

THE WAITING ROOM

THIS WAY IN

ADHD Causes Motor Skill Problems

BY GINA SHAW

Children with attention deficit/hyperactivity disorder (ADHD) don't just have trouble controlling their attention and behavior—they also have measurable difficulties controlling specific movements. That's the conclusion of two new studies of children with ADHD published in the February 15, 2011 edition of the American Academy of Neurology's journal *Neurology*.



LACK OF HAND CONTROL

Scientists involved in the studies used two different approaches to measure “motor inhibition”—the ability to control one's movements—in children with ADHD. In the first study, 25 children ages 8-13 with ADHD, and 25 children of the same age range without ADHD, were asked to perform simple finger-sequencing movements using one hand. The scientists used video recordings and a device called an electrogoniometer to precisely measure “mirror movements”—when the opposite hand mimics the action that the other hand is doing. For example, if a child was asked to alternately tap the thumb and index finger of his right hand, his left hand might involuntarily do the same thing.

Children with ADHD had much greater “mirror overflow” than children who did not have ADHD. Even at an unconscious level, children with ADHD appear to have difficulty controlling unnecessary movements, says Stewart Mostofsky, M.D., the director of the Laboratory of Neurocognitive and Imaging Research at the Kennedy Krieger Institute in Baltimore, MD, and a member of the American Academy of Neurology (AAN), who participated in both studies.

“Just as they have difficulty controlling impulsive, hyperactive, and distractible behavior, children with ADHD seem to have difficulty controlling unnecessary movement during motor tasks,” says Dr. Mostofsky. “These difficulties may help to explain why many children with ADHD show difficulties with motor coordination and control, and often have difficulty with performing a num-

ber of tasks that involve motor skills, such as handwriting.”

The other study, involving 98 children ages 8-12, used a brain stimulation technique called transcranial magnetic stimulation (TMS) to evoke slight movements in the fingers of the dominant hands. The researchers found that a particular “braking signal” in the area of the brain responsible for motor control was less efficient in children with ADHD. Children with less of this braking signal were also the ones with the most severe motor skill impairments and behavioral ADHD symptoms.

ADHD NOT JUST “BEHAVIORAL”

These two studies demonstrate that specific neurologic functions can be measured safely and in a relatively short amount of time to show how the brain may be hard-wired in ADHD, says

Donald Gilbert, M.D., M.S., associate professor of pediatric neurology and director of the Tourette's Syndrome and Movement Disorders Clinics and the Transcranial Magnetic Stimulation Laboratory at Cincinnati Children's Hospital Medical Center in Ohio.

“One of the problems with conditions like ADHD is that the diagnosis is based entirely on a series of observations by parents and teachers. These observations tend not to be very specific—there are, after all, a lot of reasons why a child might not be paying attention—and not very biological,” says Dr. Gilbert, who is an AAN member.

“Without an objective way to make the di-

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—STEWART MOSTOFSKY, M.D.

NEUROBICS

Name Recognition

People with aphasia have trouble understanding or producing language. Sometimes aphasia interferes with written language; sometimes it interferes with speech. Curiously, a person with aphasia may retain the ability to recognize letters but lose the ability to fuse letters into words.

Here is a puzzle that will give you a taste of what it is like to have trouble reading words. Each name below identifies a famous writer. I have distorted the names to make them harder to read. For instance, I blurred the first name, which is “William Shakespeare.” Can you identify the other writers?

To read names 6 and 7, hold the magazine up to your eye so the page is parallel to the ground, and look at the letters edge-on.

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

This puzzle was adapted from the book *The Playful Brain: The Surprising Science of How Puzzles Improve Your Mind*, by Richard Restak and Scott Kim (Riverhead Books 2010). For more information, visit theplayfulbrain.com. — Scott Kim, scott@scottkim.com

ANSWERS ON P. 46

agnosis of ADHD using biological measures, sometimes parents hear from others—or can’t help thinking themselves—that if mom and dad had just done a better job, their child wouldn’t have trouble in school,” says Dr. Gilbert. “In fact, many parents said the reason that they signed their children up for our study was that they felt blamed for the child’s condition. But now, these studies show that there is a measurable neurobiological difference in these kids. Although these are not tools for clinical diagnosis, they provide a biological marker that mirrors the behavioral problems, which may help researchers conduct more studies into the biology of ADHD.”

There were some clear gender differences in the findings. In both studies, the boys with ADHD had significantly more trouble controlling unnecessary movements than children without ADHD, but the girls with ADHD did not. That makes some sense, says Dr. Mostofsky. “Girls tend to mature earlier than boys, including earlier maturation of their motor functions. We might see differences in girls at younger ages. It’s also possible that boys in particular have difficulties with motor control, along with difficulties in behavioral control.”

WHAT CAN PARENTS DO?

What can parents and teachers of children with ADHD do with these findings? For starters, it’s important to realize that these kids may require accommodations that will let them demonstrate what they’re learning without performing a fine motor task—such as handwriting. “Children with ADHD may need accommodations in school, such as use of a keyboard and extra time to complete written assignments,” Dr. Mostofsky says. “When possible, the fine motor aspects of what has to be done in class should be minimized, to allow children with ADHD the opportunity to show their knowledge in other ways.”

And school is just the beginning, says behavioral neurologist Kenneth Heilman, M.D., James E. Rooks Jr. Distinguished Professor of Neurology at the University of Florida’s Center for Movement Disorders and Neurorestoration. “A lot of activities that we do require independent movement of both hands—everything from tying shoelaces to playing the piano or guitar,” Dr. Heilman says. These studies show that such “bimanual tasks” may be particularly difficult for kids with ADHD. “If a child has mirror movements, then whatever he is doing with his right hand, he’ll tend to do the same thing with his left.”

