SPECIAL REPORTS

Connectivity

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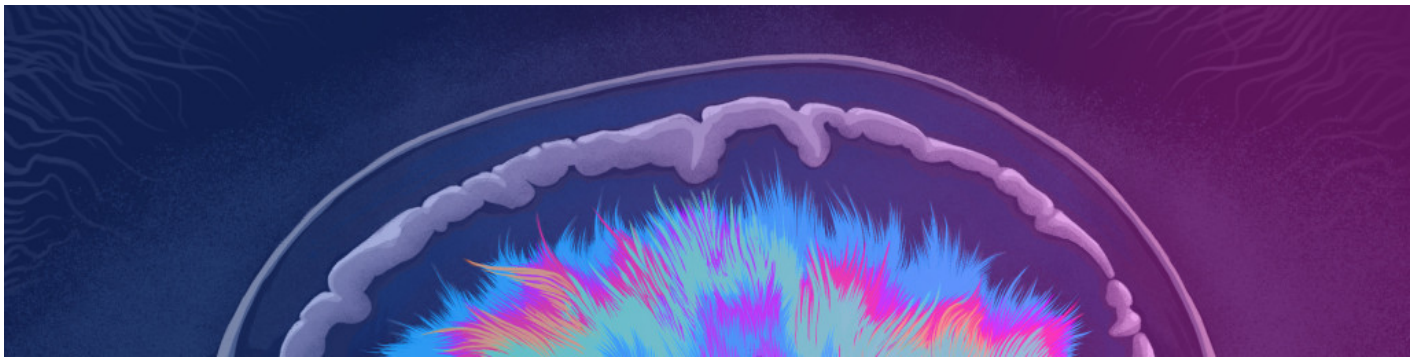

The connectivity theory of autism, which is among the more popular hypotheses to explain the disorder, holds that the brains of people with autism have altered connectivity between different regions.

For this special report, we commissioned a series of expert-written pieces to examine some of the seemingly contradictory ideas surrounding this hypothesis.

For example, the theory comes in a number of flavors: Some suggest that **long-range connections** across the brain are impaired, or that **short-range connections** are overactive, **or both**.

Others suggest the problems are limited to specific tracts — between the **frontal cortex and more posterior parts** of the brain, as Marcel Just and Timothy Keller explain in their **Viewpoint**. Just, who **proposed a version of the connectivity theory** in 2004, says the hypothesis is better referred to as the 'underconnectivity theory.'

Tal Kenet, an instructor in neurology at Harvard Medical School and Massachusetts General Hospital, reported in February that people with autism have **weaker local connections** than controls do, contrary to the traditional connectivity theory. In her blog, sheemphasizes the need to better define the **meaning of local connectivity**.

Three studies published last year questioned the basis of many connectivity studies by suggesting that **movement during brain scans** may alter the results. This could make it appear as if people with autism have connectivity differences when they do not, the studies suggested. In his blog, **Mike Tyszka**, associate director of the Caltech Brain Imaging Center, discusses **new efforts to fix the motion artifact**.

Following the discovery of the head motion problem, in the past year two groups have found **largely normal connectivity** in people with autism. Other studies with similar results may exist but not have been published because it is **difficult to publish negative results**, **Dan Kennedy**, assistant professor of psychological and brain sciences at Indiana University in Bloomington, says in his blog.

It's possible that more sophisticated analysis of the **network organization** of the brain will reveal new deficits, which **Damien Fair**, assistant professor of behavioral neuroscience at Oregon Health and Science University, explores in his blog on **graph theory**.

Scientists employ a number of **different techniques for mapping the brain**, such as functional magnetic resonance imaging and electroencephalography. Some techniques, such as diffusion tensor imaging, look at anatomical connections, whereas others track functional connections — links between regions that are active at the same time or in response to the same task.

Carlo Pierpaoli, a scientist in the Program on Pediatric Imaging and Tissue Sciencesat the National Institute of Child Health and Human Development, discusses the **challenges of using diffusion tensor imaging** to study brain anatomy in people with autism.

Our special report includes a look at some of these techniques, and their strengths and weaknesses for **mapping connectivity**.

Finally, **Jon Brock**, a research fellow at Macquarie University in Sydney, Australia, poses **six important questions** for researchers studying connectivity in autism.