

Memory disorders, how the brain distinguishes and preserves similar events: the discovery of the University of Turin

April 24, 2024

The process by which the brain distinguishes and preserves similar events has been identified



A research group from the University of Turin has discovered how the brain distinguishes and memorizes similar events separately. The discovery will make a significant contribution to developing new therapeutic strategies in memory disorders, such as dementia and post-traumatic stress disorder, given that in these situations there is a tendency to confuse past events.

From the University of Turin they explain that: "forming memories of similar events constitutes a real challenge for our brain. It is essential that each event is memorized separately to preserve its specificity. However, it is equally important to recognize and remember the aspects common between events. If this delicate process is compromised, people risk confusing one event with another, thus losing the clarity and specificity of their memories."

The new study published in the prestigious scientific journal *Cell Reports* has identified an intricate brain process that allows similar events to be distinguished and memorized separately, while maintaining similarities between them. The research was mainly conducted by researchers Giulia Concina, Luisella Milano and Annamaria Renna coordinated by Prof. Benedetto Sacchetti of the Department of Neuroscience of the University of Turin.

The researchers studied brain activity during the learning of two distinct events but with elements in common, discovering that in the amygdala, a key brain region for the formation of memories, separate groups of neurons are activated to memorize distinct events separately. However, some neurons respond to both events, helping to remember their similarities. The number of these common neurons is regulated by a

particular type of cell called inhibitory neurons. By blocking these cells, the researchers noticed how the number of common neurons increased significantly, causing the two events to become confused and overlap. According to the researchers, in conclusion, inhibitory neurons therefore contribute to maintaining distinct memories of similar events.

The research was conducted adopting a multidisciplinary approach that integrated behavioral analysis methodologies, molecular biology, high-resolution microscopy and modulation of brain activity. In particular, thanks to the use of the innovative technique of "chemogenetic labeling", the researchers were able to visualize the neurons involved in the perception of both the distinctive aspects of two events and their common characteristics. This analysis also allowed us to identify the cells capable of limiting the number of shared neurons, i.e. the inhibitory neurons. Finally, by combining techniques of chemogenetic labeling and inactivation of neuronal activity, the researchers selectively blocked these cells, noting that this led the subjects to confuse events with each other.

"This research - explains Prof. Benedetto Sacchetti - is of significant importance since it highlights the existence of neurons whose role is to keep separate the memories of distinct events but with aspects in common, thus allowing memories to be preserved of such events precisely and clearly. Considering that one of the typical characteristics of memory disorders, such as dementia and post-traumatic stress disorder, is the tendency to confuse past events, this research could provide new information useful for developing new therapeutic strategies."