Should parents choose more bimanual tasks for their child with ADHD in an effort to improve motor control, or should they focus on activities that are more one-handed—like painting—where the child might be more immediately successful? “Parents could go either way, as long as they’re careful. It’s possible that training of the motor system could reduce the problem,” Dr. Heilman says. “But parents should not choose activities that will set their children up for failure. Whichever path they choose, parents and teachers should be aware of these problems and be prepared to help children cope with them.”

NEUROLOGY NEWS

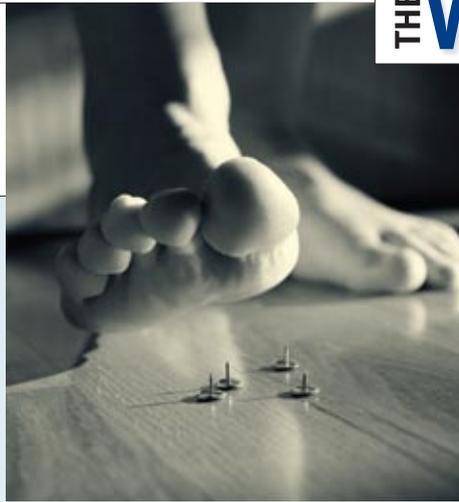
Guideline for Diabetic Neuropathy

The American Academy of Neurology (AAN) recently issued a new guideline for the treatment of diabetic neuropathy, also called diabetic nerve pain. The condition is the result of nerve damage caused by high blood-sugar levels associated with diabetes. According to the National Institute of Diabetes and Digestive and Kidney Diseases, 60 to 70 percent of people diagnosed with diabetes also have neuropathy, with the level of risk rising with age and the longer one has diabetes.

The experts interviewed by *Neurology Now* say the AAN guideline adequately summarizes most of the current treatment options, although some believe it is too heavily weighted towards pharmaceutical remedies.

“The first thing I still do is tell my patients with diabetic neuropathy to start exercising. After all, what’s better than having your own body remodel your nerves?” says Thomas Chelimsky, M.D., professor of neurology at Case Western Reserve University School of Medicine in Cleveland, OH, and Director, Autonomic Division, University Hospitals of Cleveland.

Nevertheless, “The guideline should be helpful for patients,” says John Markman, M.D., associate professor of neurosurgery and Director of the Neuromedicine Pain Management Center at the University of Rochester School of Medicine and Dentistry in Rochester, NY. “You just have to make sure the treatment is tailored to your situation, taking into account any associ-



ated diseases you might have,” Dr. Markman says. “So be honest with your doctor about everything that’s bothering you.”

SEIZURE DRUG TOPS LIST

The AAN guideline was created by experts who reviewed 79 available scientific studies on therapies for diabetic neuropathy, culled over a four-year period, and then rated the quality of the evidence. (For more on levels of evidence, see “Proof and Consequences” at <http://bit.ly/aoknb0>.)

Of all the treatments used for diabetic neuropathy and rated by the AAN, the seizure medication pregabalin was the only one found to have “strong evidence” supporting its effectiveness.

Just below pregabalin, in the category with “moderate evidence” supporting their effectiveness, were a host of other treatments. The seizure drugs gabapentin and valproate were in this category, with some evidence that gabapentin works better

if taken with the antidepressant venlafaxine. However, the AAN guideline also notes that valproate can cause weight gain, trouble controlling blood sugar levels, and serious birth defects.

The antidepressant drugs amitriptyline, venlafaxine, and duloxetine were also in this category, but the AAN guideline points out that research hasn’t determined which works best. Topical drugs with moderate evidence of effectiveness against diabetic nerve pain include capsa-

cin cream and isosorbide dinitrate spray.

Opioids such as dextromethorphan, morphine sulphate, tramadol, and controlled-release oxycodone are noted in the new AAN guideline for having “moderate evidence” of temporary effectiveness. However, their serious side effects—including rebound headaches in between drug doses and the possibility of opioid dependence—were also highlighted.

Only one non-pharmaceutical therapy, transcutaneous electric nerve stimulation (TENS)—a portable device that sends an electrical current to electrodes attached to the skin—was shown to have moderate evidence supporting its effectiveness.

LESS EFFECTIVE TREATMENTS

Moderate evidence showed that other seizure drugs such as oxcarbazepine, lamotrigine, and lacosamide were *not* helpful in treating diabetic neuropathy, and that it’s too early to determine whether the drug topiramate is helpful. Similarly, there was insufficient evidence to support or refute use of the antidepressants desipramine, imipramine, fluoxetine—along with the combination of nortriptyline with fluphenazine. There is only weak evidence supporting the effectiveness of the lidocaine patch.

Moderate evidence showed that the heart and circulation drugs clonidine, pentoxifylline, and mexiletine are *not* helpful, and there is not enough evidence to show if vitamins or alpha-lipoic acid do more good than harm. The AAN guideline also states that evidence leans *against* the effectiveness of magnetic shoe insoles, laser therapy, and Reiki Massage. More research is needed to determine whether electrotherapy and the antidepressant amitriptyline are effective.

Still, says Dr. Markman, “I’d suggest caution with following any guideline without taking into account the particulars of a patient’s pain problem.”

“I view a guideline as an evidence-based collection of population statistics,” notes Dr. Chelimsky. “You still see a doctor to treat every case separately.” —Paul Smart

The seizure medication pregabalin was found to have strong evidence supporting its effectiveness.