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Brain power shortage: Applying new rules is mentally taxing and costly

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Can you teach an old dog (or human) new tricks? Yes, but it might take time, practice, and hard work before he or she gets it right, according to Hans Schroder and colleagues from Michigan State University in the US. Their work shows that when rules change, our attempts to control our actions are accompanied by a loss of attention to detail. Their work is published online in the Springer journal *Cognitive, Affective, & Behavioral Neuroscience*.

In order to adapt to changing conditions, humans need to be able to modify their behavior successfully. Overriding the rules we adhere to on a daily basis requires substantial attention and effort, and we do not always get it right the first time. When we switch between two or more tasks, we are slower and more likely to commit errors, which suggests switching tasks is a costly process. This may explain why it is so hard to learn from our mistakes when rules change.

The authors explain: "Switching the rules we use to perform a task makes us less aware of our mistakes. We therefore have a harder time learning from them. That's because switching tasks is mentally taxing and costly, which leads us to pay less attention to the detail and therefore make more mistakes."

A total of 67 undergraduates took part in the study. They were asked to wear a cap, which recorded electrical activity in the brain. They then performed a computer task that is easy to make mistakes on. Specifically, the participants were shown letter strings like "MMMMM"

or "NNMNN" and were told to follow a simple rule: if 'M' is in the middle, press the left button; if 'N' is in the middle, press the right button. After they had followed this rule for almost 50 trials, they were instructed to perform the same task, but with the rules reversed i.e. now if 'M' is in the middle, press the right button; and if 'N' is in the middle, press the left button.

When the rules were reversed, participants made more consecutive errors. They were more likely to get it wrong twice in a row. This showed they were less apt to bounce back and learn from their mistakes. Reversing the rules also produced greater control-related and less error-awareness brain activity.

These results suggest that when rules are reversed, our brain works harder to juggle the two rules - the new rule and the old rule - and stay focused on the new rule. When we spend brain energy juggling these two rules, we have less brain power available for recognizing our mistakes.

More information: Schroder HS et al (2012). Action-monitoring consequences of reversing stimulus-response mappings. *Cognitive, Affective, & Behavioral Neuroscience*; DOI 10.3758/s13415-012-0105-y

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