

Nick Matteucci was in third grade when his teacher reported that he was slow learning to read, and not writing well. The teacher suggested he might have an attention deficit disorder, but because his IQ was high, and he was not yet behind grade level, the school was not ready to test him.

His mother Sandra, a faculty member at Washington University's School of Engineering, didn't think that attention deficit diagnosis fit Nicky. He could play the same game for hours, and he could answer any question about a story read aloud to him. In fact, after a particularly bad social studies quiz, she persuaded the teacher to read the questions to him—and he showed dramatic improvement.

So Sandra went to the web, and found the home page of the Center for Vision and Learning in Creve Coeur. On a hunch, she made an appointment for testing. Upon examination Nicky's vision was 20/20 and his eyes were healthy. He was able to focus correctly for a time, but when Dr. Gail Doell, a developmental optometrist, and her therapists observed his eye movements, they found that his eye moved well for a short time, and then stopped scanning correctly. His eyes were experiencing extreme fatigue.

The good news was that Nicky's problem was amenable to vision therapy, according to Doell. Exercises could strength his eyes to let them move quickly and accurately without fatigue.

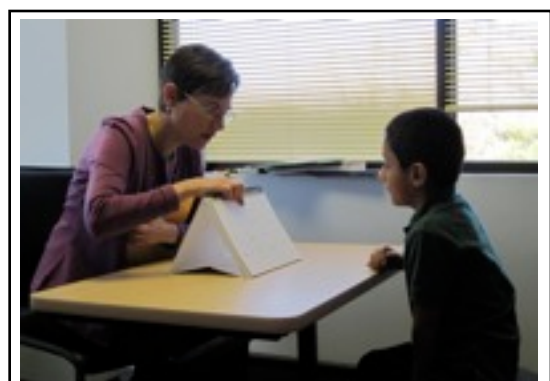
After 8 weekly sessions of vision therapy exercises, and daily practice of those exercises at home, Nicky's eye strength had increased from the 5th percentile to the 50th. After another 8 weeks, he was in the 90th percentile, and he stopped office visits. He continued to do the exercises at home, and began to read—enthusiastically once he discovered Harry Potter.

Today, four years later, Nicky is a straight A student taking advanced coursework. His mother says vision therapy was 'the turning point' for him.

How does therapy strengthen the eyes?

A visit to the Center for Vision and Learning showed a seemingly chaotic space where children were doing a variety of quiet and not-so-quiet activities with their individual therapists. Seated, a junior high school student was reading through 'flip lenses.' As the therapist reversed the lens orientation, she had to change her focus from distant to close and back again repeatedly. A young boy was hitting a ball hanging on a rope back and forth with a target device. Another eight-year old was reading a chart of random letters while standing on a balance board.

Some of the exercises, like the flip lenses, seemed more aimed at the eye itself—working the lens accommodation apparatus. In order to bat the tethered



Vision therapist Sarah Bridges tests Nick LaChance. Nick was found not to have a vision problem, and his mother went home with a list of other specialty therapists who might help with his reading difficulties.

ball in the right spot, the eye had to follow the moving ball—again working the accommodation. Sort of physical therapy for the eyes.

The kid on the balance board? He was being required to maintain his concentration on reading the letters while his body was working to maintain his balance. This seemed more like occupational therapy, strengthening certain mental pathways by working through distractions.

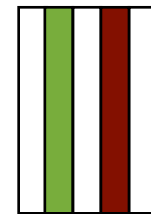
Doell explained that the therapy is designed to not only train the eye muscles, but also to develop awareness of when the visual system is working correctly, and when it is not.

As an example, she used convergence insufficiency, a common visual problem in which eyes that can see perfectly at a distance are unable to synchronously rotate inward the slight amount needed for close work. Because the eyes do not converge, print will be out of focus or may appear to jump around on the page.

One of the exercises used to treat convergence insufficiency is the “pencil pushup.” Two pencils are held together at a distance. One pencil is brought closer and closer to the face, and the patient must maintain focus on that pencil. If both eyes are working together, the pencil closest to the face will look single, but the far pencil will appear to be double.



Other checks for using both eyes may involve red and green ‘3-D’ glasses and transparent strips. If a vinyl sheet like the one in the figure is laid over a sheet of reading materials, a reader using both eyes will be able to read through all the stripes. But if the reader is using only one eye, one of the colored stripes will appear black.



