MedicalXpress

Mental time travel—an exclusively human capacity

December 22 2015

Are humans the only ones who are able to remember events that they had experienced and mentally time travel not only into the past but also the future? Or do animals have the same capacity? To a certain extend, according to three researchers who are contributing a new theoretical model to this long-standing discussion. They published their results in the journal *Neuroscience and Behavioral Reviews.*

Episodic memory is a component of mental time travel

The model developed by the three researchers Prof Markus Werning, Prof Sen Cheng (both Mercator Research Group "Structure of Memory" at RUB) and Prof Thomas Suddendorf (University of Queensland) differs from other approaches with regard to one major aspect: it suggests a new relationship between mental time travel and episodic memory. The research team assumes that mental time travel is composed of different components. "Component one are memory traces from episodic memory. That means: fairly accurate representations of personally experienced episodes, where each trace represents a particular experience, i.e. is very specific," explains Prof Sen Cheng. Component two is the ability to construct mental scenarios; by this, the researchers mean dynamic representations of past or expected situations that are not isolated but rather can be embedded into larger contexts and be reflected. If, for example, someone misplaces their key, they mentally travel back to places and situations where they still had the key. By

associating the past situation with other experiences and information, a scenario is created. The question if and, if so, how the construction of mental scenarios is linked to a specific "autonoetic" form of consciousness is particularly interesting from the philosophical point of view. The authors discuss several options with an open outcome.

No definitive evidence for foresightful behaviour in animals found

In order to answer the question if animals are capable of mental time travel, the researchers relied on published experimental studies and matched the results with their model. Conclusion: "Some animals indeed appear to possess episodic memory. There is, however, no evidence that they are able to construct, reflect and compare different future scenarios like humans are. We therefore don't believe that animals are capable of mental time travel," says Prof Sen Cheng. For example, the ability of squirrels to cache food in autumn for the winter can be interpreted not as an anticipatory activity, but rather as innate behaviour. "The squirrel would hoard food even if it had been fed in the winter all its life," says Cheng.

Research across disciplinary boundaries

As professors in the interdisciplinary Mercator Research Group "Structure of Memory" at the Ruhr-Universität Bochum, Prof Sen Cheng and Prof Markus Werning have successfully looked beyond the boundaries of their respective disciplines when conducting memory research. For their current study, they were joined by Prof Thomas Suddendorf, one of the pioneers in the research into mental processes in animals. The three researchers are old acquaintances. Thomas Suddendorf had spent two months as Senior Scientist at the Mercator Research Group and was one of the speakers at the ECE Summer School

"Memory and Mind."

More information: Sen Cheng et al. Dissociating memory traces and scenario construction in mental time travel, *Neuroscience & Biobehavioral Reviews* (2016). DOI: 10.1016/j.neubiorev.2015.11.011

Provided by Ruhr-Universitaet-Bochum