



# Psychological Assessment Rounds: ADHD **Questions & Answers**

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**Q: Can you say a little about the BRIEF, what it measures, and how it compares with other scales that try to measure EF? Do you have thoughts about advantages/disadvantages between the BRIEF2 and other measures such as the CEFI, the DREF, and others? How many publications support these scales?**

**A:** As an author of the first published rating scale of executive functions for use with children and adolescents, I try to keep abreast of developments in measurement of executive functioning. Without offering a critique of the available measures, I have summarized some basic data in the table below that may be helpful in appreciating some of the differences between them. I focused here on those that offer standardized scores for the child and adolescent range, though some have versions for younger children and for college-age and older adults.

As when choosing any measure, I would strongly encourage a careful review of the manual to understand the approach to scale development (e.g., What was the source of the items? Were they empirically supported or based on author opinion? Were they tested via item-total correlations, factor analyses, and/or measures of sensitivity?), the influence of demographic characteristics on scores (e.g., Are there gender, regional, racial/ethnic differences?), the precision (reliability data), and, most importantly, the evidence for accuracy (i.e., validity).

The measures vary widely in these characteristics, with one having no empirical evidence that would allow you to interpret the scores for individual scales that are provided, one having substantial and significant effects of child race, one having only parent ratings and relying on parent reported disabilities for clinical groups, and yet another having only teacher ratings and eschewing traditional psychometric considerations, and so on. The differences are often striking, with at least one measure likely to under-identify a substantial proportion of children with true executive functioning problems. I believe that any comparison of these measures would show that the BRIEF2 was the most thoughtfully and empirically developed measure and has, by far, the strongest, most independent, evidence of precision and accuracy.



The table below shows some basic characteristics of the Barkley Deficits in Executive Function Scale-Child and Adolescent (BDEFS-CA), the Behavior Rating Inventory of Executive Function, 2nd Edition (BRIEF2), the Brown EF/A Scales (Brown EF), the Delis Rating of Executive Functions (DREF), and the Comprehensive Executive Function Inventory (CEFI).

	<b>Measure</b>				
	<b>BDEFS-CA</b>	<b>BRIEF2</b>	<b>Brown EF</b>	<b>CEFI</b>	<b>DREF</b>
<b>Year Published</b>	2012	2015	2019	2013	2012
<b>Raters (ages rated)</b> P = parent, T = teacher, S = self	P (6-17)	P (5-18) T (5-18) S (11-18)	P (6-18) T (6-12) S (8-18)	P (5-18) T (5-18) S (12-18)	P (5-18) T (5-18) S (11-18)
<b>Age range (years)</b>	6-17	5-18	6-18	5-18	5-18
<b>Full age range available</b>	6-81	2-90	3-44	5-adult	5-18
<b>Standardization Sample</b>	P 1,922	P 1,400 T 1,400 S 800	P 800 T 600 S 600	P 1,400 T 1,400 S 700	P 500 T 342 S 220
<b>Peer-reviewed empirical papers</b>	6	1090	0	5	3
<b>Languages available</b>	1	>100	1	2	1

My search strategy in PsycInfo was to use the test name using wildcards (\*) to allow for different spellings (e.g., "behavior" vs.. "behaviour") within the "Tests and Measures" field. Terms were: "Behav\* Rating Inventory of Exec\* Func\*", "Comprehen\* Exec\* Func\* Inventory", "Barkley Deficits in Exec\* Func\*", "Delis Rating\* of Exec\* Func\*", "Brown EF/A Scale\*" and "Brown Exec\* Func\*/Attention Scale\*". I searched both versions of the Brown EF/A Scale, as it is written both ways, and neither turned up an article.

I limited the search to peer-reviewed empirical articles involving school-aged children and adolescents, as that was the consistent age group across measures (i.e., some also had younger children and/or adults; some had neither).



## Q: What rating scales are used for ADHD? And to whom do you give them when evaluating a student for ADHD, particularly when considering other diagnoses such as oppositional-defiant disorder?

**A:** There are many rating scales designed to help detect the presence of ADHD. Which measure(s) you choose depend on your evaluation of their efficiency, reliability, and accuracy. If you are trying to identify individuals for whom a diagnosis of ADHD is likely, looking for data about the sensitivity (what percentage of children with known ADHD are correctly detected at a certain “cutoff” score) and specificity (what percentage of children without ADHD are correctly ruled out at that cutoff score) is important, as they tell you about how well the test behaves. We would like to have a test with a cutoff score (e.g., a *T* score) that identifies most children who have ADHD and rules out most children who don’t have ADHD. Measures designed to help identify a condition, such as ADHD, should report sensitivity, specificity, a “hit rate” (overall accuracy), and predictive values.

It is important to examine the positive predictive value (PPV) and negative predictive value (NPV) for a given cutoff score. These tell you about the accuracy of your diagnosis for a given individual. Predictive values are, however, dependent on the prevalence or base rate of the condition in your referral sample. Detecting a handful of children with the characteristics of ADHD when screening all children in a school is much more difficult because so few will have ADHD (needle in the haystack problem). If you are running an ADHD clinic, however, and 80% of the referrals will be diagnosed with ADHD, it is much easier for a measure to detect the presence of ADHD (80% of the haystack is needles and you just need to pick out the hay), though more challenging to rule-out ADHD.

