Project title: Adolescent development of corticostriatal circuits for affective and reward-based decision making.

Project leader: Peter Stiers

Function: Assistant professor

Collaborators: Esther Keulers

Proposal (250 words):

Introduction: It is well established that behavioral changes in cognitive ability, reward sensitivity and emotional responsiveness during adolescence are mirrored by maturational changes that take place in the brain, which take the form of both changed functional couplings between long-distant brain structures and changes in brain activation during task execution. However, it is still unclear how these changes in brain activation and in connectivity are related, or whether they can explain interindividual differences in affective and cognitive ability.
Hypothesis and Objectives: We bridge this gap by relating interindividual differences in brain maturation to behavioral characteristics, while avoiding the blurring effect of traditional group level averaging methods.
Setting and Methods: We will perform a longitudinal study from 13 to 15 years of age, a developmental period during which considerable brain changes take place (cf. Keulers et al. 2012). We will quantify changes that take place in brain connectivity and in brain activation during task execution. We will include a pure cognitive task, a reward-based decision task and an affective task. Voxel-wise corticostriatal circuits for cognition reward and affect will be traces in individual data sets and their change quantified. These changes will be related to behavioral measures of emotional, economic and cognitive factors as well as individual differences in life style and psychiatric vulnerability.
Impact: Insight in how change in functional networks drives change in brain activation and in behavior will greatly advance our way of thinking about the mechanisms underlying behavioral and psychopathological risk that is associated with adolescence.

Requirements candidate: Highly motivated student with good English communication skills and proactive and resolute attitude. Experience with neuroimaging analysis and willingness to acquire programming skills are a plus.

Keywords: Brain development, limbic system, basal ganglia, functional connectivity, emotion, motivation, stimulus-response mapping.

Top 5 selected publications:

1. Evers, E.A., **Stiers P.**, Ramaekers, J.G. (2017). High Reward Expectancy During Methylphenidate Depresses the Dopaminergic Response to Gain and Loss. *Social, Cognitive, and Affective Neuroscience, 12*:311-318.
2. **Stiers, P.**, Falbo, L., Goulas, A., van Gog, T., de Bruin, A. (2016). Reverse inference of memory retrieval processes underlying metacognitive monitoring of learning using multivariate pattern analysis. *Neuroimage, 132*:11-23.
3. **Keulers, E.H.H.**, **Stiers, P.**, Nicolson, N.A., Jolles, J. (2015). The association between cortisol and the BOLD response in male adolescents undergoing fMRI. *Brain Research, 1598*:1-11.
4. **Keulers, E.H.H.**, Goulas, A., & Jolles, J., & **Stiers, P.** (2012). Maturation of task-induced brain activation and long range functional connectivity in adolescence revealed by multivariate pattern classification. *NeuroImage, 60*:1250-1265.
5. **Keulers, E.H.H.**, **Stiers, P.**, & Jolles, J. (2011). Developmental changes between 13-21 years in the extent and magnitude of the BOLD response during decision making. *NeuroImage, 54*, 1442-54.