Function & ADHD: A View From the Conductor

## **Questions & Answers**

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Following are questions and answers presented during the Executive Function & ADHD: A View From the Conductor webinar held on November 24, 2020.

**Q: Other than the Executive Coaching Model, are there additional executive functioning recommendations or interventions that you have found helpful to support students with ADHD-I or SCT in the classroom?**

**A:** Executive coaching as we understand it comes from the work of Mark Ylvisaker and Tim Feeney and has formed the foundation of effective interventions, including our own work on the BRIEF2 Interpretive Report and upcoming intervention guides, and Dawson and Guare’s intervention model (e.g., “Executive Skills Coaching with Children & Adolescents”). This kind of intervention is really a series of scripts for asking a student, or adult, about what they want to accomplish (goal), why that is important (why), how they will approach their goal (plan), following the plan (do), then looking back to see what worked and what didn’t work (review), and thinking about what they might do differently the next time. It applies to managing a bunch of school or work tasks (e.g., a backlog of reports that are due), one work task (e.g., writing a difficult report), home chores (e.g., cleaning a room, making a meal), and social activities (e.g., playing successfully with peers).

A model for how we might create evidence-based interventions using this coaching model is Kenworthy et al.’s [Unstuck and On Target!](#) This is the first “cookbook” coaching intervention that has been through a randomized clinical trial and found good support for efficacy. It is specifically designed to help students be more flexible but is a great model for how we can develop and test such interventions in the future.

Coaching can be particularly useful for students with attention, planning, organizing, and monitoring problems. In fact, it is probably best for these students, and less effective for students with impulsivity. Within a coaching model, there are many commonly used accommodations and interventions for students with ADHD-I, such as placing the student more in the middle of things and in the teacher’s sight path, giving them a preview of what is to be learned, providing an outline, keeping things BRIEF2, and offering repetition. Many teachers know that they need to give the class instructions and then stop by the student with ADHD’s desk and provide a summary



of instructions and guidance. I like teacher “check-ins,” where the student is asked to do one or two problems or parts of an assignment, then bring the work to the teacher for review and positive feedback, then asked to do a few more problems, and so on.

We discuss lots of interventions for executive function problems in our BRIEF2 Interpretive Report, which is available when a protocol is scored on [PARiConnect](#). CHADD is a good clearing house for what works and what doesn't for ADHD symptoms. Also, books like *Late, Lost and Unprepared* by Cooper Kahn and Dietzel, *Smart but Scattered* by Dawson and Guare, and *Taking Charge of ADHD* by Barkley are all great resources.

For a good review of interventions for executive function problems, see [Diamond & Lee \(2011\)](#) and [Diamond & Ling \(2016\)](#).

## Q: What is the impact of the home environment and parenting on the development (or lack thereof) of EF?

**A:** This is an important question, as it can lead us to ways to support better executive function, or self-regulation, in children. Indeed, the early years up through early elementary grades are perhaps the most important in establishing good executive routines and habits. Early executive functions are predictive of long-term outcomes academically, behaviorally, socially, and likely vocationally. For example, teacher ratings of kindergarteners' executive functioning predicted academic development two years later, and early indications of executive dysfunction in children with ADHD predict outcomes by the end of high school and beyond.

There is a body of research showing that early adversity is associated with longer-term impact on self-regulation. For example, children with trauma histories are more likely to show problems with self-regulation. Often, they present early in elementary school with the characteristics of ADHD, usually combined presentation, and they may remain hypervigilant, with heightened sensitivity to threat and exaggerated emotional responsiveness. Amanda Roy, Cybele Raver, Dana McCoy, Clancy Blair, and others have done very large studies showing that poverty is associated with poor self-regulation, poor behavior control, and reduced academic success, and that relieving poverty—even to a small extent—can result in improvements in self-regulation. The research with ACEs, the adverse childhood events research begun by the CDC, clearly shows that the more adversity the child experiences, the worse their self-regulatory, emotional, and long-term health outcomes.



