

# **Human Brain Activity during Observation of Humanoid Robot Actions**

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## **Abstract**

This study examined the human brain activity during observation of robot actions. The human mirror-neuron system (MNS) comprises several brain motor areas that are activated not only when an individual performs an action but also when they observe the same action performed by others. This resonance characteristic of motor areas is believed to reflect the role of motor areas in the understanding of the internal representation of other's action, which most likely supports human social cognitive abilities. The present study investigated whether and how the motor area activity is influenced by appearance (human versus robot) and/or kinematics (human-like versus robot-like) of the observed action using near-infrared spectroscopy. The results showed that there was a strong interaction between appearance and kinematics factors, revealing strong deactivations in sensorimotor areas when the subject saw a human agent performing robotic actions, which was significantly different from responses when observing the human agent acting in a human way and the robot agent performing robotic actions. We confirmed that this tendency holds even for a humanoid robot with an additional neuroimaging experiment, showing higher MNS activation when the humanoid robot performed robotic actions than humanlike actions. These results indicate that MNS activity is sensitive to congruency between the appearance and kinematics of the agent.