SCIENCE NEWS of the week

Dyslexics Read Better With the Blues

Many children with dyslexia, a common reading disability, can improve their reading comprehension by placing plastic overlays tinted blue or gray atop the pages they are reading, new studies suggest.

Researchers caution that the findings remain preliminary and should not be confused with an increasingly popular, widely advertised system that promises similar improvements using expensive eyeglasses with tinted lenses. But if additional studies now underway confirm the new findings, says study leader Mary C. Williams, the plastic overlays may provide the first effective treatment for this frustrating condition, which leaves 10 to 15 percent of the U.S. population inexplicably tripping over written words.

Williams, a psychologist at the University of New Orleans, studied a group of 8- to 12-year-old dyslexic children with average or above-average intelligence. Their reading skills lagged behind those of nondyslexics by at least 2 years, despite average progress in other subjects and an apparent absence of behavioral or medical disorders.

In previous research, Williams and psychologist William Lovegrove of the University of Wollongong, Australia, found that about 70 percent of dyslexic children show deficits in a part of the visual processing system called the transient subsystem — the neural switchboard that processes information on depth, motion and eye movements. They also found that most dyslexics appear normal in the other major visual subsystem, the spatial system, which processes information on stationary details.

According to one theory, reading ability relies on the precise synchronization of these two systems in the brain. Basing her approach on evidence that dyslexics suffer from a sluggish transient system — and on the knowledge that transient processing rates depend in part upon visual contrast — Williams tested the effects of various background colors behind black text.

She had 38 dyslexic and 32 nondyslexic children read passages presented on red, blue, gray, green or white backgrounds, using color-monitor computers or lightly tinted plastic overlays on printed pages. Tests of reading comprehension revealed significant improvement in 80 percent of the dyslexics when the text appeared on a blue or light gray background. Several nondyslexic children also showed some improvement.

Clear overlays had no effect, and other colors generally had either no effect or a detrimental effect, Williams reported last week in Universal City, Calif., at a seminar sponsored by Research to Prevent Blindness, Inc.

Lovegrove has obtained similar results in a trial of about 20 children in Australia, he told SCIENCE NEWS in a telephone interview. He notes that the overlay technique, with its benefits mostly limited to blue and gray backgrounds, differs markedly from the so-called Irlen lens system, promoted heavily in some parts of the United States and Australia in recent years. Lovegrove and Williams say Irlen specialists charge patients hundreds of dollars for assistance in choosing among a broad range of colored eyeglass lenses. The controversial system is purported to correct a form of dyslexia called scotopic sensitivity syndrome — a vaguely defined syndrome that some visual specialists contend does not exist.

"It's probably true that there's something wrong with the transient system in dyslexics," comments vision researcher Margaret Livingstone of Harvard Medical School in Boston, who has conducted her own studies of dyslexia and perception. She says it's feasible that blue backgrounds speed a slow transient system by affecting contrast levels. However, she adds, the mechanism behind such effects remains a mystery.

Williams and Lovegrove note that the lack of an easily diagnosed visual defect in dyslexics has led many people to assume that these children suffer from a generalized language deficit. With new evidence that dyslexia represents a specific defect in visual perception — one perhaps subject to improvement with relatively simple and inexpensive methods — the researchers anticipate a new wave of remediation techniques.

Williams has begun long-term outcome studies to track improvements in dyslexic kids currently using the overlays for all their reading. One advantage of the overlays, she finds, is that "the kids love to use them." — *R. Weiss*

Shining a bright light on quantum darkness

In their quest for true darkness in the twilight zone of quantum mechanics, researchers have been exploring the possibility of machining materials or arranging microscopic, electrically insulating spheres into geometric forms that would completely exclude photons of certain wavelengths from a region of space. Such a structure would prevent an excited atom embedded within it from spontaneously emitting a photon, in effect greatly prolonging the time an atom could spend in an excited state.

As a first step toward that goal, physicists Nabil M. Lawandy and Jordi Martorell of Brown University in Providence, R.I., have now demonstrated that an orderly arrangement of tiny polystyrene spheres suspended in water can delay photon emission from laser-excited dye molecules trapped among the spheres. The researchers will report their findings in the Oct. 8 PHYSICAL REVIEW LETTERS.

Spontaneous emission of photons by atoms is such a fundamental, ubiquitous phenomenon that it's easy to forget that an excited atom will emit a photon only if the surrounding vacuum (the space between atoms) can receive it. The explanation for this effect hinges on the peculiar quantum-mechanical notion that the vacuum itself consists of a seething sea of electromagnetic fields that interact with photons and allow their passage. This vacuum field normally acts as a giant reservoir into which excited atoms can deposit photons.

To inhibit spontaneous emission, researchers have tried various strategies for modifying the vacuum to cancel out or suppress — in a well-defined region of space — the quantized electromagnetic fields required for carrying photons of a certain wavelength. One strategy involves creating an orderly array of identical spheres of just the right size and spacing to inhibit the emission or transmission of certain photons.

Lawandy

In this layered colloidal polycrystal, consisting of polystyrene spheres immersed in water, different colors correspond to different sphere spacings.

Lawandy and Martorell relied on nature to create the desired periodic structure. Uniformly sized, negatively charged polystyrene spheres immersed in pure water settle into an orderly pattern re-