As an example, the BRIEF2 Professional Manual and BRIEF2 ADHD Form describe these statistics for detecting the presence of ADHD using the BRIEF2 Working Memory scale and identifying subtypes using the Inhibit scale at different prevalence rates. In a clinical or school referred setting, when the question of ADHD is likely to come up about half the time, a student with parent ratings of  $T \geq 65$  on the Working Memory scale is likely to be accurately identified as meeting inattentive criteria for ADHD 90% of the time (PPV > .90), and a child with a *T* score  $\leq 65$



would be accurately identified as not meeting inattentive criteria 79% of the time (NPV = .79). If a student meets criteria for likely ADHD based on the Working Memory scale, cutoff scores on the Inhibit scale can then help sort Combined from Inattentive Presentation.

Many ADHD-specific scales offer these statistics. For example, the Brown EF/A Scales report PPV and NPV at different prevalence rates for different cutoff scores to help identify the presence of ADHD (though not subtypes). At a *T* score of 65 or greater on the parent form in an 8–12 year old child, the PPV was .89 and NPV was .75, similar to the values for the BRIEF2 Working Memory scale.

Other widely used scales that report these statistics include the Conners Rating Scale and the ADHD Rating Scale–V. There are several ADHD rating scales for adults as well, including the Barkley Adult ADHD Rating Scale and the Conners Adult ADHD Rating Scale. As always, it is important to review the psychometric properties of the scales (e.g., evidence for reliability and validity) and the diagnostic utility (sensitivity, specificity, and predictive values at different cutoff scores for different prevalence rates) as well as where the samples were gathered and how well they were defined. For example, one rating scale relied only on parent report of a disability, while another relied on a single clinician’s diagnosis in a small number of cases from their clinic during the early 1990s.

## **Q: Would you take the same approach for evaluating ADHD in adults? What about evaluating high achievers who are looking for accommodations for college or graduate school? What broadband measures of social-emotional-behavioral functioning would you use for adults?**

**A:** For the most part, yes. Evaluating adults with a question of ADHD also involves a process of gathering history, particularly looking for evidence of attention problems emerging by late elementary and early middle school years; gathering information about current functioning; then developing an assessment plan to rule-in the characteristics and rule-out other issues or confounds. Many clinicians use self- and informant forms of an ADHD-specific scale, such as the Barkley Adult Attention Rating



Scale, the Clinical Assessment of Attention, or the Conners Adult ADHD Rating Scale, and an executive function scale (most commonly the BRIEF-Adult Version) to rule-in the ADHD characteristics, then a personality (e.g., the PAI) or broadband behavior (e.g., BASC-3 SRP College or ASEBA Adult Behavior Checklist) measure.

This provides a wealth of rule-in/rule-out information that might then lead to additional assessment using performance measures of cognitive and/or academic functioning and specific performance measures of attention (e.g., continuous performance tasks) and executive functioning (e.g., trail making, verbal fluency, Stroop, and tower tasks). There is often an emphasis on assessing validity of attention complaints (i.e., symptom validity) and test performance (i.e., performance validity), particularly when complaints emerge for the first time in adolescence or young adulthood, and there may be questions of accommodations for high stakes testing.

## **Q: Is ADHD a lifelong condition? Do some people experience fewer symptoms as they get older?**

**A:** ADHD persists into adulthood, though the symptoms often present differently with age and changes in demands and stressors. Historically, it was thought ADHD was a disorder of childhood that went away in adolescence. That was likely based on observations that the behavioral aspects of impulsivity and hyperactivity changed with onset of adolescence, morphing into other expressions of impulsivity and restlessness, such as driving recklessly and engaging in risk-taking behavior.

A [new article](#) that presents a consensus statement about “208 evidence-based conclusions” about ADHD by the World Federation of ADHD is a great read. It is concise, and summarizes an incredible amount of international data from major researchers in the field.

## **Q: Can you provide references regarding emotional impulsivity/deficits in emotional self-regulation in ADHD?**

**A:** There is a fair amount of literature on “emotional impulsivity” (EI) and “deficits in emotional self-regulation” (DESR). Reports in the literature, including George Still’s



1902 paper that first described the symptoms, have frequently described emotional control difficulties in individuals with ADHD, particularly with impulsivity. Essentially, if one is impulsive behaviorally, verbally, motorically, attentionally, and socially, we might expect to also see impulsive emotions. That is, the individual has typical emotional responses but they are not appropriately regulated and come out much more strongly than expected (EI). Many have suggested that EI/DESR be included in the diagnostic criteria for ADHD.

My [favorite article](#) thus far is the practitioner review by Steven Faraone at MGH. This is a clear, concise, and freely accessible paper. In Table 1, they point out how the characteristics of emotional expression (e.g., sudden onset, sudden offset, duration, and other features such as irritability) may help us distinguish between a host of disorders including ADHD, bipolar, depression, and so on.

