Culture plays a role in dyslexia, scientists say

Different areas of the brain affected in Chinese children

The Associated Press
Updated: 6:30 p.m. ET Sept. 2, 2004

LONDON - Westerners shudder at the idea of reading even the most basic street signs and instructions in Chinese, a language with 6,000 characters to memorize to be considered fluent.

A new set of brain images shows why:
Reading English-style alphabets and Chinese characters use very different parts of the brain.

The results also suggest that Chinese schoolchildren with reading problems misfire in a different brain region than the one used in reading alphabet-based languages like English. This demonstrates that the learning disorder dyslexia is not the same in every culture and does not have a universal biological cause, researchers said.

Neurologists described the results as "very important and innovative." While dyslexia has certain common roots, they said they now have some proof that this kind of functional problem plays out differently according to the unique demands that Western and Eastern languages place on the brain’s wiring and processing centers.

And, it suggests that treating dyslexia around the world probably will require different therapies between nations and languages as well, they said.
“We should not be alphabet-centric in our thinking,” said Georgetown University neuroscientist Guinevere Eden. She has conducted brain scans on American dyslexic children, but she did not participate in the study on Chinese students.

“Reading is complex,” Eden said. “This shows we need to be more open-minded about diverse treatment approaches.”

Dyslexia is a common developmental disorder in which people of normal intelligence have difficulty learning to read, spell and master other language skills. In the United States, it is observed in 5 to 15 percent of the population, while in China it affects up to 7 percent.

Its origins are complex. There appears to be an inherited genetic aspect. Researchers say they expect that the same genes would be involved in dyslexics regardless of their heritage.

It also may result from neural injury before birth that changes visual and auditory pathways in the brain.

Earlier brain scans show that English-reading dyslexics misfire in the left temporal-parietal region of the brain associated with awareness of phonemes, 44 sounds from the English alphabet. It is located in the middle and upper portions of the brain’s left lobe.

Similar results were found with French and Italian dyslexics.

“We assumed that all dyslexics probably were the same,” Eden said. “But reading Chinese requires a different set of skills.”

And, according to the new study, it uses some different parts of the brain called the left middle frontal gyrus, or LMFG.

Brain scans show the LMFG fires in normal Chinese readers, but Chinese dyslexics show glitches in that circuitry, according to Li-Hai Tan of the National Institute of Mental Health in Bethesda and the University of Hong Kong.

The LMFG is located toward the left-front of the brain. It is associated with symbol interpretation. Unlike alphabet letters, Chinese characters represent entire thoughts and physical objects.

Tan’s results appear in the latest issue of the journal Nature.

In the experiment, the researchers worked with 16 Beijing schoolchildren who are 10-12 years old. Eight were dyslexic and the rest were normal readers.

The children took turns being placed in an MRI machine as sets of Chinese characters were flashed electronically on a screen. They saw the characters briefly and had to choose an answer by
pressing a key with their index finger. During the test, the MRI
took snapshots of oxygen-rich blood flowing to portions of their
brains in action.

It does not mean Chinese dyslexics might be able to use different
portions of their brain and learn to read English signs and
instructions more easily. Once a person learns to read they tend
to use the same circuitry regardless of the second language and
its alphabet, Eden said.

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