Sex hormones & brain lateralisation
- Research Program -
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Introduction
There is a long-standing debate about how much variation in lateralisation between and within individuals is due to exposure to sex hormones. The relation between sex hormone exposure and functional laterisation will be investigated as follows:

1. Correlate existing data on prenatal hormone exposure with brain lateralisation in healthy children of 15 years.
2. Analyse brain lateralisation in individuals with Gender Dysphoria (GD) before and after hormone treatment.

Hypotheses
1. Prenatal testosterone masculinizes strength and direction of lateralisation.
2. Hormone treatment influences strength and direction of lateralisation towards the experienced gender in individuals with GD.

Method

Prenatal hormones
Amniocentesis was performed within the 14th-19th week of pregnancy, the same period as brain lateralisation is assumed to be modulated by the influence of steroid hormones. The children born from these pregnancies are 15 years old now.

Subjects

<table>
<thead>
<tr>
<th>Prenatal</th>
<th>15 y</th>
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<tr>
<td>Amniocentesis</td>
<td>fTCD-study (25♀, 25♂)</td>
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fTCD
Brain lateralisation will be measured with functional Transcranial Doppler sonography. fTCD measures the difference between the left and right hemisphere in blood flow velocity in the Middle Cerebral Arteries during a cognitive task.

Tasks
Individual strength and direction of lateralisation will be assessed during 3 tasks:
- Mental rotation
- Chimeric faces
- Word generation

Additional data:
- Current hormone levels
- Handedness
- Aggression, Empathy
- Pubertal stage, Gender identity & Sexual orientation

Hormones later in life
Individuals with Gender Dysphoria experience a strong incongruence between their gender identity and natal sex. Many individuals with Gender Dysphoria undergo cross-sex hormone treatment to align their body with their gender identity.

Subject groups
Treatment in adolescence:
- 8-11 y: No treatment
- 15-17 y: Puberty suppression
- 16-18 y: Cross-hormone treatment

Treatment in adulthood:
- 18-40 y: Gonadal suppression
- 18-40 y: Cross-hormone treatment

Group comparisons
The organisational effect on lateralisation: 8-11 y GD vs. 8-11 y controls
The effect of puberty on lateralisation: 8-11 y controls vs. 15-17 y controls
The effect of cross-sex hormones on lateralisation in adolescents: (GD cross-sex – GD puberty suppression) vs. controls
The effect of cross-sex hormones on lateralisation in adults: (GD cross-sex – GD gonadal suppression) vs. controls

fMRI
Brain lateralisation will be measured with fMRI.

Tasks
Word generation, Mental rotation, and Facial emotion recognition.

Additional data:
- Current hormone levels
- In some cases: Diffusion Tensor Imaging, Voxel-based morphometry or Resting state connectivity

Points for Discussion
1. Suggestions for essential measurements in the “Prenatal hormones study”?
2. How to analyze lateralisation in existing fMRI-data?