As I mentioned in the presentation, one of my most common referrals is, “the student is under the table throwing stuff. Evaluate.” We immediately know that something is going wrong for the student. Are they learning disabled and thus is being under the desk better than reading? Are they disinhibited, in keeping with an ADHD-C diagnosis, and can’t manage themselves? Are they depressed and miserable and this is how they express themselves? Is their home life so dysregulated and disruptive that they are unable to settle themselves and are perhaps dissociating? While the behavior is the same, the job is to figure out what causes the behavior—with a goal of improving it for the student.

## **Q: What does the research say about efficacy of EF, such as practicing specific EF skills? Is it possible to improve EF abilities through intervention?**

**A:** Yes, it is possible to improve executive functioning for many people, particularly for children. There are two ways to think about doing so: Improve the executive function directly via practice (e.g., practicing working memory span tasks) versus improve a person’s ability to manage their executive functions (e.g., executive coaching). The latter is likely more effective than the former, in general. For a good review, see [Diamond & Ling, 2016](#).

There have been attempts over the years to train executive functions directly in hopes of improving them. I grew up on Sohlberg and Mateer’s Cognitive Rehabilitation from the 1980’s, where we had people practice trail making, cancellations, and span tasks. This was a clever system, but it turned out that it was difficult to get generalization beyond the practice tasks to the real world. Today, we see executive/attention improvement systems that train working memory and attention directly, and people show some improvement on these tasks, with a little generalization for a short period of time. Thus, the direct training method is not as successful as we would like.

The greatest effects are seen in an executive coaching model. This can be applied to almost anything, from martial arts to doing math homework to engaging in play with peers. It is often referred to as “mindfulness,” meaning that we ask people to be present and aware of themselves. Martial arts training (or dance, skiing, etc.) are great places to implement the model. A good martial arts teacher asks students to calm themselves, be centered, and be “mindful.” Then they are asked to think of their goal, to plan their steps, to see themselves doing the steps or moves, to execute them,



and then to review what went well and what needs improvement. This is the essence of executive coaching. Studies show that exercise without coaching/mindfulness does not improve self-regulation, but that with coaching we see improvements. In essence, Mr. Miyagi was right.

## **Q: How do you explain average or above performance on working memory tasks on cognitive assessments, yet reported significant challenges with EF?**

**A:** This is one of my favorite questions. I hope to put together another webinar that discusses what performance measures (tests) of executive function tell us and what the BRIEF2 tells us. There are several lines of evidence for validity of each that we can examine, including:

- 1) Are they sensitive to problems with executive functioning in clinical groups?
- 2) Are they associated with biological markers of executive dysfunction (e.g., brain injury, brain imaging)?
- 3) Are they associated with real-world functioning (e.g., academics)?
- 4) Do the measures show improvement with treatment for executive function problems?

In brief, I would answer all of these in the affirmative for both tests and the BRIEF2, though to varying degrees.

To explain the differences between WM tasks (i.e., span tasks) and the BRIEF2 WM scale, it is important to look at what each is measuring. They correlate at about .25, meaning that there is a small but significant correlation between them, but there is a whole lot going on that is not shared between them. Digit span is the most widely used measure of any aspect of executive functioning, largely because it is included in standard cognitive batteries. Digit span is important for many students: Digits forward tells us if the student can capture and hold small amounts of information momentarily, and digits backward tells us if they can then manipulate that information at least briefly. A deficit in either tells us about an important problem. If a student can't hold a few digits in their head momentarily, then they are not likely capturing lectures/discussions in the classroom and more. If they can't do backward,



then I'm very concerned about concentration. Both are important to know: Digits backward is much more working memory vs digits forward which is, well, span.

On the other hand, the Working Memory scale on the BRIEF2 asks about holding information over time and interfacing with real world demands. It does not ask about momentarily holding information in mind or reversing it, but instead asks about forgetfulness, poor concentration, inattention, and so on.

Debbie Waber and colleagues published one of my [favorite papers](#) that directly addressed this question. They used the NIH normal brain development study data, with about 350 children who were being followed with multiple measures (e.g., brain imaging, medical tests, neuropsychological evaluations, etc.) over at least a 20-year span. Waber et al. correlated digit span and spatial span scores with multiple brain areas (brain volumes, cortical thickness) and did the same with the BRIEF2 Inhibit (as a foil) and WM scale scores. They found that Inhibit correlated with brain volume in a different area than did WM scale scores, meaning that they are measuring different things (great!). Then they found that digit span and spatial span both correlated with hippocampal volume. First, hold digits or locations is the same thing, essentially. Second, your memory storage unit, the hippocampus, holds small amounts of information at least momentarily, just like it should do.

