Shaping-up Nicely: Advances in Developmental and Translational Neuroimaging of the Subcortex

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Sub-cortical systems sometimes take a backseat to the cerebral cortex as a focus for basic and clinical neuroimaging studies. However, structures such as the striatum and thalamus are evolutionarily ancient components of the brain that not only play a fundamental role in sensorimotor processing, but also diverse domains of higher mental function. Despite the clear importance of sub-cortical systems for developmentally dynamic, sexually differentiated and disease-sensitive aspects of brain function, sub-cortical maturation and sexual dimorphism in humans remain relatively uncharted, and clinical studies rooted in these normative models are scarcer still. This symposium will bring together some of the latest work from labs in Europe and North American that have been developing and applying new tools for sub-cortical analysis in order to (i) unlock the wealth of shape-related information hidden within classical measures of sub-cortical volume, (ii) create four-dimensional maps of sub-cortical maturation using longitudinal data in healthy youth, (iii) dissect-out patterns of structural and functional connectedness between sub-cortical structures and the rest of the brain, and (iv) leverage these newly-built normative models to arrive at mechanistically informative and clinically useful sub-cortical signatures of neuropsychiatric disorders across the lifespan.

Learning Objectives:
1. The unique challenges faced in MRI-based analysis of sub-cortical systems, and the latest strategies being adopted to address these
2. How the volume and shape of sub-cortical systems change between childhood and adolescence in healthy males and females, the way in which age and sex-biased illnesses impact typical sub-cortical development, and the structural and functional connections that tie developmental dynamic and disease-sensitive sub-cortical "hot-spots" into other brain systems to underpin behavior.
3. The power of high-resolution, high-field image acquisition techniques in fine-mapping sub-cortical connectivity in humans as a parallel to animal research and strategies for wielding sub-cortical analyses in order to generate clinical useful predictions in disease states.

Developmental Deformations of the Subcortex in Healthy: Localizing “Hotspots” of Dynamic Change and Sexual Dimorphism in Childhood and Adolescence
Armin Raznahan, Child Psychiatry Branch, National Institute of Mental Health, Bethesda, MD, USA

Compromised Neuroanatomical Developmental Trajectories and the Translational Utility of Subcortical Anatomy
M. Mallar Chakravarty, The Centre for Addiction and Mental Health, Toronto, ON, Canada

Ultra-High 7T MRI of Structural Age-Related Changes of the Subthalamic Nucleus
Birte U. Forstmann, Cognitive Science Center Amsterdam, University of Amsterdam, Amsterdam, The Netherlands

Structural and Functional Cortical-Subcortical Interactions and Their Relationship toTypical and Atypical Development
Damien Fair, Oregon Health and Science University, Portland, OR, USA