

## **Predictive coding of observed action in the brain – a 7T study**

### **ABSTRACT:**

#### **Background**

The network of brain regions recruited by observing goal-directed hand actions include the lateral occipital cortex, parietal region PFt and premotor region BA44. Traditional views emphasized a feed-forward architecture in which visual features are organized into increasingly complex representations that feed onto motor programs in parietal and premotor cortices where the matching of observed actions upon the observer's own motor programs contributes to action understanding. Predictive coding proposes that feed-back connections from premotor regions back to parietal and visual neurons represent predictions about upcoming actions and guide our view of the world around us.

#### **Aims**

Leveraging the notion that feed-back connections target deeper cortical layers, we aim to test whether observing sequences of hand actions in their natural order, which permits participants to predict upcoming actions, triggers more feed-back input to parietal regions than seeing the same actions in a scrambled sequence that hinders making predictions.

#### **Method and Results**

We acquired data from nine subjects and using the novel combination of sub-millimetre fMRI acquisition at 7T and inter-subject correlation analysis strategy we demonstrate that our hypothesis is indeed true: predictable compared to unpredictable sequences triggers more action-related activity in deep layers of PFt. Inter-subject functional connectivity analysis suggests that these originate from BA44.

#### **Conclusions**

This data showcases the utility of inter-subject functional correlation in combination with 7T MRI to explore the architecture of social cognition under more naturalistic conditions, and provides evidence for models that emphasize the importance of feed-back connections in action prediction.

#### **Keywords**

Action prediction, Predictive coding, Laminar fMRI, Inter-subject functional correlation, Inter-subject functional connectivity

### **Published Work:**

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