Importantly, the BRIEF2 WM scale scores correlated with para-hippocampal volume. That is, brain tissue that is right next to the hippocampus. So, holding information is related to the hippocampus, while holding that information over time and interacting with real world demands is right next to the actual holding place. The authors suggest that while digit span reflects the actual holding of information, the BRIEF2 WM scale reflects the momentary binding of what is held with real world demands over time.

I know that is a lot to take in, but think of it this way—you want to know if the student can hold and manipulate information in active working memory, so you do digits forward (holding) and digits backward (manipulating), and maybe some other things, like mental arithmetic. But then you want to know if they are able to do so in the everyday real world, with multiple demands, with distractions, with emotions, with poor nutrition or lack of sleep, or with trauma, and so on. The BRIEF2 is capturing what is really happening in the child's everyday world, while span tasks are looking at the underlying part.



## Q: For children with an ADHD diagnosis, when testing, do you see a common relationship with low working memory and somewhat high processing speed?

**A:** This can happen, but there is no reliable pattern we can see on test performance in students with ADHD. Many students with ADHD diagnoses will exhibit lower scores on digit span. This might help confirm your hypothesis of an attention disorder. But it is important to remember that the largest meta-analysis of test performance in students with ADHD diagnoses found that less than half of them had poor performance on any attention/executive task. Thus, having a low score might support your hypothesis of ADHD, BUT having a normal score on WM tasks doesn't mean the student doesn't have ADHD.

In the same vein, many students who are impulsive seem to whip through our processing speed tasks quickly. They are just that, fast (though often make more mistakes than we expect). Doing well on speed of processing tasks doesn't mean they don't have ADHD. Interestingly, another study but the same authors as the meta-analyses (Pennington, Faraone, et al.) looked at EF test performance in students with ADHD vs reading disorder. They found very large overlap in performance on working memory tasks, speed of processing tasks, and impulse control tasks. The only difference was on phonological decoding, with LD students doing poorly and ADHD students doing well.

Russ Barkley and Gail Grodzinsky wrote a series of [papers](#) in the early 1990's. They looked at test performance in students with ADHD-I, ADHD-C, or LD vs controls. They found that poor performance on a continuous performance test and on verbal fluency was predictive of ADHD diagnosis, but 1) no other tests had this result, 2) no test discriminated between the two subtypes, and 3) absence of poor test performance was not at all predictive of absence of ADHD. For example, this paper:

In sum, our tests aren't that helpful in identifying the presence of ADHD. Poor performance might suggest the presence of ADHD, but good performance doesn't mean anything with regard to ADHD. It is the behaviors that you observe and that parents and teachers report that are by far the better predictors of ADHD diagnosis. As Barkley said (2012, pp. 190):

"Dogmatic adherence to the psychometric tradition of understanding and assessing



EF at its most basic cognitive level is grossly inadequate. It provides only a superficial evaluation of even the conventional phenotypic view of EF. It fails to capture entirely the multilevel, concentrically arranged, affectively/motivationally charged, socially important and culturally facilitated nature of the extended phenotype of EF/SR in everyday human activities.”

**Q: I've never heard the term sluggish cognitive tempo before. Is that a neuropsych term? Where can I learn more about it?**

**A:** This is one of my favorite groups of kids (and adults). It is a whole ‘nother talk, but in general, these are individuals who tend to be “drifty” and inattentive, often have at least slightly low motor tone (e.g., floppy, poor pencil grip and use), and are characterized by poor initiation. They just don’t get started. There is a natural history of development. They often do okay in elementary school until about fifth grade. Then the direct support from the teacher drops off and the assignments get bigger. These kids do not get started on their own, instead sitting and drifting, as if lost in a fog. They start declining in terms of grades in middle school, and parents ask for an evaluation. They do fine on cognitive and academic testing, often great in fact, yet can’t get going on their work. Parents are often quite frustrated by the time we see these kids, as the parents (usually mom) are pushing every night, sitting with the kid and arguing about homework. Teachers often view the student as unmotivated or uninvested, or even “lazy.” The students absorb this, and can become depressed, further suppressing their initiation.

