Dr. F. Xavier Castellanos has been paying close attention to attention-deficit/hyperactivity disorder (ADHD) for 17 years. Following his 2002 landmark study—which used neuroimaging to disprove that the drug Ritalin shrinks children's brains—he shifted his attention to a new way of studying the brain's activity, with implications for understanding not only ADHD, but how the brain processes information.

"The Brain Pediatrician"

F. Xavier Castellanos, M.D.

Brooke and Daniel Neidich Professor of Child and Adolescent Psychiatry; Director of Research at NYU Child Study Center; Director, Phyllis Green and Randolph Cōwen Institute for Pediatric Neuroscience; Professor of Radiology

Dr. Castellanos and his team at the NYU Child Study Center are working with the idea that slow, widespread patterns of brain activation, which fluctuate roughly every 45 seconds, highlight the circuits connecting widely dispersed parts of the brain, which could provide a key to understanding psychiatric disorders like ADHD. "The synchronization of these fluctuations across long distances indicates that the regions are functionally connected," Dr. Castellanos explained. "Even though we can't see the connections, there is no other explanation for their synchrony." His team has used various "spheres of interest," or "seeds," to measure blood flow patterns and to look for matching patterns in other parts of the brain. The fMRI image (above, left) is from a recently published pilot study of adults with ADHD. It compares the functional connectivity between front and back regions of the brain in a group of adults with ADHD and a control group. It shows that a strong association between the ventromedial prefrontal cortex and the posterior cingulate cortex (in red), was missing in the ADHD group.

To give a name to the unusual convergence of his work in pediatrics, child psychiatry, and radiology, Dr. F. Xavier Castellanos had to be creative. "I coined the term 'Brain Pediatrician,'" he admitted. But then, creativity seems to come naturally to someone whose penchant for original ideas has been acknowledged so widely.

Dr. Castellanos has been on the frontlines of ADHD, the most common and controversial of childhood disorders. He's convinced that the way to make real progress in treating disorders like ADHD is by uncovering their neurological basis. For ten years, he pursued his neurobiological investigation at the National Institute of Mental Health (NIMH), where he and collaborators published papers uncovering discernible physical differences in the brains of children with ADHD.

At NYU Langone's Child Study Center, he has found the creative freedom and the collaborators to pursue investigations of a little-understood aspect of the brain's neural activity: slow fluctuations in blood flow exhibit regular patterns of neural activity and inactivity that are synchronized widely throughout the brain—even when the brain is at rest. Because he believes this phenomenon reveals fundamental aspects of how the brain processes information, Dr. Castellanos and his colleagues are exploring how this 'functional connectivity' between brain regions may account for the cognitive symptoms of ADHD.

"With ADHD, there's confusion and frustration on the part of parents and afflicted children," said Dr. Castellanos. "And while we've done a good job of describing the behavioral aspects, we still don't have a good explanation of what's going on in the brain. Until we have that, the controversy will continue."