

When an error has occurred, acetylcholine is crucial to focus on goal again

The reason for human errors is often a lack of attention and getting distracted by irrelevant information. For instance, if you add salt instead of sugar to a cup of tea, you might have been misled by the white color and ignored the labeling. Claudia Danielmeier, Gerhard Jocham and Markus Ullsperger from the Otto von Guericke University Magdeburg, Germany, investigated neural processes related to this type of action slips in collaboration with colleagues from Bergen University, Norway, and the university hospital in Cologne, Germany. Previous studies demonstrated that visual brain areas, processing relevant information for reaching a goal, show increasing activity after errors, thereby enhancing attention to relevant information. However, it remained unknown *how* these adaptations are conveyed. The current study by Danielmeier and colleagues shows that acetylcholine is crucial for neural and behavioral adjustments after errors. Medial frontal brain areas that participate in error detection activate neurons that release acetylcholine in specific parts of the visual cortex. This leads to enhanced processing of relevant and decreased processing of distracting information. The results of this study are important because the role of acetylcholine has so far been neglected in the context of performance monitoring and cognitive control. The findings could also lead to new insights into impairments in Alzheimer's disease since a lack of acetylcholine is the central underlying problem in this condition.

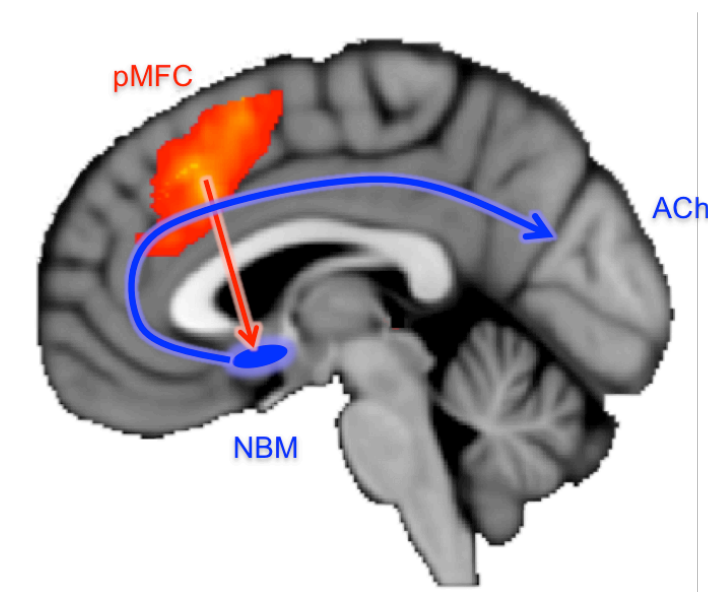


Figure: Signal cascade to strengthen selective attention after errors. The performance monitoring network detects errors leading to increased activity in the posterior medial frontal cortex (pMFC, red). The error signal presumably affects cholinergic neurons of the nucleus basalis of Meynert (NBM, blue) in the basal forebrain. These neurons are connected to visual cortex (arrow to back of the brain), where they release acetylcholine. This mechanism increases the processing of relevant information and suppresses distracting information, thereby focusing attention to task-relevant information, which helps to avoid similar errors in the future.