

A New Approach to Amblyopia Treatment



Michael Repka, M.D. researches ways to push the boundaries of amblyopia treatment.

No doctor likes telling a patient, "I could have helped, if only you'd gotten here earlier." And because that conversation is especially difficult to have with parents about their child, ophthalmologist Michael Repka, M.D. has spent his career improving the likelihood that

kids with amblyopia ("lazy eye") can be treated successfully.

In recent years he and his colleagues have shown that even if a child is entering adolescence, proper treatment can improve the vision of an amblyopic eye — long beyond what conventional clinical wisdom held to be the cut-off age.

"Even 10 years ago," says Repka, who has studied amblyopia for 25 years, "people thought that kids with lazy eye had to be treated by age 7."

Affecting roughly 3 percent of the population, the reduced visual accuracy of the amblyopic eye also results in defective binocular vision.

Amblyopia may develop for

several reasons, including strabismus ("crossed eyes" - the most common cause), congenital cataracts, and refractive differences between the eyes. In cases of severe amblyopia, the amblyopic eye could have vision worse than 20/200.

Doctors traditionally treated patients by blocking the vision of the good eye with a patch, forcing the "lazy" eye to be used, and thereby slowly improving its vision. Dating back to at least the beginning of the 20th century, the use of atropine eye drops to blur the good eye had been used as an alternative to patching. But this technique was treated as a novelty and never taken seriously by most ophthalmologists. All of this changed with reports in 1993 and 1997 from the Krieger Children's Eye Center by Kurt Simons, Ph.D., David Guyton, M.D., and Repka, that, in fact,

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Wilmer Continues the 'Fight For Sight'

The impact being made by the Wilmer Eye Institute could not happen without the generous financial support from individual donors and organizations. One of the organizations that has greatly impacted the work being done at Wilmer is Fight For Sight.

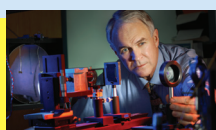
Fight For Sight was founded in 1946 and joined forces with Wilmer in the battle against blindness in 1956. Since that relationship was formed, over 70 gifts have been given by Fight For Sight to support Wilmer.

Just a few years ago, David Guyton, M.D.,

director of the Zanyvl Krieger Children's Eye Center at the Wilmer Institute received an award of \$10,000 that enabled the pediatric division to purchase visual acuity monitors for the pediatric ophthalmology clinic rooms. These monitors

are used every day in the care of hundreds of patients annually.

The financial support of organizations like Fight For Sight has helped Wilmer make great strides in curing and preventing blindness, especially within the pediatric community. □



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using an atropine eye drop to dilate the good eye is as effective as patching. This was a major step forward. Both children and their parents have always disliked the patch. Not only is it irritating, but it also leaves the child dependent on the poor vision of the amblyopic eye. The typical child thus does his or her best to remove the patch, which reduces the effectiveness of the treatment. In the case of atropine, however, the blurring cannot be removed, and children are less bothered by the eye drops. The overall result is a boon to compliance.

"We're talking literally two eye drops a week compared with two to six hours a day of patching," says Repka, noting that 80 percent of children with moderate amblyopia who are treated with drops end up with at least 20/25 vision after treatment.

With that knowledge, Repka has recently been investigating whether eye drops can be used in both older children and in more severe cases. In data just published, he and his national trial colleagues report that they are seeing treatment effectiveness in moderate amblyopia patients between 7 and 13 years of age.

Repka currently is also conducting a National Eye Institute-sponsored study comparing levodopa, a drug usually used for treating Parkinson's disease, with atropine/patching treatments in 8 to 17-year-olds with amblyopia. Previous studies elsewhere suggested that levodopa works within hours to improve amblyopic vision, but the effects weren't long-lasting. Tweaking the drug to increase efficacy and/or using it as an adjunct to atropine or patching are all possibilities for improving outcomes. "We think that levodopa enhances the retina's ability to function," says Repka.

