"The Mirror-Neuron System and the Consequences of its Dysfunction"

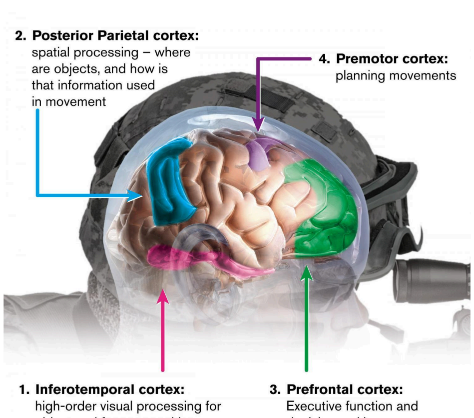
Authors: Marco Iacoboni, Mirella Dapretto

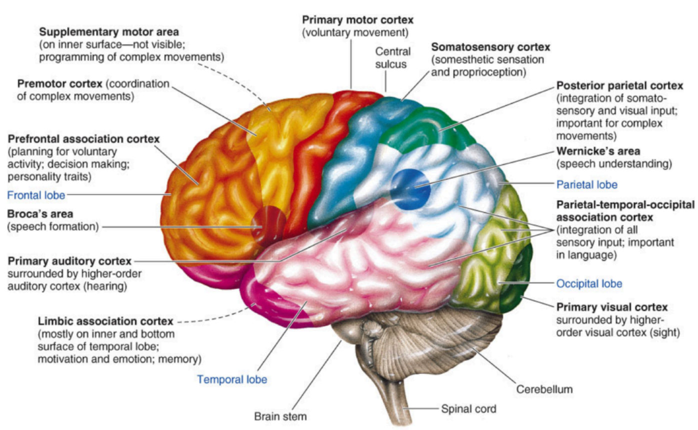
This paper delves into the mirror neuron system, particularly how it helps humans understand the actions and intentions of others, which is crucial for interpreting nonverbal cues like body language and facial expressions. It also explores the potential dysfunction of this system in conditions like autism, affecting nonverbal communication.

Iacoboni, M., & Dapretto, M. (2006). The mirror neuron system and the consequences of its dysfunction. *Nature reviews. Neuroscience*, *7*(12), 942–951. https://doi.org/10.1038/nrn2024

marques:

premotor and posterior parietal cortex (of the macaque brain) but these are human brains:





(a) Regions of the cerebral cortex responsible for various functions in humans: mirror neuron areas are located in the posterior inferior frontal gyrus and adjacent ventral premotor cortex, and in the rostral part of the inferior parietal lobule.

in macaques: mirror neurons located in area F5 in the inferior frontal cortex and area PF/PFG in the inferior parietal cortex.

sensorimotor integration: complex process in the central nervous system where sensory information from multiple sources is selectively and rapidly integrated to produce task-specific motor output.

mirror neurons in monkeys respond to the sound of actions and
code the intention associated with the observed action.
vs
mirror neuron system in humans is related to imitation + use of limbic system.

limbic system:

- processes and regulates emotion and memory while also dealing with sexual stimulation and learning.
- behavior, motivation, long-term memory, and sense of smell is also related.

Evidence of MNS abnormalities in autism spectrum disorder (ASD) is provided by structural MRI, magnetoencephalography, electroencephalography, transcranial magnetic stimulation and functional MRI (fMRI). fMRI data show that children with ASD have reduced MNS activity during social mirroring and that MNS activity correlates with the severity of disease: the higher the impairment, the lower the MNS activity in ASD.

MRI: a medical imaging technique that provides precise details of your body parts, especially organs and soft tissues, with the help of magnetic fields and radio waves.

Magnetoencephalography (MEG): a functional neuroimaging technique for mapping brain activity and locating seizures by recording magnetic fields produced by electrical currents occurring naturally in the brain, using very sensitive magnetometers.

Electroencephalography (EEG): a test to monitor the electric sensitivity of the brain by recording an electrogram of the spontaneous electrical activity of the brain and thereby detect disorders if any, using electrodes.

Transcranial Magnetic Stimulation (TMS): a noninvasive form of brain stimulation in which a changing magnetic field is used to induce an electric current at a specific area of the brain through electromagnetic induction.

