Bartlett looking for genetic key to
specific-language impairments

Of all the American school children receiving special education services, the largest number suffer from learning language impairments, including a subset of children that have language as their only deficit. Specifically Language Impaired (SLI) children have weakened language ability but otherwise possess normal hearing, education and intelligence.

"My laboratory staff examines DNA from families that have multiple persons with specific language impairment," said Christopher W. Bartlett, Ph.D., an assistant professor at The Research Institute at Nationwide Children's Hospital and The Ohio State University (OSU). *"The laboratory of my collaborator, Dr. Stephen A. Petrill, a professor of human development and family science at OSU, works directly with the families to enroll them in the study.* Then we work together to understand how the DNA data and analysis from my group can be understood in the context of language difficulties."*

Bartlett points out that while several studies consistently have shown that SLI can be inherited, only a handful have begun discovering specific molecular genetic causes of the disorder. Bartlett's group found strong evidence of a genetic variation associated with SLI, located on the human chromosome 13q21; however the specific version of the gene that increases susceptibility to SLI, he noted, has not yet been identified. The work is greatly complicated since language involves many underlying biological processes in the brain, including multilevel interactions of many genes.

This type of genetic analysis typically involves millions of likelihood calculations at each genetic position linked to the trait under investigation. To speed up this process, Bartlett applied algebraic computation that achieved a speed-up factor of around 20 to 40.

"The gain of speed-up comes at the expense of memory demand, as large polynomials are stored in the memory for fast access," Bartlett said. *"For complex pedigrees, the memory consumption can go as high as 64 gigabytes, if not more. Once the polynomial is built, the evaluation process is highly parallelized, and we have been able to utilize the high memory and multi-core nodes of Ohio Supercomputer Center clusters to the full extent to complete our important research, which would otherwise be impossible or too slow to conduct."*

The aims of the project are important, according to Bartlett, because they link genetic analysis with the multiple cognitive pathways that may lead to SLI in the hopes of earlier identification in patients and earlier intervention with the goal of much better language outcomes for the children. ■

*Families interested in finding out more about the study can email bls@ehe.osu.edu for details.

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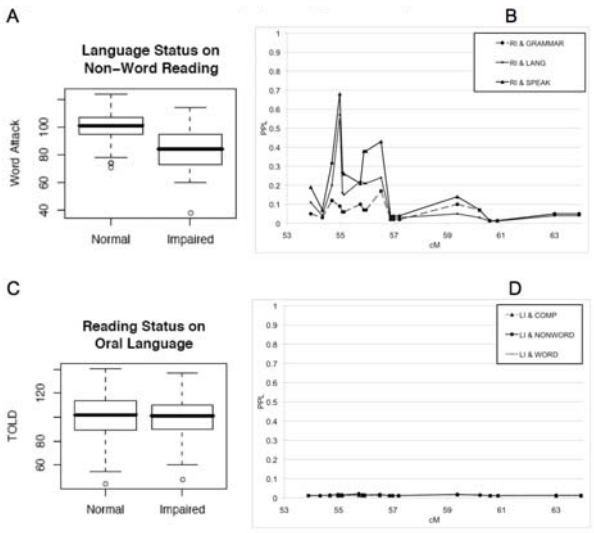

Leveraging Ohio Supercomputer Center resources, Christopher Bartlett at the Research Institute at Nationwide Children's Hospital (left) employed a unique statistical model to clarify relationships between clinical diagnosis and quantitative variation (above).