These are very misunderstood students, and this can have lifelong implications. I evaluated a fellow long ago who was 55 years old. He had two degrees but could not keep a job. He would get a job and stop going after weeks or months. His wife insisted he get an evaluation because she was, understandably, getting frustrated. His low tone was remarkable, with “slushy” underarticulated speech. On interview, he said, “I asked my father how he got up and went to work every day all those years, and my father replied that it wasn’t a choice because he had a mortgage, bills, and kids. I just never felt that way.” In this way he captured it well: He did not feel the normal, internal, biological motivation that makes most of us get up and go give yet another test battery even when we don’t feel like it. We are biologically motivated to work in order to survive into the future.





There is a pattern on the BRIEF2 that should raise a question about sluggish cognitive tempo (SCT). In fact, we created the Initiate scale to capture this problem in young children who had been exposed to central nervous system chemotherapy and showed marked problems with initiation. We were not expecting to see it in individuals without that history, but it turns out that SCT shows an elevation on Initiate, Working Memory, and Plan/Organize most of the time.

While SCT is not a DSM diagnosis, there is a good literature going back to the 1980's. Russ Barkley has long been an advocate of recognizing this group of individuals and coming up with 1) a better label, 2) a diagnosis separate from ADHD, and 3) treatments. (The person who comes with a great label for SCT will do all of us a huge favor.) For now, SCT is identified as ADHD-I, even though they often aren't quite meeting ADHD-I criteria. It is the best we can do.

Treatment is very difficult. It takes a team including the kid, the family, and the school team. It is important first that the student understand that this is a real biological thing and not their fault, in particular it's not their lack of motivation. They have to be on board if we are going to make any headway. Medications have not been shown to be helpful to date. Having students jump around and get some energy lasts only very briefly. It is a challenge, and we don't have an answer.

Stephen Becker and Russ Barkley have written quite a bit about SCT, and Barkley has a scale. See [Kofler et. al \(2019\)](#), [Lee et al., \(2014\)](#), Barkley (2014), and [Becker & Barkley \(2018\)](#).

**Q: I am wondering about the requirement that teachers know the child for at least 6 months on the BRIEF2. It really limits our ability to get teacher ratings because of the transient nature of our teachers. Do they really not have teachers who have known the child for fewer than 6 months complete the form?**

**A:** We agree with you, and the BRIEF2 suggests that teachers have substantial contact and experience with the student. We suggest that being the classroom teacher and knowing the child for a month is sufficient. In the original BRIEF, we wanted to ensure that teachers knew the child well. In 20 years of experience with the measure,



however, we have learned much. This includes that teachers can usually complete the scale by the time the referrals start coming in the fall (i.e., fifth week of school).

## **Q: How effective is the BRIEF2 in assessing EF in adults? Is there a measurement tool for adults to your knowledge?**

**A:** The [BRIEF-Adult Version](#) has been out since 2005. We had a substantial amount of clinical data from a wide variety of well-defined clinical groups to work with and compared them with a standardization sample that was well-matched to the U.S. Census. We found that the BRIEF-A was sensitive to executive function problems in adults with mild brain injury, ADHD (medicated versus unmedicated), epilepsy, mild cognitive impairment, Alzheimer’s dementia, and others. The evidence for valid interpretation in the BRIEF-A manual is substantial and includes correlations with several other measures, clinical group studies, and factor analyses.

Since publication, there have been several hundred publications with the BRIEF-A in a wide range of clinical groups and typically developing groups. There are studies in psychiatric and medical and typically developing populations, including many clinical trials (you can search on [clinicaltrials.gov](http://clinicaltrials.gov)). It is an international standard for clinical and research work with many standardized versions around the world, and research translations from Afrikaans to Zulu and everything in between.

