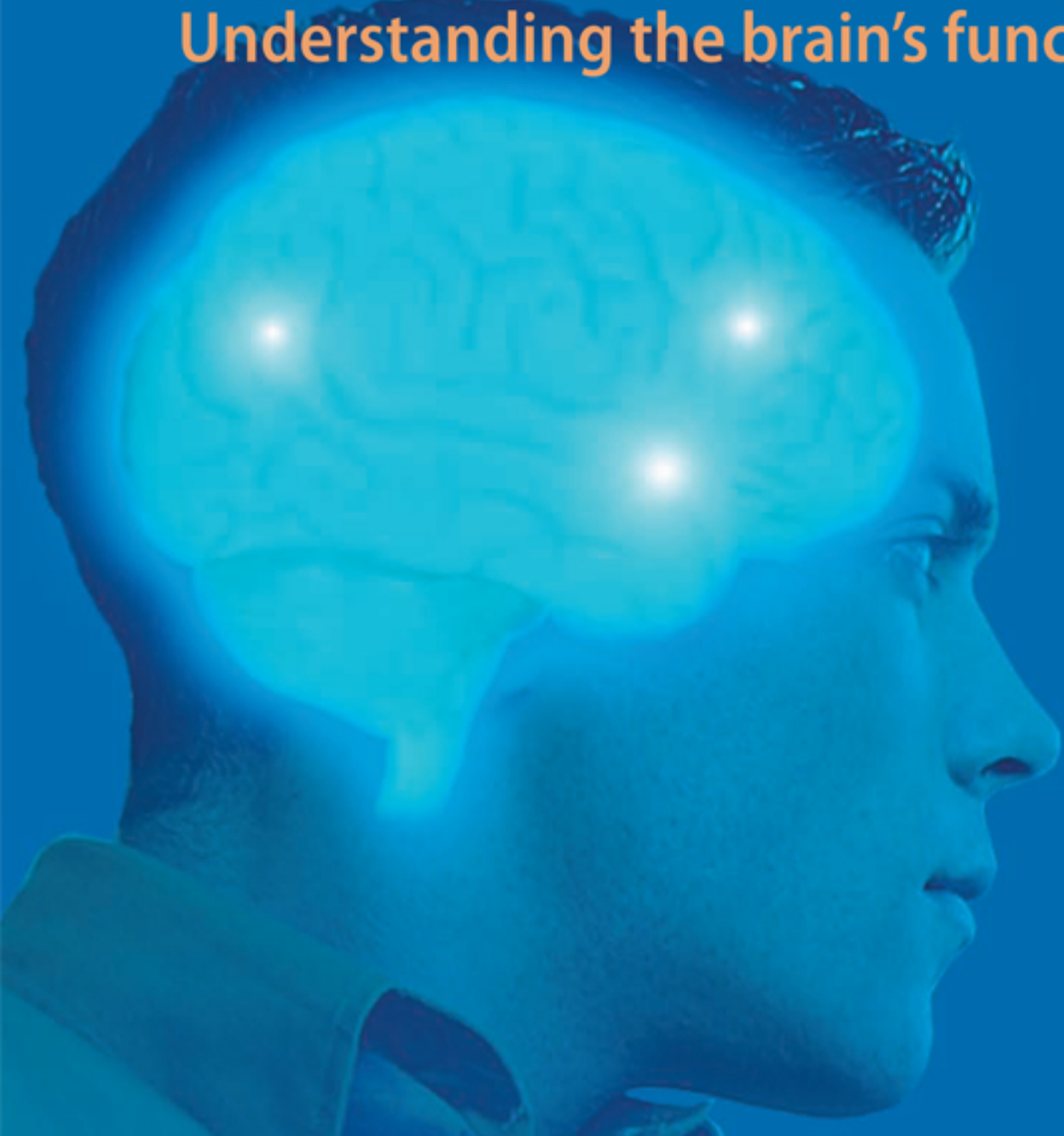


Thinking through Tourette Syndrome

Understanding the brain's functional organization offers a promising pathway to developing effective treatments



If the brain is a party, who's talking to whom? Scientists studying cognitive networks in the brain find useful analogies in studies of social networking. But just as party guests mix and mingle, the brain changes over time. As a person matures, brain networks reconfigure, becoming better-suited to life's demands. Recent studies show Tourette Syndrome brains exhibit atypical networks. This may affect one's ability to control the unwanted repetitive actions typical of the syndrome.



1 Making connections: Effective networking in action

What links will enable the blue, green and yellow groups to communicate most efficiently? Modeling different networks reveals the better options — and suggests ways that brain function may mirror social activity.

The **Regular Network**, left, links people in series. It may look comprehensive at first glance, but it isn't optimal. The **Random Network**, right, links more people across the circle, although its chaotic paths aren't much better.

By comparison, a **Small-world Network**, center, performs most efficiently. Here, group members are linked amongst themselves, and then the groups are interconnected with key cross-linkages (red dotted lines).

