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TIME

RETRAINING YOUR BRAIN

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By JOHN GREENWALD

WHAT? WHEN NICOLE DAVIS was six, that was her standard reply to even the simplest question. Although seemingly bright, she lagged far behind her peers in speaking and reading and had a hard time making friends. Two years of private speech therapy had failed to bring her up to speed. So her mother Donna enrolled her in "Fast ForWord," a powerful video-game program developed by Scientific Learning Corp. of Berkeley, Calif., to aid children like her who cannot process the sounds of language fast enough to comprehend normal speech. Nicole spent six weeks of intense game playing at a speech clinic in New Jersey, emerging "like a different child," Donna Davis says. Today the ebullient second-grader chatters away with classmates, gets good grades and has stellar reading skills. As Nicole puts it, "I like to write stories and poems, read books and play with my friends."

The software that allowed Nicole to shine represents a promising application of recent and remarkable discoveries about the power of the brain to learn new tricks. Scientists are finding that the

brain is "massively plastic"—not rigidly fixed like a computer chip—and can rewire itself throughout life with the help of rigorous training. The Fast ForWord games are like mental aerobics—designed to strengthen weak connections in those parts of the brain that support language skills.

The remarkable plasticity of the brain has put scientists in hot pursuit of novel ways to treat a host of ailments. "What we are is a product of learning progressions in the brain," says Michael Merzenich, a neuroscientist at the University of California, San Francisco, and a co-founder of Scientific Learning. "A lot of people are thinking about how to use intensive training to remediate the impairments of mankind."

The discovery also represents a business opportunity. Scientific Learning is an education start-up that plans to launch an initial public offering in mid-July. The company, which lost \$10.7 million on sales of \$5.1 million last year, has targeted language and reading skills at a time when an estimated 16 million U.S. youngsters between the ages of four and 13 have reading problems. The vast but fragmented market for reading improvement already encompasses clinics, homes and

schools. Leading companies range from niche players like Lindamood Bell Learning Processes (1998 revenues: \$11 million) of San Luis Obispo, Calif., which operates centers for children with learning disabilities, to the Learning Company (1998 revenues: \$839.3 million), the producer of Reader Rabbit and other educational software that Mattel acquired in a \$3.5 billion stock swap last spring.

Scientific Learning scored its biggest coup in May with a pilot project to provide Fast ForWord to the Chicago public school system. Right now, private clinicians are the chief providers of Fast ForWord training, which can cost more than \$2,500.

While Fast ForWord hasn't helped everyone, it has shown remarkable success with many kids who suffer from a condition known as central auditory processing disorder. People with this ailment, which may afflict up to 4 million primary and secondary school students, have difficulty distinguishing between phonemes—the basic building blocks of language—and particularly between consonants like *b*, *d* and *p*, which fly by in milliseconds during conversation. The condition may also retard reading, since the children can't easily match up the in-

A SOUND APPROACH

Scientific Learning theorizes that the brain of a child with central auditory processing problems can be reprogrammed. How they do it:

AUDITORY CORTEX

BEFORE

The neural circuits that support language are poorly connected and weak (as represented by black dots)

EXERCISE 1

Two words whose sounds differ only by their first letters appear on a computer screen. The child must select the one he hears through his headphones

"Face"

Face Base

EXERCISE 2

He sees different colored shapes on the screen and must follow the directions he hears

Training exercises: Words are first artificially slowed down and then



LISTEN UP: Games aim to clarify basic language sounds

EVAN KATKA FOR TIME

that 90% of them gained an average of 1.5 years to two years in such skills as following directions and understanding complex sentences. But the company does not yet know why some children benefit more than others, or why some may not benefit at all. "There is no silver bullet," warns Reid Lyon, the head of child development and behavior studies at the National Institute of Child Health and Human Development, which is conducting a five-year study of Fast ForWord and other remediation programs.

Scientific Learning's harshest critics charge that it hasn't done its homework. For example, many speech experts contend that reading difficulties arise from a failure of the brain to translate sounds into language, not from an inability to detect clear sounds, as Scientific Learning maintains. The company's own studies have "never been done with proper controls" to test its theories, argues psychologist Michael Studdert-Kennedy, chairman of Haskins Laboratories, a leading center for the study of speech and language at Yale University. Replies Paula Tallal, a neuroscientist at Rutgers University's Newark, N.J., campus and a co-founder of Scientific Learning:

distinct sounds they hear with the letters on a page.

The Fast ForWord games attack this problem by training youngsters to distinguish among phonemes, first at artificially slowed speeds and then at normal rates of speech. The kids click their mouses on animated screen games to identify what they hear. The training is intense—students must sit before computers for 100

min. a day, five days a week for four to eight weeks—because it takes sharply focused attention to rewire a brain. Last fall, Scientific Learning rolled out Fast ForWord II for children who can use additional training. (Parental disclosure: this writer's 12-year-old son Billy made welcome strides in both programs.)

How well does it work? Scientific Learning's studies of 1,000 users claim

"What matters in the end is, does it work? Not, do we agree on theory?"

Gratified administrators at the Elim Christian School outside Chicago would endorse that view. Fast ForWord has worked for most of the 40 or so Elim students who have completed the program, says Linda Kleyn, director of network services at the school. That persuaded the Chicago system to give Fast ForWord a try.

Still, Scientific Learning will have to be boffo to win broad acceptance in a market marked by fierce competition, feuding theorists and frequent disdain for the profit motive. But the payoff for any company that can help kids overcome barriers to learning must be measured in more than dollars. "Boy, if you can increase the confidence of students in their own ability, you can affect a change in their lives," says Kleyn. Back in New Jersey, Nicole Davis might want to write a poem about that.

"Touch the red circle"

EXERCISE 3

He clicks on a figure and hears a word like "pet" and must click on others to match the same word

"Pet"

gradually speeded up to the rate of normal speech

AFTER

A successful training course strengthens the weak connections, enabling the child to process sounds rapidly

Source: Princeton Speech and Language Center

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