## Q: What is the reference and link to the articles/chapters on executive function interventions?

**A:** One of my favorite authors on the topic of executive functioning is Adele Diamond. She was one of the first to experimentally demonstrate the [presence of executive functions in infants](#) at a time when most believed that executive functions developed in adolescence or adulthood:

You can find almost all of her papers on her website: [www.devcogneuro.com](http://www.devcogneuro.com)

Scroll down and you'll find a recent review of evidence for executive function interventions (note- you will not find some of the widely used commercial programs such as "Zones of Regulation" in this review, as they lack empirical evidence).

You can also click on "Our Publications" at the top of the web page and you will find a treasure trove of hundreds of her articles, many of which are in PDF form that you can download and review.

## Q: Is it common to evaluate for both other health impairment and emotional disturbance in U.S. schools? Is that a common referral question? How do you explain the association between ADHD and emotional



## difficulties/emotional disturbance?

**A:** Questions of other health impairment (OHI) and/or emotional disturbance (ED) arise frequently in U.S. schools. Sometimes we are also asked about a specific learning disability (SLD), autism spectrum disorder (ASD) and intellectual disability (ID) all at the same time. I plan to build upon our simple EF/ADHD/OHI case this month and for next month's dyslexia/learning disorder/SLD case to start complicating things with more and more referral questions.

The frequency of OHI and/or ED referral questions may be in part due to the "emotional impulsivity" (EI) and "deficits in emotional self-regulation" (DESR) that are often part and parcel of an ADHD diagnosis, particularly when impulsivity is present. Often, a child who has problems with inhibitory control (i.e., is impulsive) shows this in the following ways: verbally (e.g., says things without filtering), motorically (e.g., can't sit still, hits others impulsively), socially (e.g., is intrusive, over the top), attentionally (e.g., is distractible), and emotionally (e.g., expresses feelings explosively, in outbursts, but has normal feelings). Thus, when I get this referral, I look for two things: Is the child impulsive emotionally and do I see it in other domains (i.e., behaviorally, verbally, etc.)? And does the child otherwise have mood concerns (e.g., anxiety, depression)?

In their [2019 practitioner review](#) of EI/DESR in ADHD, Farone and colleagues describe EI in ADHD as showing episodic irritability, inappropriately positive and negative emotional outbursts, no persistent anger, and no defiant behavior, versus depressive disorder as showing chronic irritability, no inappropriately positive emotions but inappropriately negative emotions, and no persistent anger.

Thus, when approaching the question of "Is it ADHD/OHI or ED?," or, in my referrals, "Why is he under the table throwing stuff?," I check the self-regulatory component and the emotional component. If the student shows impulsivity in multiple domains but does not have persistent mood issues, then it is more likely OHI and not ED. If, on the other hand, they are not exhibiting broad impulsivity but have mood concerns, it is more likely ED. Given that we often see complex cases, it is also possible that a person exhibits persistent mood/irritability AND impulsivity across domains.

## Q: What would an assessment look like for a child or





## adolescent with attention problems related to trauma?

**A:** Much has been written in the past two decades about the relationship between trauma and executive functioning and associated diagnoses of ADHD. Many children with histories of adversity present as hyperactive and inattentive, perhaps hypervigilant for threats in the environment, leading them to be diagnosed early on with ADHD-Combined presentation. Later, their anxiety may be recognized and diagnosed/treated.

My colleagues and I studied a group of 20 children with histories of adversity who were in long-term foster care and found, based on structured diagnostic interviews, that a majority met criteria for ADHD-C. We also found many symptoms of anxiety that had not been diagnosed, and their profiles on the BRIEF were characterized by elevated Shift and Emotional Control scales, consistent with impulsive emotional expression and anxiety.

A [recent meta-analysis](#) of executive function deficits and Adverse Childhood Experiences, or ACEs, found a strong relationship between several ACEs and deficits in executive functioning:

The first presentation in this Psychological Assessment Rounds involved a child with a history of adversity. That webinar is accessible via the [PAR Training Portal](#). Given the interest in assessing individuals with trauma, I would bet that we will do another presentation in this series as well.

**Q:** In this particular case, what medication is the student taking and what differences in functioning would you anticipate seeing without the medication? Did you use parent, teacher, and/or self-reports, and do these ratings differ in terms of who reports more difficulties? How do you reconcile discrepant ratings between home and school?

**A:** The student in this case was taking methylphenidate, extended release, in the morning before going to school and took a small “booster dose” after school to help him focus on his homework. He and his parents reported that he benefitted clearly



from the medication and had few side effects, and that he was consistent in using the medication. They reported that he was markedly unfocused and unable to get started on, or focus on, his work or other tasks without medication.

In this case, as in most, I collected ratings on the BRIEF2 and the BASC-3 from the student, both parents, and at least one teacher. I usually seek input from a history or language arts teacher because they see students read, write, organize, present, and interact. In this case, parent, teacher, and self-reports on both instruments were quite consistent, making interpretation easy. That is often not the case, as we see big differences between parent and teacher ratings, and often the adolescent reports no problems at all. It is important to appreciate that variability between raters is quite common. (See [de Los Reyes & Kazdin, 2005](#), for a thorough review.)

