Beyond the average child: Individual differences in longitudinal brain development

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Overview

The symposium will include 4 speakers who will present their recent work based on data collected with the L-CID study. Each talk will be 12 min followed by 3 min for short questions and setting up for the next speaker. At the end of the session we will have 10 minutes for a plenary session to answer questions and discussion.

5 min Introduction of LCID and the speakers by Lara Wierenga
15 min Michelle Achterberg will present her work on individual differences in the development of brain and behavioral mechanisms underlying aggression regulation following social rejection.
15 min Lina van Drunen will present her results on individual differences in structural brain developmental trajectories as predictors of musical capability. She studied to what extent the relation between brain development and musical capability is driven by environmental or genetic factors.
15 min Simone Dobbelaar will present her work on the effects of parenting behavior on the neural development of social behavioral control and to what extent children are differentially susceptible to these environmental changes.
15 min Lara Wierenga will show her study on sex differences in varibality and how this may relate to vulnerability to developmental disorders. In each of the talks different aspects of the L-CID study, including lessons learned and data collection, will be highlighted. We will share our open science practices in which we show how to get access to our protocols and metadata.
10 min Plenary questions and discussion section where all speakers are involved

Learning outcomes
Describe the importance of longitudinal study design to answer developmental questions
Learn about novel work on within and between individual change in brain and behavior in a developmental context
Understand importance of examining heritability and environmental influences on brain development
A better understanding of sensitive windows where experiences have heightened effects on brain development
Learn how brain-behavior associations might change across development
Learn more about different social environmental effects on brain development
Identify different methodologies to study individual differences
Learn on the goals and aims of the Leiden Consortium on Individual differences and where to find our protocols

Lecture 1: *Individual differences in social emotion regulation development: Evidence from a longitudinal fMRI study*
Michelle Achterberg Presenter

Michelle will present on individual differences in the development of brain and behavioral mechanisms underlying aggression regulation following social rejection. The innovative and complex statistical model that she uses first estimates the individual differences in both brain activity and behavior at each measurement. These estimates are then used as input for the individual differences across development. Ultimately, with these analyses and results, we can determine which individuals show strong development of prefrontal control regions and how this relates to behavioral aggression regulation. Moreover, this study provides insight on characteristics of individuals that show strong development of social emotion regulation between childhood and emerging adolescence, and unravel which individuals are prone to thrive during development, and which individuals might benefit from additional social and emotional support.

Lecture 2: *How music alters brain development: A longitudinal twin study on sensorimotor synchronization and brain plasticity*
Lina van Drunen Presenter

To better understand the influence of environmental factors on brain plasticity, Lina studies whether musical training and capability are associated with individual differences in structural brain developmental trajectories. With the identification of subgroups in brain developmental patterns, she tested whether higher musical capability is related to attenuated brain maturation compared to lower musical capability. As such, this would be indicative of prolonged brain plasticity. Furthermore, genetic modeling is used to assess to what extent the association between brain development and musical capability is driven by experiences, which may have particularly pronounced effects during sensitive windows.

Lecture 3: *Differential susceptibility effects on the development of social behavioral control: a longitudinal fMRI design*
Simone Dobbelaar Presenter

Simone will present on environmental effects on the neural development of social behavioral control. Specifically, she studies whether and why not all children are equally susceptible to social environmental changes, such as changes in parenting behavior. Bivariate growth curve modeling is used to test whether individual differences in the development of parenting behavior are related to individual differences in the (neural) development of social behavioral control. To study differential susceptibility, she tests whether the effects of parenting on the development of social behavioral control will be more pronounced in children with a more difficult temperament. Together, these findings will shine light on which children might benefit most from positive environments in order to thrive throughout their development.

Lecture 4: *Studying variability to understand vulnerability*
Lara Wierenga Presenter

There is evidence that sex related factors may contribute to vulnerability to developmental disorders, as is shown by higher prevalence, severity and early onset of male biased developmental disorders, including ADHD and ASD. To better understand these sex realted vulneratbilities Lara studied sex differences in the brain beyond mean group effects. She will discuss her work on sex differences in variability in brain structure and how this may relate to increase male vulnerability to developmental disorders. She implements the twin model design to test the involvement of the X-chromosome in larger

male variability. In addition she used normative modeling to link this to behavioral symptoms of ADHD and ASD to extreme brain patterns.