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Section B

Timeline of Brain Development
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Brain Maturation

Developmental Course of Human Brain Development

Experience-dependent synapse formation & dendritic arborization

- Sensorimotor
- Parietal & temporal association cortex
- Prefrontal cortex

Adapted by CTLT from Casey (2005).

Plasticity

- **Plasticity**: the ability of the brain to adapt to changes in environment

- **Experience expectant plasticity**: connections generated by stimuli and experiences which members of a species expect to encounter

- **Experience dependent plasticity**: development generates experiences which create conditions for further development (e.g., learning)
Plasticity

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Brain development is experience dependent

Experiences are brain development dependent
Brain Development ...

- ... and cognitive, social, and emotional development are highly interrelated

- The sequence in which the cortex of the brain develops parallels cognitive milestones

- Behavior shapes brain development as brain development shapes behavior
Experience and Brain Development

- Normal experiences support normal brain development
  - Good nutrition
  - Patterned visual information

- Abnormal experiences can lead to abnormal neural and therefore behavioral development
  - Prenatal alcohol exposure
  - Occluded vision
Pattern of Brain Maturation: Posterior to Anterior

- **Posterior lobe:** sensory and motor functions (e.g., vision)
- **Temporal and parietal:** language and spatial attention
- **Frontal:** higher cognitive and executive functions
Sensory Stimulation in Infancy

- Sensory stimulation in infancy may enhance brain development

- Rats raised in three cages after weaning:
  - Complex cages with a lot of stimuli (toys and other animals)
  - Average cages
  - Sensory deprivation cages

- As adults the rats raised in complex cages outperformed others, had more mature synaptic structure, more dendrites, more synapses per neuron, and more capillaries that enhanced blood flow and oxygen

Source: Greenough and Black. (1992).