

The Implications of Quality Early Education for Brain Development

Desmond Kelly, M.D.

Medical Director

Division of Developmental-Behavioral Pediatrics

GHS Children's Hospital

Greenville, SC

GHS Professor of Clinical Pediatrics

University of South Carolina School of Medicine

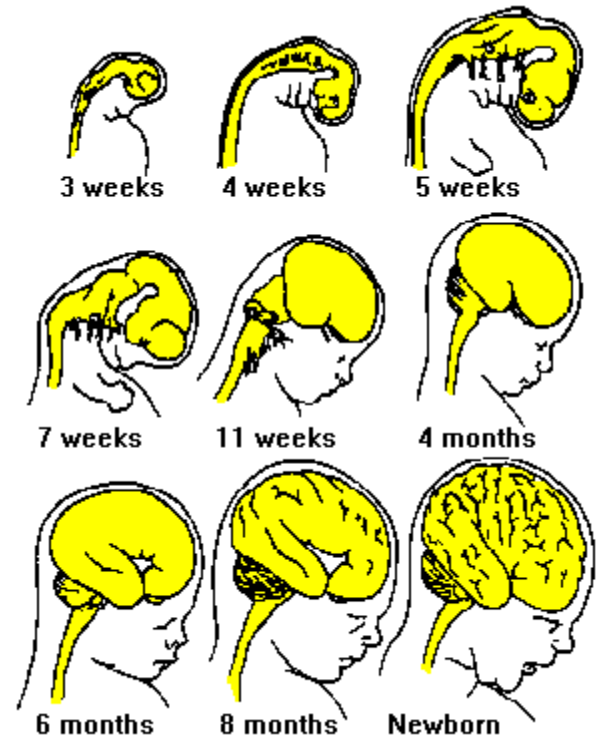
Nature vs. Nurture?

- Nature AND Nurture
- Majority of human genome is dedicated to brain development
- BUT the final form and function of the brain is a result of the interaction of genes and other influences on development both before and AFTER birth



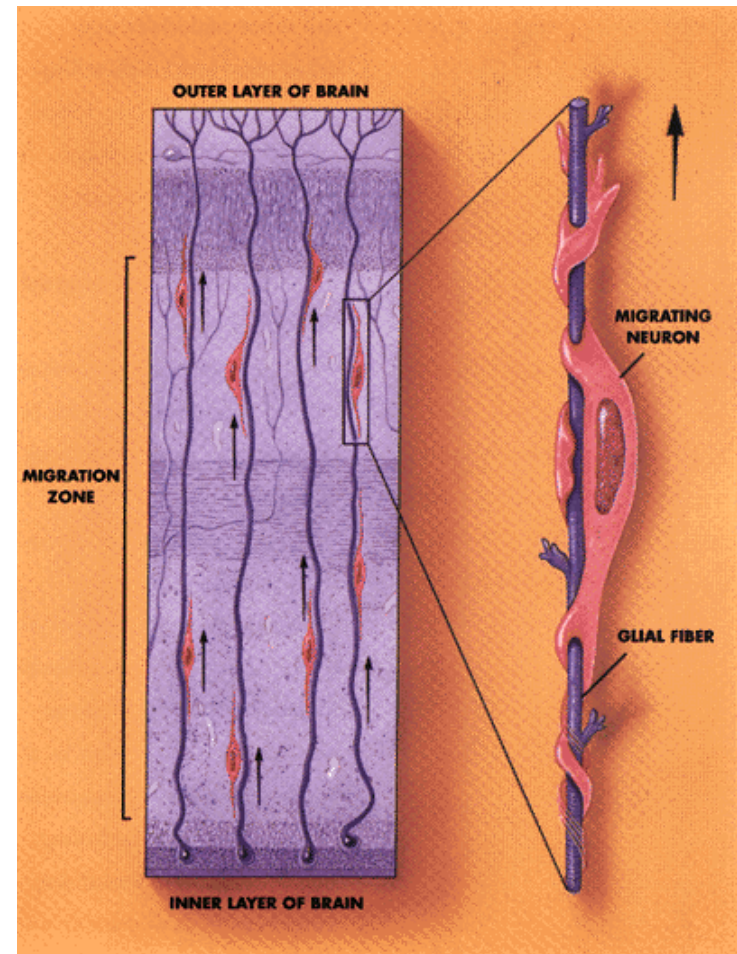
Brain Development before Birth

- Nerve cells multiply
- They receive genetic programming to perform special functions



