Title: Flexible hubs: A novel mechanism for flexible cognitive control

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The human brain is highly flexible, allowing rapid learning and switching among a virtually infinite variety of possible tasks. We hypothesized that this is possible due to what we term "flexible hubs" – brain regions with brain-wide connectivity that changes depending on task demands. These shifts in connectivity likely help coordinate the spatially disparate processes involved in task performance (e.g., processes in visual and motor regions during a visuo-motor task). To test this hypothesis we developed a novel graph theoretical approach that identifies task-general connectivity dynamics by observing region-to-region correlations that shift across a wide variety of task rules (e.g., motor, logic, visual, auditory). We focused primarily on left lateral prefrontal cortex (LPFC) due to evidence that its global connectivity predicts important indices of flexible control – working memory capacity and fluid intelligence. We found that LPFC's connectivity shifted across a wide variety of brain networks (indexed by the participation coefficient) and across a wide variety of rule types (motor, logic, and sensory). These results are consistent with the hypothesized existence of flexible hubs that help coordinate task-relevant processes distributed throughout the brain, facilitating the human brain's extensive cognitive flexibility.