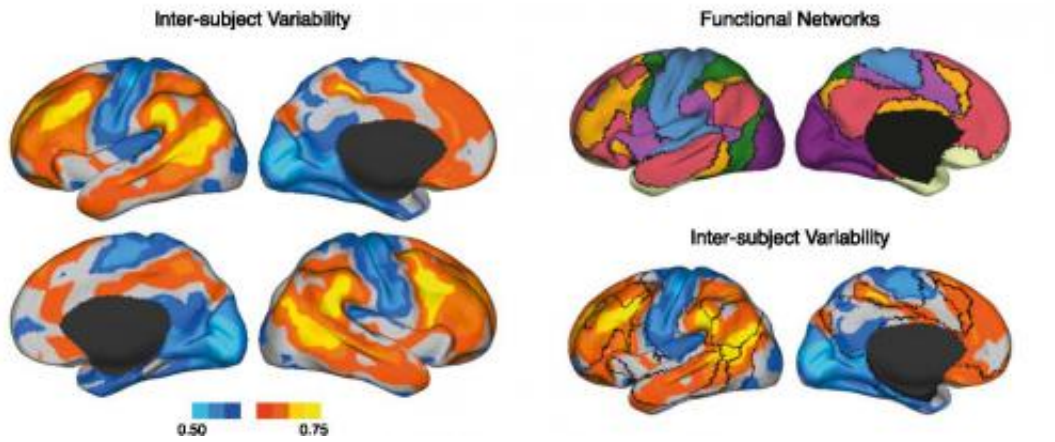
Brain research provides clues to what makes people think and behave differently

February 6 2013

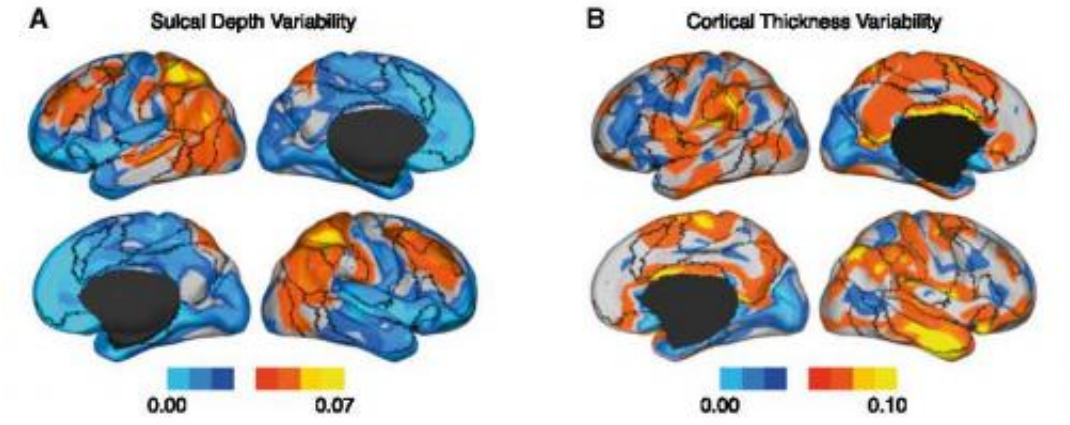


Intersubject variability was quantified at each surface vertex across 23 subjects after correction for underlying intrasubject variability. Values below the global mean are shown in cool colors while values above the global mean are shown in warm colors. Credit: *Neuron*, Mueller et al.

Differences in the physical connections of the brain are at the root of what make people think and behave differently from one another. Researchers reporting in the February 6 issue of the Cell Press journal *Neuron* shed new light on the details of this phenomenon, mapping the exact brain regions where individual differences occur. Their findings reveal that individuals' brain connectivity varies more in areas that relate to integrating information than in areas for initial perception of the world.

"Understanding the normal range of individual variability in the human brain will help us identify and potentially treat regions likely to form abnormal circuitry, as manifested in neuropsychiatric disorders," says senior author Dr. Hesheng Liu, of the Massachusetts General Hospital.

Dr. Liu and his colleagues used an imaging technique called resting-state functional magnetic resonance imaging to examine person-to-person variability of brain connectivity in 23 healthy individuals five times over the course of six months.



Functional connectivity variability is significantly associated with the variability in sulcal depth (A) but not the variability in cortical thickness (B). Intersubject anatomical variability was calculated using intraclass correlation (ICC), with the intrasubject variance properly accounted for. Sulcal depth variability showed a significant correlation with functional variability (r = 0.30, p 0.05). Credit: *Neuron*, Mueller et al.

The researchers discovered that the brain regions devoted to control and attention displayed a greater difference in connectivity across individuals than the regions dedicated to our senses like touch and sight. When they looked at other published studies, the investigators found that brain

regions previously shown to relate to individual differences in cognition and behavior overlap with the regions identified in this study to have high variability among individuals. The researchers were therefore able to pinpoint the areas of the brain where variable connectivity causes people to think and behave differently from one another.

Higher rates of variability across individuals were also displayed in regions of the brain that have undergone greater expansion during evolution. "Our findings have potential implications for understanding brain evolution and development," says Dr. Liu. "This study provides a possible linkage between the diversity of human abilities and evolutionary expansion of specific brain regions," he adds.

More information: *Neuron*, Mueller et al.: "Individual Variability in Functional Connectivity Architecture of the Human Brain." dx.doi.org/10.1016/j.neuron.2012.12.028

Provided by Cell Press