2 Coordinated dual networks within the human brain



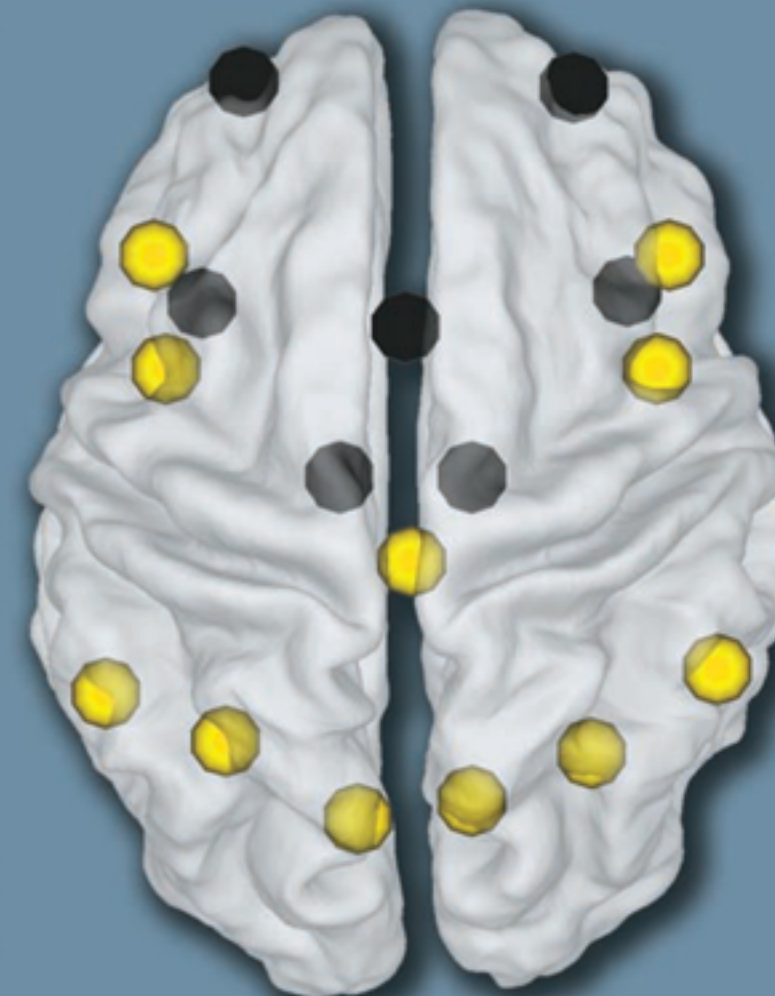
INPUT → Moment-to-moment mental processing → OUTPUT

Not one but two networks within the brain probably work in tandem to control mental and physical activity. One network seems to initiate and adjust control; the other network provides stability and maintains activity throughout the duration of a task. Both networks handle similar information, but for different purposes and using different mechanisms.

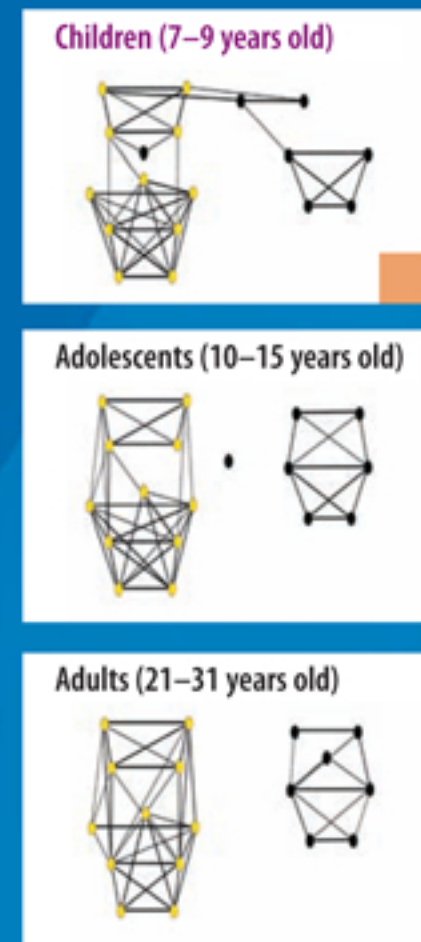
Dense local connections within these networks and weaker "long-range" connections between them mirror the Small-world Network model. Having dual systems offers potential work-arounds for impairments due to disease or trauma.

Dual networks within the brain

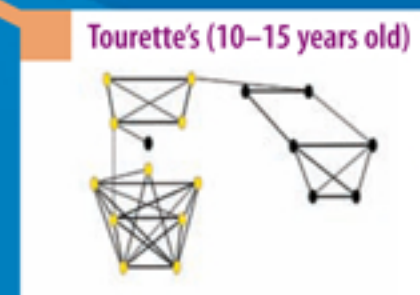
Yellow: Rapid adaptive control
Black: Stability and maintenance control



3 Developing brain networks



Brain networks develop with age: There are marked differences in the networks within an adult brain as compared to a child (top). Researchers plot and compare these complex relationships as seen here.



The brain of a teenager with Tourette Syndrome resembles the networking within a child's brain. Understanding why a brain fails to develop a well-coordinated dual network system may provide one key to developing effective treatments for Tourette Syndrome.