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Cross-modal association learning in humans and monkeys

Abstract:

Compared to other animals, humans have been suggested to have a unique capacity for symbolic representations, as exemplified in their ability for language and mathematics. However, direct evidence for this hypothesis remains sparse. One element of symbolic representation is that an association is bidirectional, a symbol can be presented either before or after the associated object for them to be paired. Behavioral studies have indicated that non-human primates do not spontaneously reverse learned associations. Here, we directly compared humans with macaque monkeys in their ability to reverse a cross-modal association, and if so, which cortical areas were involved. In humans, a network of areas, including the inferior frontal gyrus and the superior temporal gyrus reacted to incongruent pairs independently of the direction of the pairing (canonical or reversed), indicating that humans store the association in a reversible manner, at a symbolic level. In contrast, monkeys only showed an effect of incongruency in the canonical (i.e. learned) direction, without generalization to the reversed pairs. In monkeys, the network was limited to the early sensory areas and the inferior frontal gyrus. These results demonstrate a fundamental difference between humans and monkeys, using the exact same paradigm in both species. Humans, but not macaque monkeys, can spontaneously access to a symbolic format, going beyond simple associative learning. This study confirms difficulties for symbolic representations in animals as indicated in previous studies.

Wednesday, January 29th 2020, at 11:00

ENI, seminar room 2nd floor

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