Both the BRIEF2 and BASC-3 report on the consistency between raters. In the BRIEF2 Professional Manual, pages 44-45 show the frequency of differences between raters. For example, parent and teacher ratings are within +/- 10 T score points 57% of the time overall, with parent ratings 10-20 points higher than teacher ratings 20% of the time, and 10-20 points lower 10% of the time. Parent and self-reports are within 10 points of each other 62% of the time, and teacher and self-reports are within 10 points 57% of the time.

Of note, it is unusual for adolescent self-reports on the BRIEF2 to be substantially higher (> 20 points) than parent reports (2.4% of the time), though less so for teacher reports (8.5% of the time). When an adolescent reports having greater difficulties than either the parent or teacher report, it is important to follow up with an interview, as this may indicate that the student is stressed or distraught.

## **Q: For a student with average academic functioning who is diagnosed with ADHD and struggles socially, what measures would you use to look at the social component?**

**A:** Students with ADHD often have social difficulties, particularly when there is impulsivity/hyperactivity. Such students are often socially intrusive physically and verbally, and are often disliked by their peers. Impulsive students can be unpredictable, and peers tend to avoid them. They may also show social pragmatic deficits. There is substantial literature on social functioning in children with ADHD, some suggesting that impulsivity is the culprit, but other evidence suggests that



working memory deficits play a substantial role.

For measurement of social functioning, I typically rely on a broadband measure first, such as the BASC-3, along with interviews with the student, parent, and teachers. In the initial referral meetings, often with the whole team present on a web meeting these days, I ask about the usual domains of interest: How does the student do socially? Emotionally? Behaviorally? Attentionally? Academically? This usually elicits a substantial amount of information in a very short time. The description of the student's social life is often very informative.

## **Q: For young students in pre-K to first grade, how might one approach differentiating between ADHD and ASD? How do you incorporate BRIEF results in assessing ASD and/or ADHD?**

**A:** Now that the *DSM-5* has explicitly permitted the diagnoses of ASD and ADHD together (*DSM-IV* excluded ADHD from an ASD diagnosis), we have seen a rise in dual diagnosis. The majority of children with ASD also show characteristics of ADHD, and some 15%-25% of children with ADHD diagnoses also show social problems consistent with ASD. Much of the recent research on differentiating these two conditions has focused on the role of executive functioning and on brain structure and function. There are both shared and distinct neural features in these two common diagnoses (e.g., [Antshel et al., 2016](#)).

Behavioral measures are more useful than performance measures in helping differentiate between children with ASD and children with ADHD. My colleague [Lauren Kenworthy and her team](#) at Children's National have studied children with ASD for many years and published extensively on executive function in ASD. They found that behavioral measures of inflexibility/resistance to change (i.e., the BRIEF Shift scale) and measures of anxiety and atypical behavior predicted ASD, while impulsivity and aggressive behavior were more predictive of ADHD.

In the BRIEF2 manual, consistent with our 2002 profile analysis ([Gioia et al., 2002](#)), we report an analysis of BRIEF2 profiles between children with ADHD-C, ADHD-I, and ASD. Children with ADHD-C had the highest scores on the Inhibit scale and the



Working Memory scale, while children with ADHD-I had the highest scores only on the Working Memory scale. In contrast, the ASD group had the highest scores on the Shift scale. Both ADHD-C and ASD groups had high scores on the Self-Monitor scale, reflecting poor social self-monitoring.

For my own work, I rely on observations, interviews, and behavior ratings on the BRIEF2, the BASC-3, and ASD-specific measures, typically the [PDDBI](#) and the Social Responsiveness Scale, 2. An adaptive functioning measure is also often required in the school setting. That is a substantial burden for teachers and parents, so I try to pace the questionnaire gathering.

I will invite my friend Lauren Kenworthy to present a case of ASD vs. ADHD in a future Psychological Assessment Rounds. She is my go-to expert in this area.

**Q: What do you do when the student has a medical diagnosis of ADHD but the BRIEF suggests a diagnosis of ADHD is unlikely? And how much faith do you put in a physician's diagnosis of ADHD, which is sometimes based on a parent describing their child as hyperactive/impulsive but no other data?**

**A:** My approach to this situation would be to make sure my assessment is adequate to answering the question of ADHD, and to try to understand the difference between parent perception and what we might observe in a school setting. There may be several reasons for the difference in perceptions, including the setting (structure in school vs. home; stressors in school vs. at home), raters (parent under stress or with different expectations), and so on. I would ask for a release from the parent to have a conversation with the physician so that we can all get on the same page. It is helpful in the long run to develop a relationship between the evaluators and the medical team, as we should be working together in the best interests of the child.

**Q: Would you also use the CAS2 to look at a cognitive profile based on evidence for PASS scores in children with ADHD?**



**A:** While I have seen the Cognitive Assessment System 2 authors present the measures as both a test of intelligence and a test of executive function, I have not seen independent evidence to support using the CAS2 as a measure of executive function.

