Language breakdown in child neurodevelopmental disorders

Neurodevelopmental disorders (NDDs) like attention deficit hyperactivity disorder (ADHD), autism spectrum disorder (ASD) and developmental language disorder (DLD) are among the most frequently diagnosed pediatric conditions. The impacts on quality of life and the economic burdens they place on health, education, social care are high. These NDDs are not invariant and discrete, as their symptoms vary widely within disorders and overlap across disorders, while the risk factors are frequently shared. Such risk factors include late language emergence and male sex. All of these NDDs are associated with language deficits. These correlated etiologies together with symptom existence in the general population are barriers to understanding their mechanisms and for tailoring intervention pathways.

The current project proposes a longitudinal approach spanning typical and atypical development (in multiple NDDs) and testing the complex interactions between cognitive and brain maturation. It is centered on the question of why and how children differ in language development and how this affects later development in and beyond language? First, we aim to test how language deficits may uniquely contribute to ADHD and ASD profiles by identifying longitudinal relationships between language skills, social cognition and attention. Next, to understand the underlying brain mechanisms of individual differences in the development of language skills, we will examine: the maturation of structural and functional architecture and dynamic neural communication, ensured by excitation and inhibition balance of large-scale brain networks implicated in language, social cognition, and attention. Finally, we will examine how variation in hormone levels, implicated in social cognition, relate to language and cognitive development, and if they interact with biological sex by considering sex differences in early social and language development and higher prevalence of NDDs in males.

The project will integrate findings from behavioral dimensions through to neural systems, incorporating a developmental account for biological variation and sex differences. It will provide evidence if ASD, ADHD and DLD share developmental pathways and build a better understanding of the neural basis of NDDs. The current project's findings will point to new directions for research on brain-behavior pathways in human development and establishing a new conceptual framework of language development. This research has the potential to transform both research and clinical practice, and ultimately improve quality of life for the large number of children who experience NDDs worldwide.