Still, he's convinced that the real key to treating amblyopia and many pediatric eye diseases is to identify them in their formative stages. "Maryland, for example, mandates eye screenings when a child enters school, but that may be later than optimum," says Repka. "Professional guidelines suggest that pediatricians (and other primary care providers) should test visual acuity at age 3 or 4 to detect an abnormality." Testing at an early age may be the key for parents to be able to hear those three wonderful words from their doctor: "I can help." □

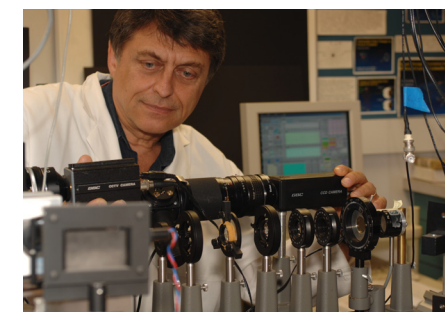
Wilmer Vision Screener Design Wins Engineering Award

Envisioning the future may be a difficult challenge for some, but for Kristina Irsch, Ph.D. and the team of researchers at the Wilmer Eye Institute, this challenge is one step closer to being met.

Irsch is a new member of the staff of the Ophthalmic Instrument Development Laboratory at the Krieger Children's Eye Center at the Wilmer Institute. She recently won first prize in *NASA Tech Briefs* magazine's medical innovation contest for her 3D engineering drawing of the Laboratory's new vision screener. This novel instrument can screen infants and toddlers for strabismus ("crossed eyes") and focus abnormalities in a matter of seconds. These causes of amblyopia ("lazy eye") can thus be detected and treated earlier, and on a much wider scale, than has previously been possible.

Irsch was cited by the magazine in its annual "Create the Future" design contest, sponsored by the magazine and software developer SolidWorks.

Irsch's honor is for her 3D design of the latest model of the vision screening device first conceived and developed at Hopkins in 1991 by David Guyton, M.D.



Boris Gramatikov, Ph. D. experiments with the new optical set-up.



Kristi Irsch, Ph.D. with her prize-winning design.

The original method of measurement was unique enough that a patent was granted on the basic principle.

An estimated 5 percent of American children have misaligned eyes (strabismus) or eyes that do not focus together (anisometropia). Left undetected and untreated, these abnormalities can cause amblyopia and lead to permanent vision loss in the amblyopic eye.

Irsch's SolidWorks rendition shows the optical/mechanical design of the current version of Guyton's instrument, known as the Pediatric Vision Screener (PVS). The PVS is intended to be a simplified and accurate mass screening tool for infants and young children that is easy enough to use that it can be operated by lay people with minimal training. Currently, an eye exam performed in the doctor's office by a pediatric ophthalmologist or optometrist is the only way to ensure accurate diagnosis, but is far too expensive for widespread screening.

"Our PVS detects misalignment and focus abnormalities in a few seconds and can be used by a lay person, making it the perfect candidate for a mass-screening tool," says Guyton.

From about ten inches away, the screener scans beams of infrared light into both eyes, onto the retinas. If a child's eyes are misaligned or out of focus, the signals that bounce back from the retinas will be abnormal, a sign to seek care from a specialist for further evaluation and treatment.