PASS theory is based on Luria's model of cognitive function that focuses on planning, attention, and simultaneous and sequential processing. As a developmental neuropsychologist trained in a Lurian model, I appreciate this general conceptualization. While planning and attentional control are considered aspects of executive function, they are selected components and do not encompass the more comprehensive domains of executive function (e.g., inhibitory control, shifting set, working memory, monitoring, etc.) Further, PASS theory is unique to the CAS. It is not discussed much, if at all, in the literature on executive functioning.

There are many widely used performance measures (i.e., tests) of executive functioning with a substantial research base, most commonly trail making, verbal fluency, Stroop, and tower tasks. Absent clear and independent evidence of an association between measures on the CAS2 and executive functions, I would not be comfortable interpreting scores as reflecting executive functioning.

## **Q: In the U.S., do you need a medical diagnosis of ADHD to identify a student with an other health impairment?**

**A:** The requirement of a medical diagnosis of ADHD, or other health condition, in order to identify students with an OHI depends on the condition and the state. Some states do require a physician diagnosis of ADHD for identifying OHI. At the same time, other states do not and are satisfied that a team of professionals that includes a psychologist can make a determination of OHI. I live on the border between two states, and also practice in a third, and one state requires a physician diagnosis and the other two do not. In states that require the physician diagnosis of ADHD, practitioners, whether clinical or in a school setting, can do the assessment, rule in the characteristics and rule out other causes, and provide the information to the physician with appropriate permissions. In states that do not require physician diagnosis, we would do the same assessment, and I prefer to provide that information directly to the physician as well, since they are part of the treatment team.



It is important to appreciate the differences between our professions and how often we are asked to evaluate and perhaps diagnose a condition such as ADHD; learning disabilities; or behavioral, social, and emotional conditions versus the frequency with which pediatricians or general medical practitioners see these conditions. While attentional, social, learning, and emotional conditions make up the bulk of our work, they are a small part of physicians' caseloads. Along with the myriad of other health conditions, from well child checks to colds to injuries and serious health conditions, physicians have less training in assessing for conditions like ADHD and have considerably less time to invest. There also tends to be a difference in assessment tools used along with differences in understanding psychometrics and score interpretation.

In either case, assessment practitioners provide important information about the presence or absence of ADHD in any complicating factors, as well as treatment recommendations to the overall team including the physician, therapists, and family.

**Q: How do you sort out a BRIEF profile that suggests ADHD versus normal performance on neuropsychological measures (i.e., tests)? How do you assign weight or credibility to findings when tests and the BRIEF are different? If the BRIEF is a subjective measure, how do we know there are or are not EF problems without giving merit to performance measures? In this case, the student had an average score on the WISC-V Working Memory Index when assessed previously. How do you reconcile absence of deficits on the Working Memory Index and a diagnosis of ADHD?**

**A:** This one of my favorite questions and topics. I plan to present a separate webinar, likely 2 to 3 hours, on integrating performance measures of executive function and



the BRIEF2. This will likely be early next year via PAR.

We have struggled to integrate findings from performance measures and rating scales for years. One of the reasons that we began developing the BRIEF in the early 1990s was because we observed that children's performance on executive function performance tasks did not match parent and/or teacher reports of everyday functioning consistently. It was common to see good performance on tests in a child referred due to marked dysregulation, and to see poor performance on tests of EF in children referred for conditions other than self-regulation problems. We originally developed the BRIEF as a way of measuring the everyday presentation of executive functioning in order to compare it with test performance. Over time, research has consistently shown parent, teacher, and self-reports of everyday executive function on the BRIEF are much more predictive of everyday functioning, and of the presence or absence of conditions such as attention disorders and other developmental disorders, than are performance tests.

While once upon a time there were arguments over whether the BRIEF was more accurate or tests were more accurate, and which was really measuring executive function, we have for the most part moved beyond this question and instead sought ways to integrate information from the two. This is our current challenge. We need empirical models that show us how best to combine information from executive tasks, such as trail making, digit span, verbal fluency, and other tasks, with BRIEF findings in order to explain as much variance in self-regulation in a condition as possible.

As an example, [Toplak and colleagues \(2008\)](#) compared a group of children diagnosed with ADHD and a matched group of healthy controls without ADHD. They found that, like most studies, test performance on executive tasks was different between the two groups, explaining on the order of 5%–10% of the difference (small effect sizes). The BRIEF explained over 50% of variance (moderate to large effect sizes). When the BRIEF and performance tests were entered into a regression equation predicting ADHD vs. not ADHD, the BRIEF Working Memory scale or Inhibit scale were the only significant contributors, not the tests. When the score trail making, for example, was entered first into the regression equation, accurate identification of children in the ADHD group improved from 50%–60%. That is, test performance was indeed somewhat helpful in identifying the presence of ADHD. When the BRIEF WM scale was entered after the test score, that 60% accuracy improved to over 90%.