Where do the patients come from?

Referrals for screening by a developmental optometrist come from reading specialists, occupational therapists, psychologists, and other doctors of optometry not trained in this specialty.

The screening include first a thorough eye exam (is vision 20/20 or correctable to that with glasses, and are the eyes healthy?), but goes on to test for binocular vision, depth perception, smoothness of eye movements, and other functional tests not usually performed in a routine eye exam.

Joanne Curran is a reading specialist in the Ladue school system. About 18 years ago, she was working with a third grade student reading at the first grade level. “It was clear to me that her eyes were jumping around as she was reading.” She suggested to the parents that they look into developmental optometry, and after about four months of office treatment and home exercises, the child was reading two years above grade level.

Since then she has looked for vision problems as one component of reading difficulties, and has found that a large number of her students have problems with the eyes. Many, of course, just

need glasses or a new prescription. Some, though, may show such symptoms as difficulty in moving the eyes smoothly across the page from left to right, or eyes that jiggle vertically while reading a line of type. In her testing, she looks for certain types of errors like omissions of parts of words, a mistake that may indicate difficulty of maintaining focus. She is also careful to ask students whether reading gives them headaches, if it is harder to read the longer they read, if print words seem wiggly to them, and other questions that might indicate difficulty with convergence or other eye muscle problems.

Alyson Aviv, a neuropsychologist, also mentioned visual spatial deficits such as difficulty judging directionality (identifying which 2 arrows are pointing at the same target from an array of arrows), and being able to match pictures and rotations of complex shapes on standardized tests as a reason she might refer to a vision therapy office.

Kay McCarthy, an occupational therapist who treats children with sensory problems also looks for discrepancies in eye-hand coordination. Suppose a child has age-appropriate hand skills, but can't use those skills in an exercise that requires hand-eye coordination. A 3-year old, for example, may have normal pincer grasp, and the ability to pick up and use a pencil, but may not be able to push the shoelace through the holes in a lacing card. She will start looking for other evidence that eye function gives trouble, such as a cocked head when watching television.

Success Stories

Not only children go to vision therapists. Greg Heille, a 63 year old priest, had amblyopia (often called lazy eye) since birth, and considered himself blind in his right eye. Although as a child his parents had taken him for treatment, patching the strong eye to strengthen the weak one did not help him.

When his ophthalmologist suggested plastic surgery on his 'blind' right eye to correct a droopy eyelid and excessive tearing, he hesitated. Upon a friend's recommendation he went to see Dr. Lisa Dibler, the other developmental optometrist in private practice in St. Louis. Dibler showed him that he did have some sight in the right eye, and he began working with her. "Almost immediately, the eyelid stopped drooping, and the eye stopped tearing." After 2 years he has full stereoscopic peripheral vision in both eyes, and reports that he was able to see the movie 'Avatar' in 3-D. Central vision in his right eye is still impaired.

Success stories abound on the web and from people like Joanne Curran.

Paradoxically, these stories have given vision therapy a bad reputation with ophthalmologists.

Medical Point of View

According to Dr. Gregory Lueder, Professor of Ophthalmology and Vision Science at Washington University, "The bottom line is that there is almost no data to support what they (vision therapists) do—it is almost all anecdotal."

A resident in the Children's Hospital Eye Center, when asked about convergence insufficiency, said that exercises are not going to hurt, but neither do they help.

The problem, says Dr. Lueder, is that families spend time and money on vision therapy, and by the time they decide to have surgery, the child's strabismus (crossed eye, turned eye, wandering eye) can be fixed, but the child is behind developmentally.

In 2009, as Judith Warner put it in a New York Times article in May of this year, the American Academy of Pediatrics along with the American Academy of Ophthalmology "essentially declared war" on developmental optometry. In a joint statement, they issued guidelines for treating dyslexia and learning disabilities. Children suspected of having these problems should be referred for educational, psychological, neuropsychological and/or medical assessment. "Diagnostic and treatment approaches for dyslexia that lack scientific evidence of efficacy such as behavioral vision therapy, eye-muscle exercises, or colored filter and lenses are not endorsed or recommended."

Aviv, the neuropsychologist, supports these guidelines. Dyslexia, a language based disability, cannot be cured by vision therapy. Some of her patients undergo initial neuropsychological assessment after having done a course of vision therapy and still have significant learning difficulties.

