Aims

Brain structures follow various developmental trajectories during adolescence. For most structures, initially there is growth, followed by a decrease in volume (with exception for white matter volume). The peak of this trajectory is different for structures, and for boys and girls. These trajectories are often studied cross-sectionally, and rarely in a longitudinal setting.

- Investigate subcortical volume change during adolescence
- Estimate heritability of subcortical structures in adolescence
- Explore association subcortical structures with IQ

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Volume change

<table>
<thead>
<tr>
<th>Increase</th>
<th>Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thalamus</td>
<td>Caudate</td>
</tr>
<tr>
<td>Pallidum</td>
<td>Putamen</td>
</tr>
<tr>
<td>Amygdala</td>
<td>N. accumbens</td>
</tr>
<tr>
<td>Hippocampus</td>
<td></td>
</tr>
</tbody>
</table>

Different for boys/ girls and left/ right

Genetic architecture of subcortical volumes

- Heritability: most over 50% (not n.accumbens)
- Same genetic factors over time

Association with IQ

- Subcortical volumes correlate between .05 and .32 with total IQ. After correction for IC only the left thalamus (.13) and left hippocampus (.15) correlate significantly with IQ.

Genetic factors explain this association.

Subcortical brain development is a dynamic process, following different trajectories of growth or volume reduction. However, heritability estimates over a 3-year interval are relatively similar. In general, heritability is high. Only volume of the left thalamus and hippocampus correlate with IQ.

Methods and Sample: Netherlands Twin Register

112 families
96 MZ & 128 DZ twins, 9.2 yrs
103 siblings, 11.8 yrs (9-14)
91% MRI scan

89 families
80 MZ & 98 DZ twins
83 siblings, 14.8 years old (14-17)
74% MRI scan

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Automatic segmentation (in Freeserver) was used for volume measurement of the thalamus, caudate, putamen, pallidum, amygdala, hippocampus and nucleus accumbens.

IQ: total, verbal, performal, index scores (verbal comprehension, perceptual organization, processing speed)

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