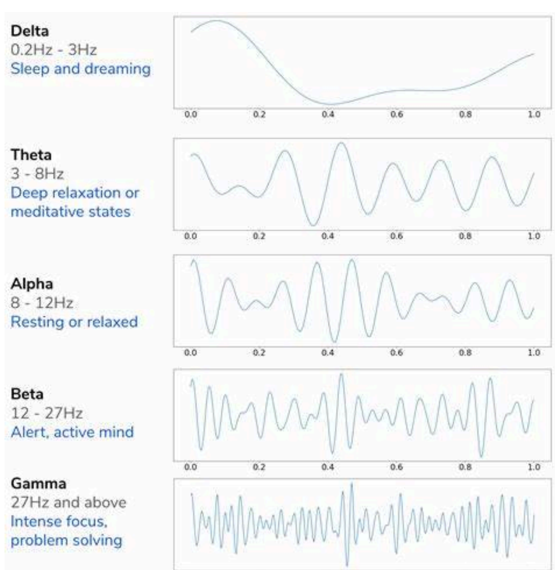
fMRI: measures brain activity by detecting changes associated with blood flow.

"The Role of Beta-Frequency Neural Oscillations in Motor Control"

Authors: Nick J. Davis, Simon P. Tomlinson and Helen M. Morgan

This study discusses how beta oscillations (15-30 Hz) are linked to motor control, particularly how they change during voluntary movement and return to baseline after movement. It explores the hypothesis that beta activity represents the status quo and how its disruption is associated with motor disorders like Parkinson's disease. The paper also examines the use of transcranial alternating current stimulation (tACS) to investigate the role of these oscillations in motor control.

Davis, Nick J, et al. "The Role of Beta-Frequency Neural Oscillations in Motor Control." Journal of Neuroscience, vol. 32, no. 2, 11 Jan. 2012, pp. 403–404, www.jneurosci.org/content/32/2/403, https://doi.org/10.1523/jneurosci.5106-11.2012



"Gamma-Band Synchronization in the Macaque Hippocampus and Memory Formation"
Authors: Michael J. Jutras, Pascal Fries and Elizabeth A. Buffalo
This paper focuses on gamma-band synchronization (30-100 Hz) in the hippocampus and its role in memory formation. It provides evidence that gamma synchronization during the encoding phase of a memory task predicts better subsequent recognition memory. The study highlights the importance of precise timing in neuronal activity for long-term synaptic changes, which are crucial for memory encoding.

Jutras, Michael J, et al. "Gamma-Band Synchronization in the Macaque Hippocampus and Memory Formation." Journal of Neuroscience, vol. 29, no. 40, 7 Oct. 2009, pp. 12521–12531, www.jneurosci.org/content/29/40/12521, https://doi.org/10.1523/jneurosci.0640-09.2009

"A Unifying View of the Basis of Social Cognition"
Authors: Vittorio Gallese, Christian Keysers, Giacomo Rizzolatti
This paper discusses how mirror neurons are key to understanding not just movements but also emotions through facial expressions and body language. It outlines the relationship between mirror neuron activity and beta/gamma oscillations, contributing to theories about neuroplasticity and learning from social interactions.

Gallese, Vittorio, et al. "A Unifying View of the Basis of Social Cognition." *Philpapers.org*, 2014, philpapers.org/rec/GALAUV

"Imaging Functional Neuroplasticity in Human White Matter Tracts"
Authors: Cathy J. Price, Karl J. Friston
This paper reviews the use of MRI, particularly diffusion tensor imaging (DTI), to study neuroplasticity in white matter tracts. It discusses how motor training can lead to structural and functional changes in white matter, such as the internal capsule and corpus callosum. The study also explores how these changes are associated with improved motor performance and the underlying mechanisms of neuroplasticity, including myelination and axonal transmission efficiency.

Frizzell, T.O., Phull, E., Khan, M. *et al.* Imaging functional neuroplasticity in human white matter tracts. *Brain Struct Funct* **227**, 381–392 (2022). https://doi.org/10.1007/s00429-021-02407-4