New Insights Into the Neuroscience of Dyslexia

Most of us take the ability to read and write for granted. For some, however, these fundamental skills are difficult to master.

Sadly, factors associated with the variety of symptoms that contribute to a diagnosis of dyslexia have remained obscure. New research may change this picture as researchers announce a major advancement toward understanding the cause of dyslexia.

Neuroscientist Begoña Díaz, Ph.D., and her colleagues at the Max Planck Institute for Human Cognitive and Brain Sciences in Leipzig, Germany, have discovered an important neural mechanism underlying dyslexia.

They believe problems arise in the part of the brain called the medial geniculate body in the thalamus. Experts believe this discovery can provide the basis for developing potential treatments for the condition.

People who suffer from dyslexia have difficulties with identifying speech sounds in spoken language. For example, while most children are able to recognize whether two words rhyme even before they go to school, dyslexic children often cannot do this until late primary school age.

Most people suffer from dyslexia for their whole lives although many learn to compensate.

“This suggests that dyslexia can be treated. We are therefore trying to find the neural causes of this learning disability in order to create a basis for improved treatment options,” Diaz said.

Experts say that between five and 10 percent of children suffer from dyslexia, yet very little is known about its causes.

Dyslexia is not associated with a lack of intelligence. However, individuals with dyslexia have difficulties in reading, and in understanding and explaining individual words or entire texts.

In the new study, researchers showed that dyslexic adults have a malfunction in a structure that transfers auditory information from the ear to the cortex. The short circuit in the medial geniculate body in the auditory thalamus causes an error in the process of speech sound.

“This malfunction at a low level of language processing could percolate through the entire system. This explains why the symptoms of dyslexia are so varied,” says Diaz.

In the study, researchers conducted two experiments in which several volunteers had to perform various speech comprehension tasks.
When affected individuals performed tasks that required the recognition of speech sounds, as compared to recognize the voices that pronounced the same speech, magnetic resonance tomography (MRT) recordings showed abnormal responses in the area around the medial geniculate body.

In contrast, no differences were apparent between controls and dyslexic participants if the tasks involved only listening to the speech sounds without having to perform a specific task.

“The problem, therefore, has nothing to do with sensory processing itself, but with the processing involved in speech recognition,” Díaz said. No differences could be ascertained between the two test groups in other areas of the auditory signaling path.

The new findings combine various theoretical approaches, which deal with the cause of dyslexia and, for the first time, bring together several of these theories to form an overall picture.

“Recognizing the cause of a problem is always the first step on the way to a successful treatment,” said Díaz.

Researchers say their next goal is to study how current treatment programs can influence the medial geniculate body in order to make learning to read easier for everyone in the long term.

Source: Max Planck Institute

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