

DIMINISHED CINGULUM BUNDLE ASYMMETRY IS ASSOCIATED WITH NEGATIVE EMOTIONALITY AND HPA-AXIS FUNCTIONING

Introduction: Structural and functional changes in the amygdala and anterior cingulate gyrus have been linked to anxiety and mood disorders, for which the trait neuroticism and increased hypothalamic-pituitary-adrenal (HPA) axis activity are known risk factors. Increased right and decreased left functional connectivity between amygdala and anterior cingulate / dorsomedial frontal cortex have been associated with higher trait neuroticism. The major fibre bundle connecting these structures is the cingulum. An altered balance between left and right anterior cingulate function has been hypothesized to contribute to the heightened negative affect and neuroendocrine arousal observed in depression. Presently, there are no studies relating the risk factors neuroticism and HPA-axis activity to specific fibre bundles in the brain. Here we studied the a priori hypotheses that neuroticism and HPA-axis activity would be associated with the extent of asymmetry in left and right cingulum fractional anisotropy (FA – a measure thought to reflect axonal density, organisation and myelination).

Methods: Forty-nine healthy adults (15 females) aged 20-86 were included. Neuroticism was assessed using the 240-item self-report Revised NEO Personality Inventory. HPA-axis activity was assessed by the extent of cortisol rise after wakening, i.e. the cortisol awakening response (CAR). To estimate the CAR, each subject collected five serial salivary cortisol samples at home at wakening and every 15 minutes following.

Diffusion-weighted images were acquired using a 3T MR-scanner. TBSS was used to project subjects' FA onto a mean tract skeleton after spatial normalisation. Mean FA values were extracted from the right and left cingulum bundle of all subjects. The percentage difference between left and right cingulum FA was calculated and used in multiple linear regression models.

Results: Linear regression models showed that diminished cingulum FA asymmetry, adjusted for age, age² and gender, was significantly associated with higher CAR ($p=0.039$) as well as with higher neuroticism levels ($p=0.003$). In agreement with earlier findings, higher neuroticism levels were associated with increased CAR ($p=0.032$).

Conclusion: The balance between left and right cingulum FA seems important for negative affect and neuroendocrine arousal in healthy subjects. Animal studies suggest that the left medial prefrontal cortex (mPFC) may modulate, whereas the right mPFC may facilitate neuroendocrine response and negative affect. Speculatively, diminished cingulum FA asymmetry is a possible structural brain marker of a predisposed risk of developing anxiety and mood disorders. Further studies are necessary to elucidate this question more fully.

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VERBAL FLUENCY PERFORMANCE IS ASSOCIATED WITH WHITE MATTER MICROSTRUCTURE IN A LEFT HEMISPHERE NETWORK IN CHILDREN

During childhood and adolescence, different fiber tracts exhibit distinct developmental trajectories measurable with diffusion-weighted imaging (DWI). Fractional anisotropy (FA), a measure thought to reflect axonal organization, density and myelination, has consistently been shown to increase during this age range. Important questions remain about the link between changes in FA and developing cognitive functions. Verbal fluency (VF) is the efficiency of lexical retrieval processes. VF undergoes continuing improvement in children from 7-13 years of age and evidence from lesion and fMRI studies implicates a left lateralized network in VF skills.

We hypothesized that, even within children of similar age, VF skills would be associated with increased FA within a left hemisphere language processing network (LLN) consisting of the arcuate fasciculus/superior longitudinal fasciculus II (AF/SLFII) and the anterior limb of internal capsule (ALIC).

Methods: Sixty-seven children (28 males) aged 7.6-12.8 years participated. The measure of VF was the subjects' ability to generate as many animals as possible, then as many words beginning with the letter S as possible, in both cases for one minute. The subtask scores were standardized and summed for the VF measure. DWI was acquired using a 3T MR-scanner. The diffusion tensor was fitted using the RESTORE algorithm. Spatial normalization of DWI and ROI definition was