This is an example of the work that needs to be done to integrate test performance and BRIEF scores. We need equations that help us determine the weights for variables in an equation such as:  $a \times \text{family history} + b \times \text{EF test 1} + c \times \text{EF test 2} + d \times \text{BRIEF2 scores} = \text{likelihood of ADHD-I vs. ADHD-C vs. control}$ .

There are many studies that use both approaches, and I continue to work on how to best explain and write about how these work together. Please be on the lookout for my workshop, "Tests and the BRIEF: Evidence for Integrated Executive Function Assessment," with PAR.

## Q: You mentioned other EF measures such as the Trail Making Test. Can you describe this?

**A:** There are a handful of executive function tasks that are widely used both with children and adults. It is important to appreciate that most of these measures were developed long ago for use with adults, particularly with those who sustained brain injuries. They have been studied for over 50 years ([Burgess & Stuss, 2017](#)) and have been adapted for children since the 1980s. [Welsh et al. \(1991\)](#) were the first to report on how these adult-oriented executive function tasks behaved with children developmentally. They found that children achieved adult-like performance on most measures by the onset of adolescence, or around 13 years of age. Tasks of "fluency" or idea generation, and tasks of planning, however, were not fully developed until later adolescence or early adulthood. [Romine & Reynolds \(2005\)](#) found a similar pattern on a battery of executive function tasks, with performance on fluency and planning tasks much more developmentally protracted than for other EF tasks.

The most common executive function measures in adolescence were surveyed by [Nyongesa and colleagues \(2019\)](#). They found that digit span tasks were the most commonly administered measures of an aspect of EF, used 44% of the time. This was closely followed by trail making tasks (37%) and the BRIEF family of instruments (30%). Commonly used measures are often available as standalone measures or as part of a batteries, such as the Test of Verbal Concept Formation and the Delis-Kaplan Executive Function System, as well as embedded in batteries for children, such as the NEPSY2, or for adults, such as the Neuropsychological Assessment Battery (NAB). There is a rich history of these measures in research and





clinical work. I strongly urge people to read [Paul Burgess and Don Stuss' paper](#) summarizing their take-aways from 50 years of experience with executive function assessment.

## Q: Do you recommend performance validity measures, such as Reliable Digit Span?

**A:** Both performance validity and symptom validity are recognized as important considerations in our evaluations. Symptom validity indicators are often built into measures such as the BASC-3 and BRIEF2 and other rating scales. We commonly check and interpret scales in these measures measuring consistency of responding, infrequency of responses, excessive negativity, and other indicators of bias in ratings. There are also standalone rating scales of symptom validity reports such as the Structured Interview of Malingered Symptomatology (SIMS) for adults and other measures.

Performance validity checks can be both embedded, or within a measure, and separate or standalone tasks. Embedded measures include the Reliable Digit Span (RDS) forced-choice memory on the California Verbal Learning Test (CVLT), and recall vs. recognition tasks on the Child and Adolescent Memory Profile (ChAMP). Standalone measures include the Memory Validity Profile (MVP) or the Pediatric Performance Validity Test Suite (PdPVTs) and numerous measures such as the Test of Memory Malingering (TOMM), Dot Counting Test (DCT), Green's Word Memory Test (WMT) and others are also commonly administered, particularly in a forensic context.

Symptom and performance validity assessment is a very active area of ongoing research. There are numerous texts on validity assessment for rating scales or symptom reports and performance on tests for adults and children. A standard text for performance validity assessment in children is by [Michael Kirkwood \(2015\)](#).

Whether we are in a clinical or school setting, symptom validity and performance validity assessments have become increasingly common and are recognized as important features in conducting an assessment. It helps us make sure that the ratings of an individual's functioning and that effort on tests is within expectations. This adds to our confidence in our assessment overall.



## Q: Are continuous performance tests helpful in identifying ADHD?

**A:** Yes and no. Continuous performance tests, or CPTs, are often used in assessment of attention. These measures, typically computer administered and quite lengthy (e.g., 10-22 minutes) require an individual to watch the computer screen and press a button when a “target” stimulus, such as a letter or a picture, appears, but withhold pressing the button for other “non-target” stimuli. These tests measure how frequently a target was missed (omissions, thought to reflect inattention), a nontarget resulted in a button press (commissions, thought to reflect impulsivity) and, more importantly, response time and response time variability. These latter measures tend to be the most sensitive to problems with attention and self-regulation.

Much has been written about the use of CPTs in individuals with ADHD. [The 2005 meta-analysis by Willcutt et al.](#) found that response time measures associated with CPT were the most frequently impaired in individuals diagnosed with ADHD relative to other executive function tasks. However, they also found that less than half of people diagnosed with ADHD had deficits in performance on any of a wide variety of tasks, including CPTs and other executive function measures. CPTs for assessment of ADHD tend to be sensitive but not specific. A problematic score may indicate the presence of attention problems, but the same scores does not correctly rule out people without ADHD.

A review of everything you need to know about continuous performance tests is described in a book by [Riccio, Reynolds, and Lowe](#).

