

## Children with Tourette's quicker at certain mental grammar skills

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Children with Tourette's syndrome may have to put up with some unwanted movement and verbal tics, but neuroscientists at Georgetown University Medical Center and the Kennedy Krieger Institute have found that they are much quicker at processing certain mental grammar skills than are children without the disorder.

They say the findings, reported in the current issue of the journal *Neuropsychologia*, suggest that abnormalities in the brain linked to tics in Tourette's syndrome may also result in a range of rapid behaviors -- and, possibly, superior skills -- than had been appreciated before.

“These children were particularly fast, as well as largely accurate, in certain language tasks. This tells us that their cognitive processing may be altered in ways we have only begun to explore, and moreover in a manner that may provide them with performance that is actually enhanced compared that of typically-developing children” said the study's senior investigator, Michael Ullman, Ph.D., professor of neuroscience, psychology, neurology and linguistics.

According to the National Institutes of Health (NIH), about 200,000 Americans have the most severe form of Tourette's syndrome, but as many as 10 percent of Americans have a milder form. The most common initial symptom is a facial tic, and other tics -- sudden, rapid, repeated movement or vocalization -- may follow. Tics can include eye blinking, repeated throat clearing or sniffing, arm thrusting, kicking, shoulder shrugging, or jumping, but coprolalia, which is involuntary use

of obscene words or swearing, is only rarely associated with Tourette's syndrome.

This nervous system disorder is linked to structural and functional abnormalities in the basal ganglia and frontal cortex area of the brain, which result in decreased inhibition of frontal activity, leading to hyperkinetic behaviors and development of tics, Ullman says. The disorder is also associated with abnormalities in the way that chemical substances, such as hormones and neurotransmitters, help nerve cells talk to each other.

In this study, Ullman, along with first author Matthew Walenski, PhD, and Stewart Mostofsky, MD, decided to study two different aspects of language as a way to broaden understanding of this disorder.

These two basic aspects of language, "rule governed" and "idiosyncratic" knowledge, depend on distinct neurobiological processes. Rule-governed knowledge involves the procedural memory system that depends on frontal/basal-ganglia area circuits in the brain; in language, it is used to combine parts of words together according to the grammatical rules of the language (for example, putting walk and ed together to form a regular past tense.) In contrast, idiosyncratic knowledge depends on declarative memory, and is learned and processed in the hippocampus and other temporal lobe areas in the brain. This kind of memory allows us to learn that a word is linked to an object (such as the word "cat" to its meaning "furry animal"), and also is used to learn irregular past tense word forms (as in spring and sprang).

Some previous evidence suggested that aspects of procedural memory may be abnormal in Tourette's syndrome, whereas declarative memory remains largely spared, but the contrast between the two forms of language knowledge had not been studied before. In this study, eight children, age 8-17, with Tourette's syndrome and eight typically

developing children of the same ages without the disorder were given tasks that included producing past tense forms. All of the children had a normal IQ. The investigators found that children with Tourette's syndrome were significantly faster than the control group in producing rule-governed past tenses (like slip-slipped) that depend on grammar and procedural memory but not in producing irregular or other unpredictable past tenses (such as bring-brought) that are stored in declarative memory.

The two groups of children were then given a picture-naming task to test motor skill and conceptual knowledge. Those with Tourette's syndrome responded significantly faster than the control group in naming pictures of objects that can be manipulated (such as hammer), and thus depend on motor skill knowledge, but not in naming pictures of non-manipulated objects (like elephant), which depend only on conceptual knowledge. The motor skill knowledge associated with manipulated objects also depends on procedural memory. But unlike in the past tense task, where some accuracy was lost to the speed of the response, there was no loss of accuracy in the picture-naming test by children with the disorder.

“This may mean that the brain abnormalities we see in Tourette's syndrome may lead not only to tics but also to a much wider range of unsuppressed and rapid behaviors,” Ullman said. The researchers are now developing new language and memory tests for patients with Tourette's syndrome.

Source: Georgetown University Medical Center

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