Dyslexia affects brain according to language

- Story Highlights
- Study: disorder affects different parts of brain depending on native language
- Dyslexia affects millions of children worldwide, causing learning problems
- Researcher: learning to read culturally important, but not natural
- Underlying abnormalities that cause dyslexia in the brain still unknown

WASHINGTON (AP) -- Dyslexia affects different parts of children's brains depending on whether they are raised reading English or Chinese.

That finding, reported in Monday's online edition of Proceedings of the National Academy of Sciences, means that therapists may need to seek different methods of helping dyslexic children from different cultures.

"This finding was very surprising to us. We had not ever thought that dyslexics' brains are different for children who read in English and Chinese," said lead author Li-Hai Tan, a professor of linguistics and brain and cognitive sciences at the University of Hong Kong. "Our finding yields neurobiological clues to the cause of dyslexia."

Millions of children worldwide are affected by dyslexia, a language-based learning disability that can include problems in reading, spelling, writing and pronouncing words. The International Dyslexia Association says there is no consensus on the number because not all children are screened, but estimates range from 8 percent to 15 percent of students.

Reading an alphabetic language like English requires different skills than reading Chinese, which relies less on sound representation, instead using symbols to represent words.

Past studies have suggested that the brain may use different networks of neurons in different languages, but none has suggested a difference in the structural parts of the brain involved, Tan explained.

Tan's research group studied the brains of students raised reading Chinese, using functional magnetic resonance imaging. They then compared those findings with similar studies of the brains of students reared reading English.

Guinevere F. Eden, director of the Center for the Study of Learning at Georgetown University in Washington, D.C., said the process of becoming a skilled reader changes the brain.

"Becoming a reader is a fairly dramatic process for the brain," explained Eden, who was not part of Tan's research team on this paper.

For children, learning to read is culturally important but is not really natural, Eden said, so when the brain orients toward a different writing system it copes with it differently.

For example, English-speaking children learn the sounds of letters and how to combine them into words, while Chinese youngsters memorize hundreds of symbols which represent words.

"The implication here is that when we see a reading disability, we see it in different parts of the brain depending on the writing system that the child is born into," Eden said.

That means, "We cannot just assume that any dyslexic child is going to be helped by the same kind of intervention," she said in a telephone interview.

Tan said the findings suggest that treating Chinese speakers with dyslexia may use working memory tasks and tests relating to

sensor-motor skills, while current treatments of English dyslexia focus on letter-sound conversions and sound awareness.

He said the underlying cause of brain structure abnormalities in dyslexia currently is unknown.

"Previous genetic studies suggest that malformations of brain development are associated with mutations of several genes and that developmental dyslexia has a genetic basis," he said in an interview via e-mail.

"We speculate that different genes may be involved in dyslexia in Chinese and English readers. In this respect, our brain-mapping findings can assist in the search for candidate genes that cause dyslexia," Tan said.

In their paper, the researchers noted that imaging studies of the brains of dyslexic children using alphabetic languages like English have identified unusual function and structure in the left temporo-parietal areas, thought to be involved in letter-to-sound conversions in reading; left middle-superior temporal cortex, thought to be involved in speech sound analysis; and the left inferior temporo-occipital gyrus, which may function as a quick word-form recognition system.

When they performed similar imaging studies on dyslexic Chinese youngsters, on the other hand, they found disruption in a different area, the left middle frontal gyrus region.

The study was financed by the Chinese Ministry of Science and Technology, the Hong Kong Research Grants Council and the University of Hong Kong.

In a separate paper, published two years ago, University of Michigan researchers reported that Asians and North Americans see the world differently.

Shown a photograph, North American students of European background paid more attention to the object in the foreground of a scene, while students from China spent more time studying the background and taking in the whole scene.

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