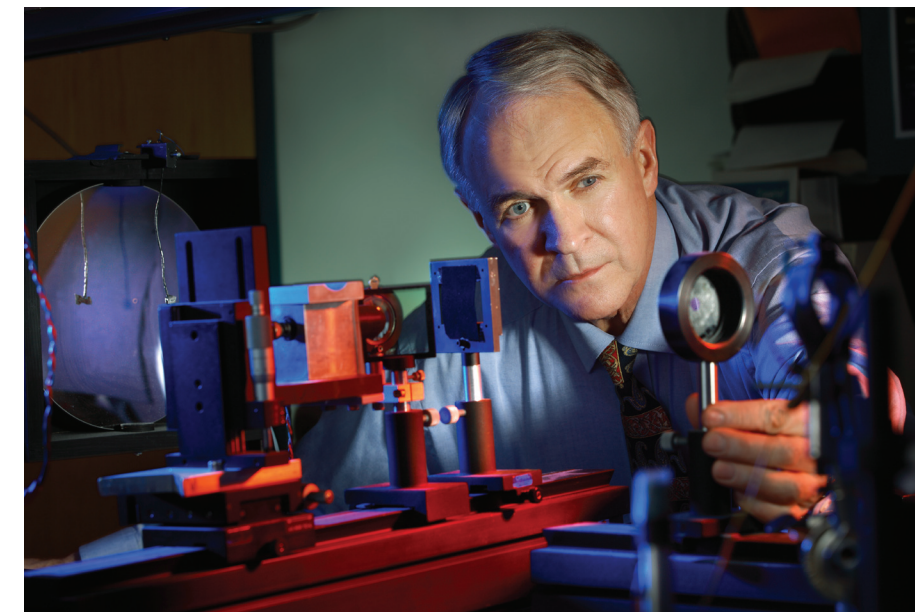
The latest innovations improve both the strength of the signals and the accuracy of the test by accounting for individual eye variations. The current design represents the fifth generation of the Pediatric Vision Screener and is likely to be incorporated into a commercially available device, Guyton says. He notes that the progress on the PVS made to date is the result of years of dedicated research and design that would not have been possible without the generous support of private philanthropists. Herbert Liebich, Barbara and Louis Levy, Vickie and Richard Baks, Robert and Maureen

Feduniak, Helen and David Leighton, and Bob and Diane Levy are just a few of the donors who have not only backed this project financially, but have also provided support and confidence in their partnership with Wilmer. Funds have also been provided by Research to Prevent Blindness, the Alcon Research Institute, and the National Institutes of Health.

Early detection of amblyopia and strabismus (in the first few years of life) is critical because the conditions can be most successfully treated in their early stages. Yet nearly half of the affected children in the United States are not diagnosed until age 5 or later. Good vision plays a primary role in brain development by providing constant feedback of visual cues to the brain. When vision is compromised by amblyopia or strabismus, so is brain development. Guyton notes that each month these conditions persist makes it harder to recover the visual loss that they cause. □

Launched in 2002 by *NASA Tech Briefs* magazine, the "Create the Future" design contest is intended to stimulate and reward engineering innovation.

David Guyton, M.D. with a bench version of the Pediatric Vision Screener.



Treatment Gaps Found in Urban Population

In a recent comprehensive eye disease study among urban pre-schoolers, Johns Hopkins investigators report that while vision problems among these children are relatively rare, they most often go untreated because they are not detected. However, nearly all are easily treated. They also found a group of children who have received treatments they don't need.

Highlighted in the April issue of the journal *Ophthalmology*, investigators from the Johns Hopkins Children's Center, the Johns Hopkins Bloomberg School of Public Health, and the Zanvyl Krieger Children's Eye Center at the Wilmer Institute report that 5 percent of the nearly 2,300 Baltimore area children who were followed in the study had refractive errors (a defect in the eye's ability to focus light) significant

enough to require treatment. However, only one percent actually were treated.

On the other hand, among 29 children who had a prescription for eyeglasses before entering the study, more than one-third didn't need those glasses.

Undetected and untreated, refractive errors can cause loss of visual acuity and, in severe enough cases, lead to amblyopia ("lazy eye").

In addition to the 5% of the children with significant refractive errors that required treatment, more than half of the 1,268 black children (55 percent) and 1,030 white children (51 percent) had at least some refractive error, which was not significant enough to require treatment.

Since one in 20 children studied had a problem that is easily treated with glasses, the researchers suggest that

pediatricians screen routinely during physicals, and parents should insist their children are screened by age 4.

"The good news is that serious eye disease in preschoolers appears to be uncommon, but the bad news is that we're missing kids who need treatment and treating some children who don't need it," says investigator Michael X. Repka, M.D., Professor of Pediatric Ophthalmology at Wilmer.

A surprising additional finding in the report is that, contrary to the previous belief that most infants will outgrow their usual farsightedness in the first few years of life, few children in the Baltimore study did outgrow it during their preschool years. This finding emphasizes the necessity of early diagnosis and treatment, says lead investigator David Friedman, M.D., Ph.D. □

If you are interested in supporting the doctors and the research they are conducting at The Zanvyl Krieger Children's Eye Center at The Wilmer Institute, please contact:



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