When rules change, brain falters

July 30 2012

A Michigan State University experiment found that learning a new task when rules change is surprisingly difficult. Study participants wore this electrode cap. Credit: Michigan State University

For the human brain, learning a new task when rules change can be a surprisingly difficult process marred by repeated mistakes, according to a new study by Michigan State University psychology researchers.

Imagine traveling to Ireland and suddenly having to drive on the left side of the road. The brain, trained for right-side driving, becomes overburdened trying to suppress the old rules while simultaneously focusing on the new rules, said Hans Schroder, primary researcher on the study.

"There's so much conflict in your brain," said Schroder, "that when you make a mistake like forgetting to turn on your blinker you don't even

realize it and make the same mistake again. What you learned initially is hard to overcome when rules change."

The study, in the research journal *Cognitive, Affective & Behavioral Neuroscience*, is one of the first to show how the brain responds to mistakes that occur after rules change.

Study participants were given a computer task that involved recognizing the middle letter in strings such as "NNMNN" or "MMNMM." If "M" was in the middle, they were to press the left button; if "N" was in the middle, they were to press the right. After 50 trials, the rules were reversed so the participants had to press the right button if "M" was in the middle and the left if "N" was in the middle.

Participants made more repeated errors when the rules were reversed, meaning they weren't learning from their mistakes. In addition, a cap measuring brain activity showed they were less aware of their errors. When participants did respond correctly after the rules changed, their brain activity showed they had to work harder than when they were given the first set of rules.

"We expected they were going to get better at the task over time," said Schroder, a graduate student in MSU's Department of Psychology. "But after the rules changed they were slower and less accurate throughout the task and couldn't seem to get the hang of it."

Continually making these mistakes in the work environment can lead to frustration, exhaustion and even anxiety and depression, said Jason Moser, assistant professor of psychology and director of MSU's Clinical Psychophysiology Lab.

"These findings and our past research suggest that when you have multiple things to juggle in your mind – essentially, when you are

multitasking – you are more likely to mess up," Moser said. "It takes effort and practice for you to be more aware of the mistakes you are missing and stay focused."

In addition to Schroder and Moser, co-researchers include Erik Altmann, associate professor of psychology, and master's student Tim Moran.

Provided by Michigan State University