Cognitive-related neural pattern to activate machines

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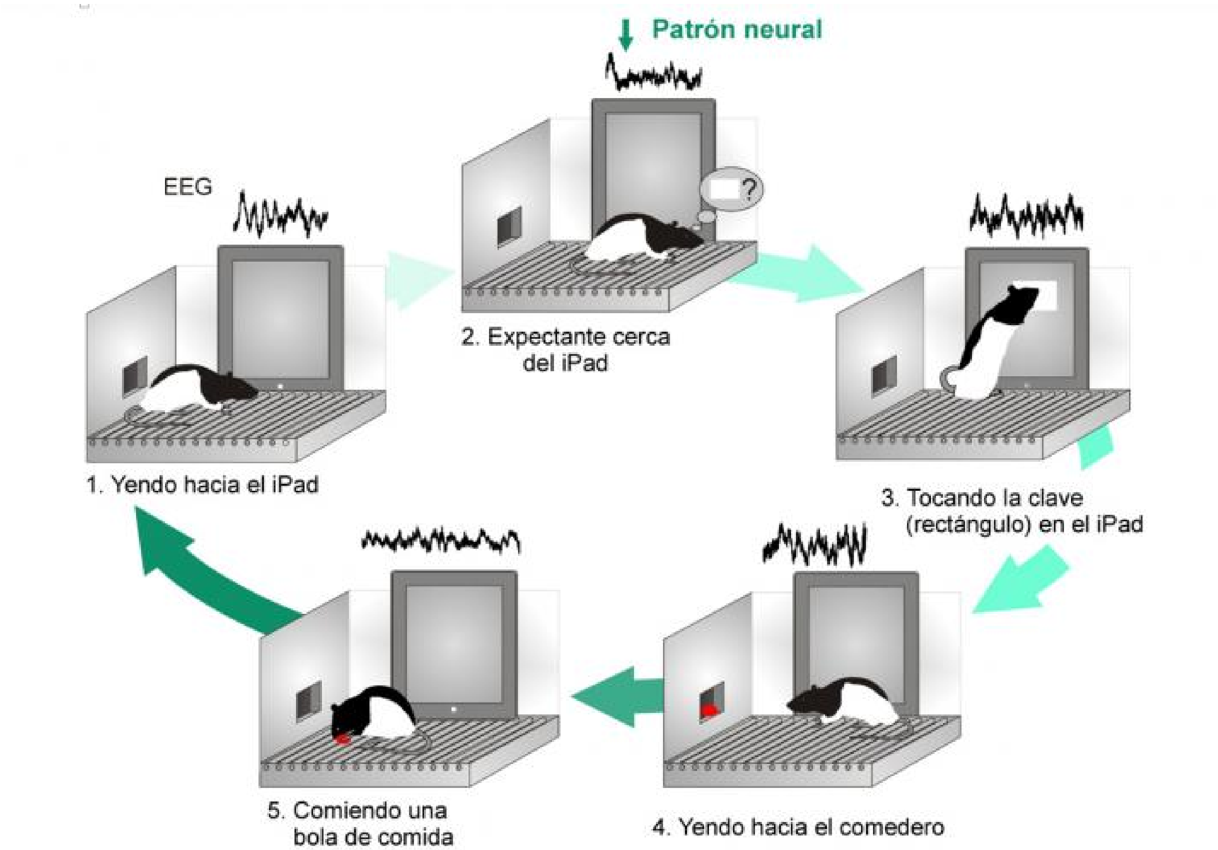

Task was developed by the subjects. 1. The rat goes next to iPad. 2. The rat waits near the iPad and generates the cognitive-related brain pattern selected by researchers. Consequently, a visual stimulus appears on the iPad's screen. 3. The rat touches the stimulus on the iPad. 4. The rats goes to feeder to get the obtained reward. 5. The rat eats the food and re-starts the cycle. Credit: www.divisiondeneurociencias.es (UPO) and Neuro-Com (UAB).

Brain-machine interfaces represent a solution for people with physical difficulties to communicate with their physical and social environment. In this work, researchers have identified a functional brain pattern in the prefrontal cortex associated with cognitive processes, and have used it to activate an iPad touchscreen.

The use of the neural cortical activity for operant conditioning tasks has existed for decades. The new device allows the activation of any environmental instrument through specific electrical brain signals selected at will. In this research, authors worked with electrical brain signals that allowed the activation of the iPad's touchscreen. At the same time, experimental animals had to touch stimuli presented on the iPad to obtain a reward and, thus, to properly complete the task.

One of the most interesting results of this research is that rats learned to increase the frequency of the selected neural pattern throughout successive experimental sessions, with the aim of obtaining the reward. Authors also prove that the selected pattern is connected to cognitive processes and not to motor or behavioral activity, which represents important progress in the design of brain-machine interfaces. Another result of interest is that the selected brain pattern did not modify its functional properties after being used to activate the associative learning. Therefore, the prefrontal cortex (a brain area particularly connected to mental processes and states) has the ability to produce an oscillatory pattern that rats can generate to control their environment. This work is expected to advance in the area of brain-machine interactions.

More information: Samuel Hernández-González et al, A cognition-related neural oscillation pattern, generated in the prelimbic cortex, can control operant learning in rats, *The Journal of Neuroscience* (2017). DOI: 10.1523/JNEUROSCI.3651-16.2017

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