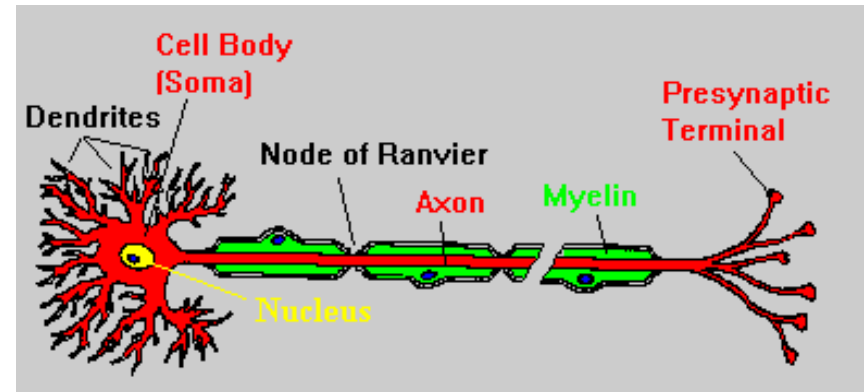
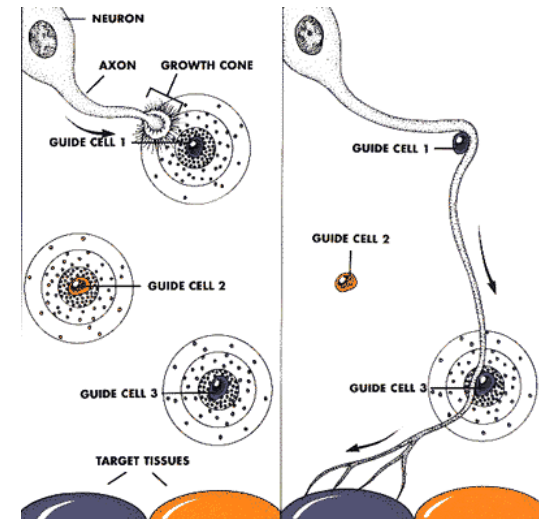
Brain Development before Birth

- Neurons journey to their final destination, climbing on a scaffolding formed by support cells



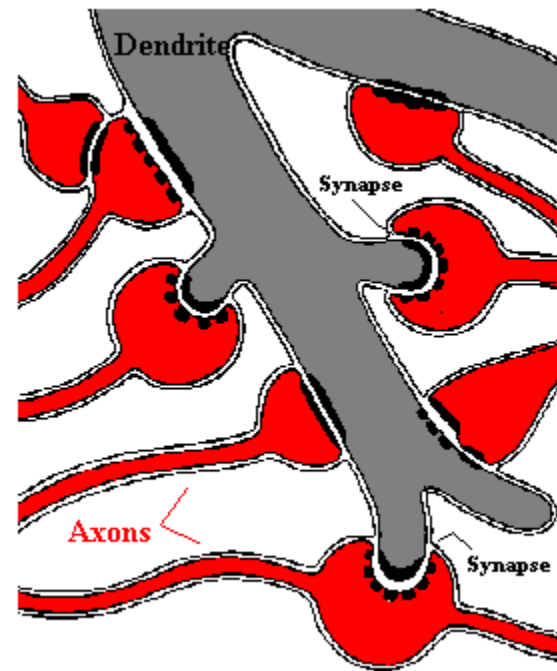
Brain Development before Birth

- Neurons send out axons to connect with the dendrites of others at synapses
- Transmission becomes more efficient through the development of myelin



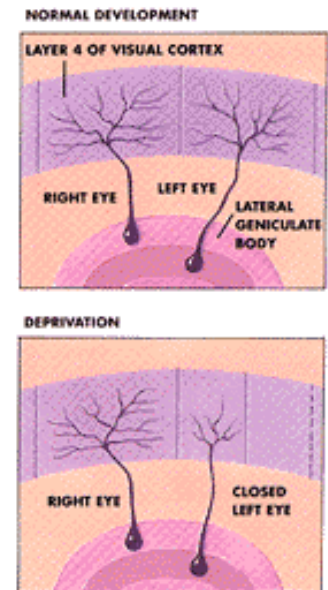
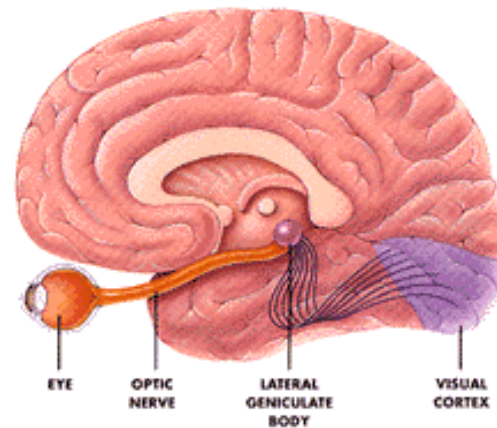
Brain Development before and after Birth

- Trillions of synapses are formed
- Twice as many as needed
- Experiences after birth determine which synapses and pathways are strengthened and which are lost



Brain Development in Infancy and Early Childhood

- “Experience-expectant” synapses
 - e.g. hearing; vision
- Optimal pathways are reinforced
- Unused connections are pruned
- “Use it or lose it”