## Q: How do we tease out ADHD vs. LD? ADHD and anxiety?

**A:** This is what we are building toward in this series of case presentations. We begin with a simple case of ADHD-Inattentive type, then consider learning disabilities separately, and combine them together. If we continue with the Psychological Assessment Rounds series, I plan to add additional complications including anxiety, ASD, and more to more closely simulate our everyday referral situations.

In general, we are often faced with more complicated questions such as, "is it ADHD, LD, anxiety, ASD, or all of the above?" By clarifying rule in-rule out



procedures and using an evidence-based assessment approach to each of these questions, we can clarify our thinking and increase confidence in including or excluding each of these conditions. The criteria for each of these conditions is different, though they are often comorbid in that some symptoms may overlap. For example, there are many performance test characteristics that are similar between children with ADHD and those with learning disabilities. Both show problems on working memory tasks, response speed, and inhibitory tasks. Only children with learning disabilities, however, tend to show problems with phonological processing and with automaticity/rapid naming. Children with anxiety also may show slower speed of output and working memory difficulties, but tend to be unique in their difficulty with adapting to change or performing on so-called "shift" or flexibility tasks. Children with ASD also show marked difficulty on flexibility tasks and measures of output speed.

The BRIEF2, particularly when used along with a broadband measure such as the BASC-3, can be particularly helpful in clarifying the overall behavioral profile in a child referred for assessment of multiple conditions. For example, children with ADHD-Combined presentation show a marked elevation on the BRIEF2 Inhibit and Working Memory scales along with elevations on the BASC-3 Hyperactivity and Attention scales. Children with ADHD-Inattentive show a similar elevation on the Working Memory scale but not the Inhibit Scale, and on the BASC-3 Attention scale but not the Hyperactivity scale.

Profiles on the BRIEF2 and the BASC-3 in children with learning disabilities are more subtle in terms of milder problems with working memory, planning and organizing, and task monitoring, along with learning problems reported on the BASC-3. Children with learning disabilities often also show some anxiety and exhibit milder elevations on the BRIEF2 Shift scale. The addition of mood concerns often presents as elevations on the BRIEF2 Emotional Control scale as well as depression on the BASC-3. And children with ASD tend to elevate most prominently on the BRIEF2 Shift scale along with a cluster of Atypicality, Withdrawal, and Anxiety on the BASC-3. Only a few studies have examined how these two work together, though we are currently working on a large number of cases that have both measures and show distinct profiles between conditions. We will share our results as soon as possible.



## **Q: Is it possible that an elevated BRIEF2 Shift scale is due to the student's sense that they are missing information and often fall behind in classes?**

**A:** Yes. This is a good point. The Shift scale is often associated with anxiety or other causes for resistance to change and inflexibility. A highly elevated Shift scale, often at a *T* score of 70 or above, is often seen in individuals with ASD. This is reported in the BRIEF2 manual, and research by Lauren Kenworthy and her colleagues finds similar profiles.

More subtle indications/elevations on the Shift scale are seen in individuals who are experiencing anxiety. In those with anxiety disorders, we often see a substantially elevated score on the Shift scale along with elevated anxiety scales on broadband measures but not elevations on other scales, such as the Inhibit scale, or scales on the broadband measures such as hyperactivity or behavior problems. In this case, elevation on the anxiety scale suggests that the student has some worries and prefers routines, as changes disrupt their ability to anticipate what comes next. Resistance to change is often a reflection of distress with not knowing what to expect.

## **Q: Have there been fMRI or MRI studies comparing children and adults who have executive function challenges with controls? Does this change with age?**

**A:** The recent synthesis of evidence from the international research community about ADHD presents a summary of findings with neuroimaging. For example, an analysis of structural MRI data from studies encompassing more than 4,000 participants found slightly reduced cortical surface area in children with ADHD, and some subcortical regions of the brain, mainly in frontal, cingulate, and temporal regions, and some reduction in cortical thickness in temporal regions. These differences, however, were not seen in adolescents or adults. The differences in brain structure are typically small to very small and quite subtle.

A meta-analysis of diffusion tensor imaging studies that show the integrity of connectivity within the brain in nearly 1,000 cases found that there were consistent white matter differences between individuals with and without ADHD, mostly in



the selenium of the corpus callosum to the right cingulate and sagittal stratum. This suggests problems in connectivity between the two hemispheres in posterior regions and in long-range frontal and posterior association tracts. In other words, connections between the front of the brain and all other regions of the brain are more likely to be disrupted in individuals with ADHD.

A meta-analysis of 21 functional MRI studies with some 600 participants found that individuals with ADHD had consistent under activation in typical regions of inhibitory control (right inferior frontal cortex, basal ganglia). These findings have been replicated in other large studies. A meta-analysis of 21 functional MRI studies with some 600 participants found that individuals with ADHD had consistent under activation in typical regions of inhibitory control (right inferior frontal cortex, basal ganglia). These findings have been replicated in other large studies.