One of my favorites is a study by Giancola and Roth using an aggression scheme. They showed that people who described themselves as well-regulated on the BRIEF-A did not become aggressive regardless of whether they had real alcohol or placebo. People who described themselves as impulsive and dysregulated on the BRIEF-A also did not become aggressive when they had placebo, but became considerably more aggressive after one or two actual drinks. This creative study showed a very real-world association between self-reported self-regulation and behavior.

## **Q: When it is not ADHD, how do you best explain EF in lay-terms for a family who is convinced it IS ADHD?**

**A:** You raise an important point—it is a clinical art form to present complex concepts in a language that is accessible. That’s why I tend to talk more in my reports and in meetings about “self-regulation” (Barkley says it is the same as EF, though I think



there is a subtle difference: executive function is a construct that we believe happens in the brain; self-regulation is what we see as a result of executive functions).

If you score one or two BRIEF2 protocols on the PARiConnect system, you can retrieve a feedback report. We wrote that to help provide more “plain language” discussions/feedback about self-regulation. I would also recommend looking at Joyce Cooper Kahn and Laurie Deitzel’s *Late, Lost, and Unprepared*. It is a very accessible paperback that is about EF and NOT specifically about ADHD.

We also wrote a book on interpretation of the BRIEF2, the [BRIEF2 Interpretive Guide](#) (creative title!). We go into some depth later in the book about giving feedback and discussing meaning.

Finally, check out the [Harvard Center on the Developing Child](#). This website provides a nice overview of executive functions, including a parent friendly video, and a bunch of more detailed lit reviews and handouts of activities that parents/teachers can use.

## **Q: How do you accurately identify ADHD in children with autism since most of them already demonstrate EF deficits? Also, how do you identify ADHD in children with intellectual disabilities who also have deficits in overall thinking, memory, etc.**

**A:** This is an excellent question and one that has been kicked around, and changed, for many years. DSM-IV didn’t allow for diagnosis of ADHD if a child had ASD, though we all knew that it was possible to have ASD with some expected attention problems vs ASD+ADHD (as it is often referred to in the literature). DSM-V explicitly suggests identifying comorbid disorders, including anxiety and ADHD if they are beyond the typical range of each of these expected in children and adults with ASD. A couple of recent articles, one from [Kevin Antshel](#) who has always done exceptional work on the biological basis and real-world functioning in children with complex conditions, and one from my BRIEF2 co-author [Lauren Kenworthy](#) who has been studying executive functioning in children with ASD for the past 20 years, can help with this decision making.



## Q: Can you speak to ruling out observational data that is confounded by parent/teacher negative attitude?

**A:** There are many factors that play a role in parent/teacher/self-reports on any behavior rating scale. De Los Reyes and Kazdin have written several articles on the sources of variability in observer ratings and how to interpret them. You can find a comprehensive review in [De Los Reyes & Kazdin \(2004\)](#).

We discuss how to interpret multiple rater differences in the BRIEF2 manual, and more so in the BRIEF2 Interpretive Guide. In essence, differences are pretty common and can be fairly large. While about half of ratings are within one standard deviation of each other, and the majority of ratings are within two standard deviations, there can be some extreme differences that are meaningful. For example, I just evaluated a child on the spectrum for whom none of us at the school would have suspected anything other than he was a bit of a tech geek. He was an active participant in all of his classes, did his work, was earning all A's in competitive classes, and hung out with a couple other boys who loved tech (they were all in the tech design class). His parents reported, however, that he had fairly severe ASD behaviors at home, with huge meltdowns, pacing and hopping in his room, adherence to routines, and fascinations with videogames that he could not put down. As you might guess, the differences in ratings were extreme. My approach was to talk with the parents about how this is fairly common in bright students with ASD, and that it reflects differences in expectations, structure, routines, etc. in the settings. We did not disagree with the clinical diagnosis of ASD at all. We explained, however, that the educationally handicapping condition diagnosis of ASD had some subtle differences, and that he did not meet criteria. We also explained that we would meet the student's needs via classroom supports and 504 accommodations. Mom was understandably frustrated.

Then there are differences between raters because 1) the parent is angry with school, withdrawn, unobservant, etc. 2) the teacher is angry with student or parent and sees them as "bad" 3) the parent or teacher doesn't like rating scales, and 4) many other reasons. We put on our best clinical hats, evaluate if the differences in ratings are that big, try to interpret the differences if we think they are meaningful, and, if not, emphasize one over the other in our reports.



