Math boosts brain research

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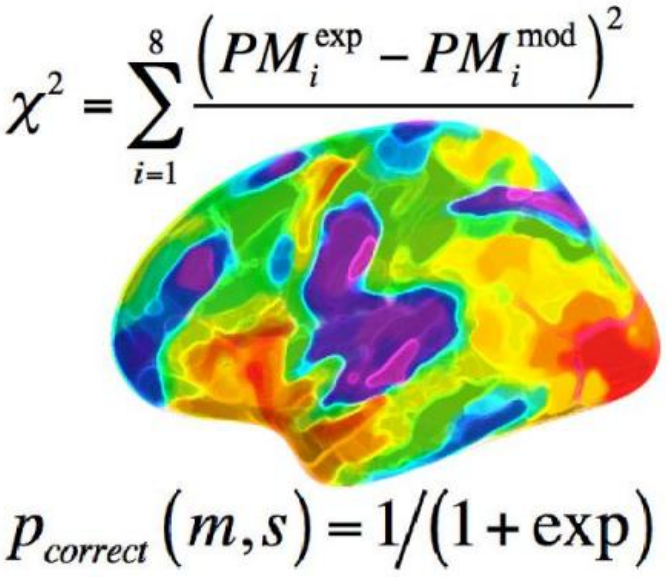

Researchers at the University of Basel succeeded at describing distinct memory processes, such as learning, remembering and forgetting using a computational model. Credit: MCN University of Basel

Human memory is the result of different mental processes, such as

learning, remembering and forgetting. However, these distinct processes cannot be observed directly. Researchers at the University of Basel now succeeded at describing them using computational models. The scientists were thus for the first time able to identify gene sets responsible for steering specific memory processes. Their results have been published in the current issue of the journal *PNAS*.

Thanks to our memory we are able to learn foreign languages, solve exams and remember beautiful moments from the past. To ensure optimal memory performance, several distinct cognitive processes have to cooperate. Information is first learned and then stored. Later, when we want to remember them, we depend on a properly functioning retrieval process.

If all these various memory processes are controlled by the same or by different genes and molecular mechanisms has so far been mostly unknown. One reason for this, is the fact that many of these processes are not amenable to direct measurement and have therefore remained inaccessible for science.

The mathematician Dr. Gediminas Luksys from the transfaculty research platform at the Psychiatric University Clinics Basel and the Faculty of Psychology at the University of Basel has now been able to successfully describe the various human memory processes for the first time. The study used data of over 1700 adults. Thanks to the computational model, the researchers were able to measure the processes and to conduct distinct genetic analyses for the specific mental processes .

Individual processes are based on different gene sets

The results show that distinct genetic profiles underlie specific memory processes: The study reports, for example, associations between a

transporter protein set and the process of learning as well as between a cell adhesion set and the process of memory storage. The findings contribute to a better understanding of the complex processes of human memory and could lead to the development of new treatment therapies for various memory disorders in the future.

More information: Gediminas Luksys, Matthias Fastenrath, David Coynel, Virginie Freytag, Leo Gschwind, Angela Heck, Frank Jessen, Wolfgang Maier, Annette Milnik, Steffi G. Riedel-Heller, Martin Scherer, Klara Spalek, Christian Vogler, Michael Wagner, Steffen Wolfsgruber, Andreas Papassotiropoulos, and Dominique J.-F. de Quervain, Computational dissection of human episodic memory reveals mental process-specific genetic profiles, *PNAS* (2015), DOI: 10.1073/pnas.1500860112

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