551

WHY IS HUMAN IMITATION DIFFERENT?
CONNECTIVITY OF THE MIRROR NEURON SYSTEM IN MACAQUES, CHIMPANZEES, AND HUMANS

E.E. Hecht[1,2], D.A. Gutman[3,4], J.K. Rilling[2,5], L.A. Parr[2,4]

[1] Neuroscience, [2]Yerkes National Primate Research Center, [3]Bioinformatics, [4]Psychiatry, [5]Anthropology
Emory University, Atlanta, Georgia, USA

Presenter's Email: ehecht@emory.edu

The ability to imitate is highly adaptive because it allows individuals to acquire beneficial behaviors without having to discover them independently. In humans, imitation is thought to rely on the mirror neuron system (MNS), which is active during both the production and observation of actions. However, macaque monkeys have mirror neurons but do not imitate. Interestingly, in humans, the MNS responds to both transitive and intransitive actions, while in macaques, it responds only to transitive actions. Furthermore, while humans reliably reproduce both the ends and means of observed actions, macaques and chimpanzees tend to reproduce only the ends. This suggests that the human MNS processes both the end and means of observed actions, while the nonhuman primate MNS processes mainly the ends. We hypothesize that species differences in imitation behavior arise from species differences in MNS responsivity, which themselves result from differences in MNS connectivity. To investigate this possibility, we carried out diffusion tensor imaging analyses of the white matter connectivity of the MNS in macaques, chimpanzees, and humans. Results indicate that the human MNS has greater parietal connectivity, a feature that may allow increased encoding of the means of observed actions. Furthermore, humans and chimpanzees but not macaques have strong connectivity between inferior frontal cortex and temporal object processing regions, a feature that may be related to social learning of tool use. These results suggest that MNS connectivity has undergone evolved change in the primate lineage which may account for different species' specialized social learning abilities.

Keywords: social cognition, observational learning, diffusion tensor imaging, evolution, tool use