Optometrists' Rebuttal

In a reply, the American Academy of Optometry and the American Optometric Association state that they do not claim that their treatments solve learning disorders, but can alleviate symptoms that make reading uncomfortable or impossible.

Both Dibler and Doell, who received their doctorates at the UMSL School of Optometry, are careful to note in their literature that their therapies do not cure dyslexia, ADHD, autism spectrum disorders or similar problems.

"After we treat an autistic child for a vision problem," says Doell, "the child may have better visual function, but will still be autistic."

On the other hand, she notes, the underlying assumption for all therapies is that the condition treated can be modified—perhaps not fully cured but improved.

Neurophysiologists do their own studies

In the meantime, neurophysiologists (those who study the function of the brain) have in recent years found increasing evidence for brain plasticity well beyond childhood. Learning can establish new neural pathways. Stroke patients can learn to perform tasks even though the parts of the brain that formerly directed those tasks have been impaired.

A 2009 book titled “Fixing my Gaze: A Scientist’s Journey into Seeing in Three Dimension,” Susan Barry, a professor of neurobiology at Mount Holyoke College, tells how she unexpectedly learned how to see in three dimensions at age 50 after being ‘stereoblind’ all her life. Three childhood surgeries had corrected her crossed eyes and she functioned normally, driving and even playing tennis.

However, when Barry’s eyes began to trouble her, a developmental optometrist found that she was not focusing both eyes, but rapidly alternating visual input from either eye. With exercises to correct her ‘shimmery’ vision, she came to see the world in 3-D. As Oliver Sachs, who wrote about her in the New Yorker as ‘Stereo Sue’ says in the foreword to her book, her experience shows the “brain’s ability to change and adapt.”



Layne van Brunt consulted Gail Doell, OD, (left) after reading ‘Fixing My Gaze.’ Childhood surgery had straightened her eyes, but she had never had stereoscopic vision.

Beginning back in the 1990’s, neurophysiologists Gadi Geiger and Jerome Lettvin from MIT’s Research Laboratory of Electronics began on their own to explore the relationship between vision and dyslexia. They compared the visual behavior of dyslexic and normal readers in the United States, Italy, Germany, and Israel.

Dyslexic children were referred to them by learning professionals who classified them according to tests standard at the time to the country they were working in. Geiger says he still uses the definition of dyslexia from the 1970 conference of the World Federation of Neurologists-- difficulty in reading in spite of adequate intelligence, adequate training in reading, and absence of obvious pathologies.

They found that normal readers focus on the word(s) they are looking at and “mask” out the surrounding words. They really will not see words on the periphery of their vision. Dyslexic children, on the other hand, are not able to “mask”, and see many words at the same time.

They devised a simple treatment. Children read a limited chunk of words through a window they could move along the page. The artificial masking alone in many cases led to a dramatic improvement in reading level. They concluded that dyslexia does indeed have a visual component. Today, as Geiger continues his research, he adds a component of eye/hand coordination to his therapy—making art.

The artificial masking technique, incidentally, is one that reading teacher Joanne Curran has used for many years.

And in conclusion

There is no question that both sides of the controversy want to do as much as possible to give children good reading skills and attain the best possible vision for everyone. They have differing viewpoints. As Lueder put it, to most ophthalmologists, the eye is a camera and the brain is a

computer. To developmental optometrists and the neurobiologists described here, the eyes and the brain are a system.

It is also true that vision therapy is expensive. Insurance will in some cases pay for all or part of the initial examination, but only a small percentage pay for the therapy, that is usually given in increments of 8 weeks. Fees vary, although the clinic at UMSL School of Optometry has a fee scale considerably lower than private practitioners'.

Meanwhile, research and applications of the therapy continue.

Boston Children's Hospital, a Harvard hospital, offers vision therapy to its clients. As Dr. David Hunter, Chief of Ophthalmology, wrote in response to an email query "While I'm aware that most of my colleagues feel that vision therapy has neither scientific support nor clinical proof of effectiveness, I believe there are enough anecdotal stories of success that the topic warrants more study. " He went on to say that they have planned clinical trials and that "properly-conducted trials might address the claims of vision therapy in a way that makes sense to optometrists and ophthalmologists alike, or at least to provide a model for larger, multi-center clinical trials of specific forms of therapy."