In sum, there are small, subtle structural differences in the brains of children diagnosed with ADHD that are not detectable in adolescents or adults. There are consistent findings of disrupted connectivity between the frontal cortex and other regions of the brain. Perhaps the most compelling evidence of differences in neurological structure and function come from functional MRI studies that show reduced activation in the fronto-subcortical tracts associated primarily with inhibitory control.

## **Q: Can an elevated BRIEF2 Emotional Control scale score reflect emotional problems that are also elevating the other scales?**

**A:** Yes. We included the Emotional Control scale on the BRIEF originally because we recognized that test performance, and ratings on other scales of executive function, may be influenced by an individual's emotional state. For example, if a student comes in for assessment and is distressed or upset by events that happened in the morning, such as a bad social interaction, they are less likely to be able to attend to tasks and to perform on our measures. Russ Barkley commented in 2001 that the BRIEF was the first measure to consider the important role of emotion in executive function or self-regulation. We agree that this is essential, and have been pleased to



see most other EF rating scales have followed suit.

We have also learned that ratings on other BRIEF scales may be more elevated in students with high scores on the Emotional Control scale. Clinically, I often see BRIEF2 profiles that are highly elevated across most domains in students who are placed in substantially separate programs for students with significant emotional disorders. Marked elevation on the Emotional Control scale should prompt evaluation of emotional functioning and distress. It may also moderate interpretation of other scales. In general, when scales on the left of the profile (i.e., Inhibit, Shift, Emotional Control) are highly elevated, this likely affects scales to the right (e.g., Working Memory, Plan/Organize).

## **Q: Is the BRIEF2 ADHD Score Report available for remote administration and scoring, and is there a way to extract information about ADHD from the BRIEF2?**

**A:** Scoring for the BRIEF2 ADHD Form can be done either by hand on a simple, two sided, tear-off sheet or via PARiConnect after running a BRIEF2 Parent/Teacher Form Score/Interpretive Report. It is not a separate questionnaire, but simply uses data from BRIEF2 Parent and/or Teacher reports to look more closely at the likelihood of an ADHD diagnosis and, if ADHD, what subtype is most likely. Visit the BRIEF2 ADHD product page for more information.

## **Q: Can people have weak executive function skills but not be diagnosed with ADHD?**

**A:** Yes. While ADHD is a clinical diagnosis based on deficits in executive functions, specifically inhibitory control and/or working memory, planning, organization, and self-monitoring, executive function deficits/weaknesses are not unique or exclusive to an ADHD diagnosis. That is, ADHD is defined by deficits in EF, but deficits in EF do not mean a person has ADHD. Executive function difficulties contribute to the presentation of a very wide range of acquired and developmental disorders. There is a large literature on executive function profiles in ADHD, LD, ASD, ID, fetal alcohol spectrum disorders, low birth weight, prematurity, in-utero exposures, and many other developmental conditions. There is also a large literature on executive functions in traumatic brain injury (TBI; moderate, severe, mild/concussion),



hydrocephalus, 22Q11 deletion syndromes, galactosemia, Type I and Type II diabetes, obesity, Parkinson's disease, multiple sclerosis, cerebrovascular accidents, dementias, mood disorders, anxiety, obsessive-compulsive disorders, and so on.

It is also common to have individuals with weaknesses in executive functioning that do not rise to the level of a diagnosable condition. For example, a student may have difficulties organizing and planning their work but not show deficits in sustained working memory/attention that would warrant a diagnosis of ADHD. Students with this profile often do not qualify for special education services but might benefit from other supports such as via a 504 or ADA plan or other informal supports.

## **Q: Does an elevated BRIEF2 Working Memory scale indicate ADHD-Inattentive if there is no other explanatory history (e.g., stroke, trauma, etc.)?**

**A:** It is important to appreciate that the BRIEF2 captures everyday executive functioning, or self-regulation. It, like the majority of psychological measures, may inform our diagnostic decision-making but we, the clinicians, make the diagnosis. Thus, the Working Memory scale may be elevated and suggest the presence of ADHD, but other conditions also may have an elevated Working Memory scale.

Many studies have shown that an elevation on the BRIEF2 WM scale is predictive of a diagnosis of ADHD. When the Inhibit scale is also high, the profile may indicate ADHD-Combined. If the Inhibit scale is not elevated, ADHD-Inattentive is more likely. This is only when there is a question of ADHD, though. I would not look at a profile with an elevated WM scale and diagnose ADHD. Instead, I would explore further, gather additional historical and current functioning evidence, clarify the question, and then interpret the elevation on the WM scale in the context of other measures and historical information.

The study by [Jacobson and colleagues](#) is instructive. They examined BRIEF2 profiles in nearly 2,000 outpatient referrals. They found a distinctive profile of elevations on the Cognitive Regulation Index (WM, Initiate, Planning & Organization, and Task-Monitor scales) in ADHD-I and ADHD-C, and elevations on the Inhibit scale only in the ADHD-C but not in the ADHD-I. Elevations for all other clinical referrals, who were not diagnosed with ADHD, were much lower. Thus, while elevations on the



Working Memory scale are not solely unique to ADHD, it is a prominent feature in individuals diagnosed with ADHD.

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