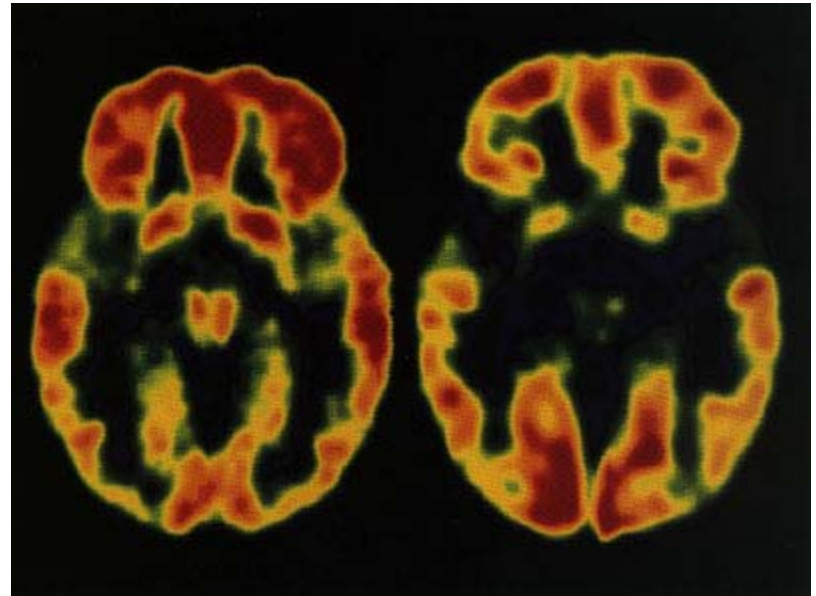


Lack of appropriate stimulation

- “Experience – dependent” synapses
- Opportunities for learning
- Connections formed and modified by life experiences
- Organized or disorganized responses

The risks of sub-optimal environments

- Brain activity in a child raised in an Eastern European institution
(typical child on left – institutionalized child on right)



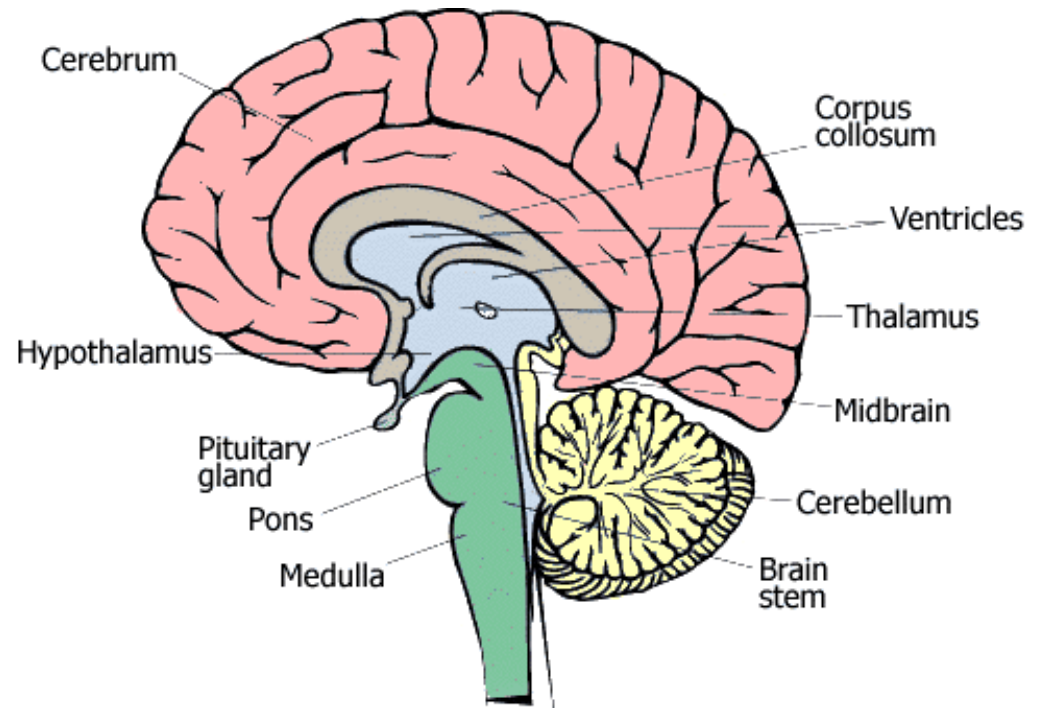
So -

Brain development is an awe inspiring miracle but it is a delicate process that is vulnerable to negative influences.

Our responsibility and our duty is to provide developing minds with the nurturing environments that will promote development to its full potential and protect against the development of dysfunctional patterns.

Brain Function Developmental Domains

- Motor Skills
- Language
- Cognitive Abilities
- Social-Emotional
- Executive Functions



Recent Research

- Dr. Charles Nelson and his group studying young children in Rumania
- Placement in more stimulating environments improves function in many areas (growth, cognitive abilities, motor abilities, mood) but some problems persist (executive function, oppositional behaviors)
- Critical developmental periods might have been missed

The Importance of a Quality Early Care and Educational Experience

- For infants and young children who spend a large amount of their time in child care settings and for those who are able to attend preschool, there must be opportunities for stimulation of cognitive and emotional development in all domains
- Failure to do this will have permanent effects on some aspects of development and learning
- We cannot afford that!