**Introduction**

- Memory in adults and children relies on a distributed network of regions in the brain, including the hippocampus.  
- Recent research has suggested that prefrontal regions, included within the frontoparietal attention network, are also important for the development of memory.  
- Interactive specialization suggests that brain and cognitive development occurs through increased integration and segregation of brain networks.  
- The present study uses graph theoretical analysis to:  
  - Investigate integration and segregation of the episodic memory and frontoparietal networks in children and adults.  
  - Investigate associations between integration and segregation and memory performance in children.

**Methods**

**Participants**

- 137 children aged 4-8 years (M= 6.50, SD = 1.48 years) and 30 adults (M=24.5, SD =5.3 years) are included in the study.

**Behavioral Data**

- Children completed a Source Memory Task where they had to recall facts and the source of the facts (puppet vs. person).

**MRI Data**

- T1-weighted high resolution (1mm³) anatomical images were acquired from a Siemens 3T scanner with a 32-channel coil using a standard structural scan sequence.

- Task-free functional data was collected via a 7 min MRI scan during which participants viewed Inscapes, a video of abstract shapes.

**Methods: Defining Nodes**

- Episodic memory and frontoparietal nodes were defined on an MNI child template using peak coordinates from meta-analyses in Neurosynth.

- Regions were defined using a 5mm sphere.

<table>
<thead>
<tr>
<th>Node</th>
<th>MNI Coordinates</th>
<th>Community</th>
</tr>
</thead>
<tbody>
<tr>
<td>L.Anterior Hippocampus</td>
<td>-24 -14 -20</td>
<td>ESN</td>
</tr>
<tr>
<td>R.Anterior Hippocampus</td>
<td>24 14 20</td>
<td>ESN</td>
</tr>
<tr>
<td>L.Posterior Hippocampus</td>
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</tr>
<tr>
<td>R.Posterior Hippocampus</td>
<td>26 -14 -20</td>
<td>ESN</td>
</tr>
<tr>
<td>L.Middle Occipital Gyrus</td>
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<td>ESN</td>
</tr>
<tr>
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<td>32 -80 58</td>
<td>ESN</td>
</tr>
<tr>
<td>L.Middle Cingulate Cortex</td>
<td>-8 -44 16</td>
<td>ESN</td>
</tr>
<tr>
<td>R.Middle Cingulate Cortex</td>
<td>8 -44 16</td>
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</tr>
<tr>
<td>L.Middle Frontal Gyrus</td>
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<td>ESN</td>
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<td>30 14 20</td>
<td>ESN</td>
</tr>
<tr>
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<td>R.Inferior Frontal Gyrus (Right)</td>
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<tr>
<td>L.Middle Frontal Gyrus (Insular)</td>
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</tr>
<tr>
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<tr>
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</tr>
<tr>
<td>R.Middle Frontal Gyrus</td>
<td>32 26 34</td>
<td>FPN</td>
</tr>
</tbody>
</table>

**Results**

**Network structure**

- Similar organization in children and adults.
- Strength of associations is stronger in adults.

**Network level integration & segregation**

- Global efficiency is significantly higher in adults (M= 0.16, SD=0.02) than in children (M=0.13, SD=0.07, t(165) = 7.85, p <.001).
- Modularity does not significantly differ between adults (M= 0.07, SD=0.06) and children (M = 0.06, SD=0.07, t(165)=0.97, p =.33).

**Node level integration & segregation**

- Neither within-module degree nor participation coefficient differs with age in children.
- Participation coefficient associated with right posterior hippocampus is negatively associated with source memory performance (r = -.19, SE = 0.07, p =.01) after controlling for effects due to age and IQ.
- No association between within-module degree and memory performance.

**Discussion**

**Results suggest:**

- Similar network structure in children and adults.
- Increased integration, but not segregation, of the episodic memory network and the frontoparietal attention network in adults compared to children.
- Individual differences in segregation of the hippocampus from the frontoparietal network is related to performance on a source memory task in children.

  - This supports prior research that suggests kids who rely on regions within the episodic memory network perform better on memory tasks than kids who don’t rely on such regions.

**References**

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