## Q: What information can you give on interpreting BRIEF2 results with children taking medication vs. not?

**A:** Typically, you would see reduction in BRIEF2 scores with effective medication in students with ADHD. There are about 100 peer-reviewed papers that used the BRIEF2 with students diagnosed with ADHD, including some medication trials. You can go to [clinicaltrials.gov](http://clinicaltrials.gov), search for ADHD and then “Behavior Rating Inventory of Executive Function,” and there are 67 trials listed. These include medication and behavioral interventions for individuals with ADHD, both children and adults. The BRIEF2 is sensitive to even subtle changes in children’s everyday functioning, including with medical intervention or behavioral intervention, or with recovery from injury such as concussion. My coauthor Gerry Gioia has put together a series of measures for tracking concussion recovery such as the [PostConcussion Symptom Inventory 2 \(PCSI-2\)](#) and the [PostConcussion Executive Inventory \(PCEI\)](#) that are part of the ConcussTrack system from PAR. The PCEI, based on the BRIEF2, is very sensitive to subtle changes over time as students recover from initial effects of a concussion. So, yes, the BRIEF2 is useful in measuring change in everyday self-regulation in response to behavioral or CBT interventions and in response to medication intervention.

## Q: Is one subscale associated with anxiety or depression, and is this an appropriate use of the BRIEF2?

**A:** Yes, and no/yes. First, the Shift scale tends to be elevated in students with anxiety. Students with anxiety often dislike change as it makes things unpredictable and adds to their anxiety: We all like to know what is coming next. When we first saw the Shift scale elevated, it was in children with ASD. Later, however, we were collecting data with a group of children with trauma histories and noted that the Shift scale was elevated in most of them, but none had ASD characteristics. We then realized that the Shift scale was driven up by anxiety. The Emotional Control scale tends to pick up on children who express their feelings loudly and clearly. This is not specific to a problem (e.g., depression or anxiety) but is often elevated in children with emotional disorders. It is also, however, often elevated in children with ADHD.



So, yes, the Shift scale and the EC scale both tend to elevate in children with anxiety (more so Shift) and mood disorders (more so EC). We often see an elevation on Shift and EC together, likely reflecting a student who doesn't like change and who melts down when confronted with change.

But also, no. The BRIEF2 has always been a measure of executive functions. It was not designed to be a measure of anxiety or mood disorders. That said, elevations on Shift and EC would make me want more information about anxiety and mood. I always use the BRIEF2 in conjunction with a broadband measure of behavioral and emotional functioning. The American Academy of Pediatrics and the American Academy of Child and Adolescent Psychiatry both have practice guidelines that suggest using a broadband measure as a first line when a child presents with a question of ADHD or other behavioral health problem. Then use a more specific measure such as the BRIEF2 to further evaluate for ADHD or a depression measure and or anxiety measure to address those questions.

Most of the time, I collect these measures before I see the individual. They give me a pretty good sense of what is going on in the context of the referral question and the history I've reviewed. When the student I meet fits with what I expect from the pattern of ratings, it is an easy assessment from there on out. When the student shows up and is not at all what I expected, then it is a fun and interesting assessment.

## Q: How do you use the BRIEF2 to measure ADHD?

**A:** In the summer of 2020, PAR released the [BRIEF2 ADHD Form](#). This is an additional score report to the BRIEF2, so the great news is that you do not have to administer an additional rating scale to parents or teachers. This score report uses the BRIEF2 scores and classification statistics within an evidence-based approach to predict the likelihood of ADHD and determine subtype (combined or primarily inattentive). It also provides a DSM-5 symptom checklist that is determined by answers from the BRIEF2.

This assessment helps evaluators to "rule in" ADHD and "rule out" other explanations for observed behaviors. In addition, it helps inform development of IEP goals.

This is extremely helpful when determining eligibility for other health impairment, making an ADHD diagnosis, or submitting reimbursement for Medicaid. The ADHD Form requires the BRIEF2 Parent and/or Teacher Form scores and cannot be used independently.



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