

CHILDREN WITH ADHD and learning disabilities typically have problems with working memory, attention, processing speed, and academic fluency (reading, writing, math). Researchers and providers of commercial products are targeting these weaknesses with working memory and brain training programs. Parents must be prepared to pose questions to determine the merits of these programs.

Here are the bottom-line questions:

- Are brain training and/or working memory programs an effective use of my child's time and our family's financial resources?
- Can we evaluate the claims made by those who promote these programs? How can we separate the scientific from the pseudoscientific (belief presented as scientific which cannot be supported by scientific evidence)?

So, what are the current findings regarding brain training and working memory programs? What information do you need to evaluate the merits of various programs? What questions should you ask regarding the effectiveness of these programs? Read on.

One family's experience

Consider the experience of Katie and her parents. When Mr. and Mrs. Jones met with Ms. Expert, the director of the Brain-Based Learning Center (BBLC), they explained that their daughter, Katie, a fourth grader, had ADHD as well as a severe reading disability based on school district testing they shared with Ms. Expert. As a result of the school's testing, Katie had begun receiving special education services in third grade.

Ms. Expert explained that Katie's district and BBLC testing (using standard IQ and achievement tests) showed that, while Katie had above average intelligence, she had scored quite low in memory, processing speed, attention, and reading. Ms. Expert emphasized that the center's "premier" twelve-week brain training program and/or its working memory training program would hasten Katie's progress in the learning center's research-based remedial reading program.

Ms. Expert explained that the cost of the brain training program was \$5,700, which did not include the cost of the subsequent reading program. When Mrs. Jones expressed concern about the cost of this program, Ms. Expert stressed that the program would make Katie's learning easier and would strengthen her underlying weak cognitive skills (such as working memory, processing speed, and attention). With assurances that the program was based on the "most recent scientific research" and recalling many positive parent testimonials, the family agreed that Katie would begin the program immediately.

What they were not told

Here is what Mr. and Mrs. Jones were not told:

- There is no peer-reviewed research that supports the BBLC claims regarding their brain training program. (Peer review is a process by which a scholarly work is evaluated by a group of experts in the same field to make sure it meets the necessary standards before it is published or accepted.)
- The same subtests of cognitive ability used for pre-testing would be used for post-testing after completion of the program to show Katie's progress. Alan S. Kaufman, PhD explains, "Practice effects refer to gains in scores on cognitive tests that occur when a person is retested on the same instrument. . . . These gains are due to the experience of having taken the test previously. . . and they do not reflect growth or other improvement on the skills being assessed."
- Shorter intervals between pre- and post-testing result in larger practice effects. With only twelve weeks between the pre-test and post-test, practice effects will likely result in higher scores. A 2007 meta-analysis by John Hausknecht and his colleagues found that practice effects can be minimized with retesting after at least one year. (A meta-analysis is a quantitative statistical analysis that combines many smaller samples into a much larger pool of data, allowing researchers to identify trends that could not be seen in smaller-scale studies.)

BRAIN FITNESS PROGRAMS

Buy? Or Buyer Beware?

by Jerome Schultz, PhD
and Pam Cook, MEd

- Scott Kaufman, PhD, stated in a 2013 blog on working memory training for ScientificAmerican.com: “Repeated practice and challenge is essential to maintaining improvements in any kind of cognitive training or else they’ll very likely decline rapidly.” So Mr. and Mrs. Jones can expect to pay again for another “dose” of brain training in the future.
- Cognitive scientist Daniel Willingham, PhD, asserts in his book, *When Can You Trust the Experts: How to Tell Good Science from Bad in Education*, that consumers should ignore testimonials: “One source of evidence that should not persuade you is testimonials—that is, first-person accounts from people who have used the product and swear that it helped.”

Additional pseudoscientific claims

Here are some additional examples of pseudoscientific brain training claims.

- Exaggerated claims (such as, child will “achieve up to a thirty-point IQ increase,” “jump three grade levels in reading,” “permanently reduce or eliminate the need for ADHD medications”)
- Weak underlying cognitive skills (memory, attention) must be strengthened before academic skill instruction (reading)

Bruce Pennington, PhD, asserted in his 2011 article on controversial therapies for dyslexia that “ineffectual treatments for psy-

chological and educational problems are harmful because they waste valuable time and money.... As parents, educators, and health care professionals, we need to learn how to make good treatment decisions for the children entrusted to our care.”

What are the characteristics of the scientific method?

- Studies are peer-reviewed and replicated (repeated).
- Failures are sought and studied closely.
- More is learned over time.
- When new evidence contradicts old ideas, old ideas are abandoned.

“Science does not accept findings that have failed the tests of replication and peer review precisely because it wants to ensure that all findings in science are in the public domain,” stressed the authors of the US Department of Education 2003 publication, *Using Research and Reason in Education*.

What we know works

Here are the habits, interventions, and accommodations we know work to improve children’s attention and academic performance.

- **Four pillars of brain health.** Caroline Latham wrote in a blog for SharpBrains.com that a lot of research can be summarized “by saying that there are four essential pillars to maintaining a healthy brain that functions better now and lasts longer”:

- Physical Exercise
- Good Nutrition
- Mental Exercise
- Stress Management

- **Early intervention is of critical importance.** According to *American Educator*, “Early intervention works. Thanks to a new generation of screening assessments, we can identify these students as early as kindergarten—and then invest in interventions for them....Once identified, these students can receive assistance... and the downward spiral... can be averted.”

