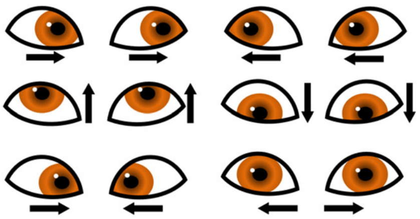
This Week in The Journal

Identification of Two Roles for Cerebellum in Saccades

Robijanto Soetedjo and Gregory D. Horwitz

(see article e1317232023)

Saccades are rapid eye movements that shift our gaze quickly from one point of interest to another. Activities such as reading or sports (among others) require these movements. While it is thought that accurate saccadic movement is mediated by the cerebellum, the exact mechanisms through which this occurs are unknown. Soetedjo and Horwitz investigated the mechanisms of saccadic movement in two male macaque monkeys. They artificially activated cells in a region of the cerebellum called the oculomotor vermis (OMV) during saccadic eye movements as a way of perturbing cell activity and observed saccade changes. They found that stimulating the OMV on the opposite side of the brain quickly decelerated saccades. The saccades later reaccelerated, allowing the eyes to reach, or come very close to, the intended target. They also found that stimulating OMV on the same side of the brain affected saccades after a longer delay and caused macaque eyes to move farther than intended. Thus, the OMV has two distinct roles in saccades: it predicts eye displacement and creates the force required for optimal saccade velocity for that displacement.



Cartoon depiction of eye movements that allow rapid shifts in fixation from one point to another. Image: Wikimedia Commons/Cristiane Tilelli, licensed under CC BY-SA 4.0.

Why Considering Scales of the Brain's Functional Connections Matters

Erica L. Busch, Kristina Rapuano, Kevin Anderson, Monica D. Rosenberg, Richard Watts et al.

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Information is transmitted through the brain by functional connections. All the functional connections in the brain make up its functional connectome, which can be used to characterize brain functionality. In many ways, the functional connectome is uniquely individual, like a fingerprint, and human imaging studies have revealed that the high variability across individuals can be attributed to genetics and is related to cognition. But these studies have observed the connectome at broad, regional scales, neglecting fine-scale connectivity due to measurement challenges. Busch and colleagues addressed this in their study of over a thousand male and female children. They examined the reliability, heritability, and behavioral relevance of the functional connectome at different spatial scales of measurement. To improve access to the finer scale information, they used a technique called hyperalignment. They found that the different scales of the connectome revealed distinct information across each of these metrics. Fine-scale connectivity was more individualistic but less heritable than coarse-scale connectivity. More heritable cognitive traits were predicted equally well at both connectome scales, but less heritable cognitive traits were better represented by fine-scale measurements. These findings are important because they demonstrate that different scales of the functional connectome discretely pertain to information processing and behavior and are differentially heritable. This is informative for future human imaging studies, suggesting that the spatial scale of functional brain measurements must be considered in studying different behavioral constructs.

This Week in The Journal was written by Paige McKeon

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