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Abstract: Introduction: Traditional functional connectivity MRI measures synchrony of intrinsic activity between brain regions. This method has been used to identify resting state functional networks that underlie cognitive function. However, little is known about how the duration of connectivity between brain regions, or sustained connectivity, affects cognition. We used the width of cross-correlation curves between fMRI time series of brain activity as a metric of the relative duration of synchronous activity.
Methods: Resting state time series data from 839 typically developing individuals were selected for analysis from the Human Connectome Project S900 Release. Following preprocessing, a cross-correlation curve was generated for each individual between pairs of time series for 7 bilateral subcortical regions (from subject-specific FreeSurfer parcellation), 7 bilateral cerebellar networks, and 7 resting state networks. Peak and width values were extracted from each curve. Behavioral data, consisting of fluid intelligence and processing speed, were also selected for analysis. Correlations were drawn between regions of interest and behavioral data. Connections were considered significant if they satisfied false discovery rate $q<0.05$.
Results: Significant negative correlations were found between processing speed and width of cross correlation curve in numerous region pairs across the cortex and cerebellum suggesting that sustained levels of connectivity may be related to slower processing speed. Additionally, significant positive correlations were found between a progressive matrices task and the peak of cross correlation curve specifically between the bilateral caudate and cerebellar and cerebral networks indicating a relationship between peak instantaneous connectivity and fluid intelligence.
Conclusions: We found that decreases in the cross correlation curve width are associated with increases in processing speed across the cerebellum and cortex and that fluid intelligence was associated with increased cross correlation peak in corticostriatal and striato-cerebellar connections. We believe that these distinctive aspects of functional connectivity may encode different cognitive domains. Sustained connectivity may represent a novel approach to the study of cognition and psychopathology in patient groups.

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Poster

362. Cortical Control of Executive Function

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Exc 257

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Title: Who does what? Neural representations of identity and ownership of one's own and a partner's subtasks.

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Abstract: In daily life, humans often coordinate their actions to perform collaborative tasks (Sebanz, Bekkering, & Knoblich, 2006). Previous studies have shown that people co-represent different parts of a general task when they carry it out together, even if representing the partner's subtask is not necessary to perform their own part of the task (e.g., Atmaca, Sebanz, & Knoblich, 2011). However, it is still an open question how these task representations are encoded at the neural level. In this study, we examined task encoding when people have to work together to achieve a common goal. Specifically, we investigated where and how the human brain represents a task that is performed by the subject or by their partner.
Twenty-six participants played a collaborative game in pairs. In the game, they had to coordinate to reach a common goal. For each pair, each subject performed the game once while undergoing functional magnetic resonance imaging (fMRI) and once using a computer in a room adjacent to the fMRI scanner. Each participant performed one part of a shared task. To win the game, the players had to consider both their own and the other's subtask. The shared task consisted in moving two pawns on a graphic path to match their positions. Each player moved one of the two pawns as specified by the subtask assigned to them. The players had to compute the combination of moves that allowed both of them to reach the goal. Importantly, the same subtask was assigned to one subject on some trials and to their partner on other trials. This paradigm allowed us (i) to identify neural representations of one's own and the other's subtask and (ii) to evaluate whether task representations differ depending on whom the task is assigned to (by comparing trials in which the same subtask was assigned to the subject vs. to their partner).
We applied multivariate decoding methods (e.g., Haynes & Rees, 2006) to fMRI data. Preliminary results show that the identity of the subtask assigned to either the subject or to their partner is represented in distinct frontal and parietal regions: ventrolateral and rostrolateral prefrontal cortex (PFC) encoded only the identity of one's own task, while medial PFC and postcentral gyrus specifically represented the identity of the other's subtask. Information about

who performed a specific subtask was contained in orbitofrontal cortex, superior parietal lobule, and inferior parietal lobule. These findings suggest that task ownership determines how information is represented across the brain.

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Poster

362. Cortical Control of Executive Function

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Topic: H.02. Human Cognition and Behavior

Title: Neural correlates of role switching: a functional MRI study

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Abstract: The switching of role depending on the situation is required in both daily life and sports in order to encourage appropriate behavior. This ability is important because switching between offense and defense sometimes decides victory or defeat in a competitive game or sport. The purpose of this study was to investigate the neural correlates of role switching using an fMRI (Siemens Verio, 3T). Twenty healthy participants (seventeen men and three women) participated in this experiment. We used a game of tag with two persons (one was a participant, and the other was the author). Participants were required to control a circular object on the screen while the author controlled a square object. The object color indicated the role of the player—that is, white represented the escape role, and red represented the chase role. When one object touched the other, the color changed, and the role was reversed (switch condition). The experimental design in the session was as follows. A fixation point was presented for the first and last thirty seconds as a rest, and a game of tag was played for four minutes. This session was carried out four times. Moreover, a control experiment was conducted with the same design except that the participants' roles did not change—that is, the role was only escape or only chase (no switch condition) with two sessions each. The order of condition was counter-balanced. We used SPM12 for fMRI data preprocessing and statistical analysis. The performance result showed that the number of touches was 19.5 (±3.4) times in the switch condition and 19.7 (±3.4) times in the no-switch condition. There was no significant difference between the two conditions. The fMRI result showed that the right inferior temporal gyrus, right middle temporal gyrus, bilateral precuneus, and dorsal premotor cortices activated during the switching condition compared with during the no-switching condition. These results suggest that these areas are