- **Accommodations, including assistive technology (AT) and accessible instructional materials (AIM) for ADHD.** Mark Mahone, PhD, points out that “School-aged children with ADHD are found to be slower than their same-age peers without ADHD on nearly every type of timed task.... Reading longer text passages requires more effortful cognitive processing.” Yet, children with ADHD can “maintain verbal information in the same manner as typically developing children.” As a result, these children require may need extended time and assistive technology to strengthen engagement with longer text using their stronger listening skills to comprehend text that otherwise would otherwise “cause fatigue that could impact their availability for learning.”



- “The most consistent benefit of text-to-speech (TTS) text-reading technology is that it enables slow readers to read faster” (Elkind and Elkind, 2007).
- “The principal findings were that the assistive software allowed the students to attend better to their reading, to reduce their distractibility, to read with less stress and fatigue, and to read for longer periods of time. It helped them to read faster and thereby to complete reading assignments in less time.” (Hecker et al, 2002).

Revisiting the family's experience

Katie completed the brain training program at the BBLC and scored very well on the program's post-test. Before beginning the BBLC reading remediation program, her parents made an appointment with Dr. Wise, an independent school psychologist. They asked that he identify her remaining needs and make recommendations regarding her future educational programming. Mrs. Jones shared Katie's third-grade school-based evaluation as well as the pre-/post-test results of the BBLC's brain training program.

Testing by Dr. Wise determined that Katie had achieved no significant gains in working memory, attention, processing speed, or reading. He also pointed out that Katie's apparent cognitive skill improvement in the BBLC's post-testing was largely a result of practice effects since Katie was pre- and post-tested on the same test administered only twelve weeks apart. Dr. Wise also shared that he had found no peer-reviewed studies regarding the effectiveness of the learning center's brain training program. He recommended that Katie begin systematic, multisensory, research-based reading instruction delivered with fidelity (as intended) by a well-trained teacher. Dr. Wise also recommended assistive technology and accessible instructional materials, so Katie could use her strong listening skills to keep up in her grade level curriculum as she continued remediation of her reading skills.

The bottom line on brain training for ADHD

Where does this leave us? We sincerely hope that many of the brain-fitness programs are able to live up to the broader claims they make, for that would be wonderful news for kids, parents, and teachers around the globe. But several well-executed and well-respected studies that take a very close and critical look at the science behind this give us pause.

For example, in 2013 Christy Walcott carried out an extensive review of the literature for the National Association of School Psychologists and concluded that while “CCT (Computerized Cognitive Training) programs may enhance some specific aspects of EF [executive functions]... they do not reliably promote meaningful transfer effects to other domains of functioning” (like verbal reasoning, word reading, or arithmetic). Walcott adds that “This is contrary to the claims of some commercial programs, and it questions their clinical utility.”

QUESTIONS TO ASK WHEN CONSIDERING BRAIN TRAINING PROGRAMS

- Has this brain training program been subject to peer review? Please refer me to the research evidence regarding this program.
- Has this research been replicated?
- How lasting are the results of your brain training? Will this training need to be repeated?
- Will my child's gains be reflected in improved school work, attention, reading, etc.? In other words, will improvements transfer or generalize into real life?
- Are claims of successful outcomes based primarily on testimonials?
- Who administers the brain training testing? (“Graduate-level training in cognitive ability assessment and a background in diagnostic decision-making are required.”)
- How is progress measured? How often is progress measured with results reported to parents?
- Are there any guarantees associated with your program (two years' growth, for example)?
- What is the cost of the recommended program?

A meta-analysis published in the December 2013 *Clinical Psychology Review* regarding brain training for children with ADHD concluded that “these treatments are not effective for treating children with ADHD. They don't improve ADHD symptoms or behavior, they don't improve academic achievement, and in many cases do not improve the cognitive functions they claim to target.”

At this point, we share the views of Zach Shipstead and his colleagues, who, after carrying out a detailed meta-analysis of CCT studies concluded that “the most accurate description of the state of WM training (and ‘brain training’) is that the fundamental techniques remain a work in progress.”

It's important to recognize that brain-training research is in its infancy and the results are as yet inconsistent and inconclusive. Consumers can have greater confidence in this growing array of products when there is abundant, well-designed and replicated research that yields consistent positive results about the far transfer effects of this type of program. (The term *far transfer* refers to learning applied in real-life situations, such as reading or math, that are different than the learning contexts, such as working memory/brain training.)

So, what's our bottom line? Be optimistic and be hopeful, for this approach to enhancing brain performance is filled with promise. But

before you send anyone a check, we hope you'll use the information in this article to help you ask the right questions and demand the right answers. If you decide to hit the "buy" button on one of these programs, you may want to ask the vendor if your purchase comes with a money-back guarantee. We sincerely hope you won't have to use it.

In conclusion, we say: *Let the buyer be aware.* 🗣️

Jerome Schultz, PhD, is a clinical neuropsychologist and a member of the faculty of Harvard Medical School. He is the author of *Nowhere to Hide: Why Kids with ADHD and LD Hate School, And What We Can Do About*

It (Jossey-Bass/Wiley, 2011). **Pam Cook, MEd**, is a former teacher and the author of *Becoming Your Child's Best Education Advocate: A Guide for Parents of Children with Emotional, Behavioral, or Learning Problems* (1997). Consult their website (sites.google.com/site/brainfitnessbuyorbuyer beware) for more information on brain fitness programs.

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