


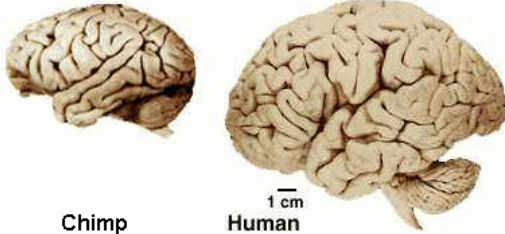
The Human Animal



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Humans Have Huge Brains

Approximate Brain Size Comparison

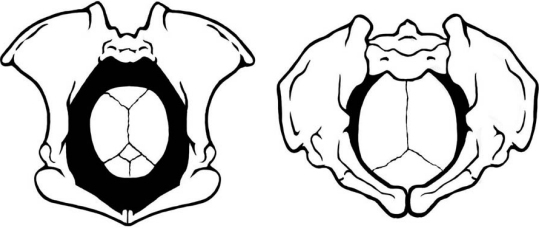


Chimp Human

1 cm

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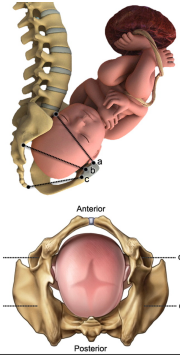
Humans Have Narrow Pelvis



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Human Brain and Birth Canal

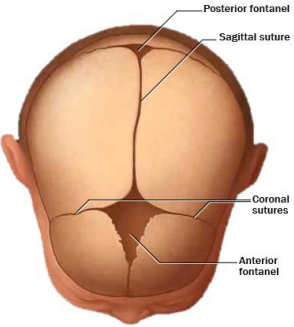
- At end of gestation, head is widest part
- High risk of getting stuck
- Compromise: brain is relatively small and immature at birth



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Soft Spots

- Bones in skull remain unfused until after birth
- Allows for squeezing of head through birth canal



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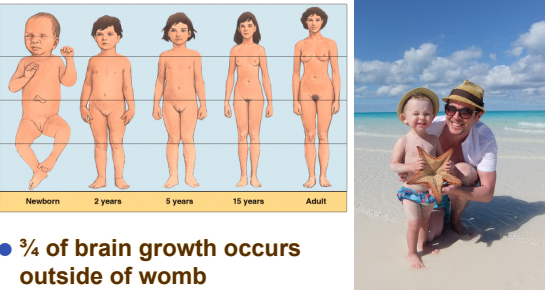
Dependent/Independent Young



- Humans have the most immature brain at birth of all mammals

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Allometric Growth



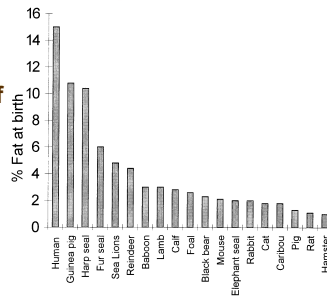
Newborn 2 years 5 years 15 years Adult

- ¾ of brain growth occurs outside of womb
- By age 3 brain is 90% adult size

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Brain Development

- Brain is an expensive tissue
- Consumes 50% of body's glucose
- During 1st 2-3 years may consume 80%
 - Rapid growth
 - High brain:body size

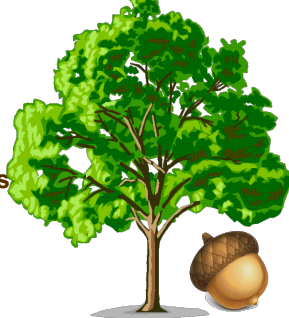


Mammal	% Fat at birth
Human	~15
Guinea pig	~11
Harp seal	~10
Porcupine	~6
Sheep	~5
Rhesus monkey	~4
Baboon	~3
Lamb	~3
Calf	~2
Foal	~2
Black bear	~2
Mouse	~2
Elephant seal	~2
Rabbit	~2
Cat	~1
Caribou	~1
Pig	~1
Rat	~1
Hamster	~1

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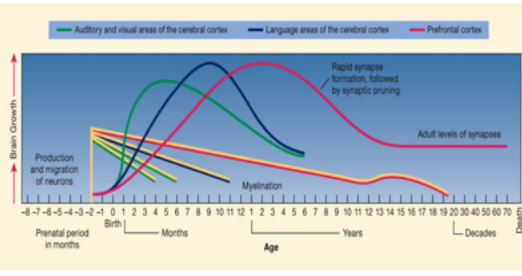
Nature vs. Nurture

- Genes dictate basic structure, developmental schedule, anatomy etc.
- Environment sculpts and fine-tunes the systems that determine how it functions



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Synaptic Pruning



— Auditory and visual areas of the cerebral cortex
 — Language areas of the cerebral cortex
 — Prefrontal cortex

Production and migration of neurons, Myelination, Rapid synapse formation, followed by synaptic pruning, Adult levels of synapses.

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Neuronal Wiring and the Environment

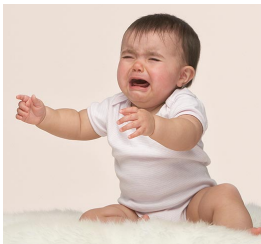
- 3 essential components critical to proper brain development:
 - Nutrition
 - Physical security
 - Consistent emotional nurturing



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Evolved Mechanisms

- Babies cry to establish security and to satisfy their needs
- Irresistible to parents
 - Supported by oxytocin
 - Allows parents to maintain pleasurable love despite challenges and difficulties
- Basis of attachment relationship



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Attachment

- Innate pursuit for closeness of others
- Survival mechanism in infants due to helplessness
- Most important factor in brain development



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Infant Mental Health

- Brain development intimately tied to psychology of parent and quality of interactions
- They feel stress, anxiety, happiness
- They read your pupils, body language, tension



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Parental Nurturing

- Presence determines levels of good mood-related chemicals
 - Serotonin (anti-depressant)
 - Oxytocin (love chemical)
- Absence determines levels of harmful chemicals
 - Cortisol (stress hormone)
 - Vasopressin (high blood pressure)
 - Shrinks hippocampus (memory storage)
- Ability to regulate psychological and physiological stress affected



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Parental Nurturing

- Opioid attachment-reward system
- Dopaminergic incentive-motivation system
- Self-regulation of PFC
- Body-brain system of stress-response mechanism



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Opioid Attachment System

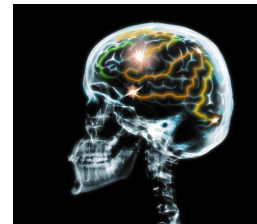
- Develops through happy relationship-based emotional interactions
- Healthy growth leads to love, connection, pain relief, pleasure & attachment
- Stunted by stress, painful emotional experiences and trauma



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Endorphins

- Alleviate physical pain
- Ease emotional pain
- Create parent-child bond
- Maintain social relationships
- Trigger feelings of intense pleasure



All are integral to being a social human being

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Dopamine System

- Governs motivation-incentive
- Built on stable experiences between infant and parent
- Neurons wired via social-emotional stimulation



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Incentive-Motivation Apparatus

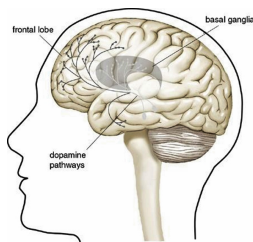
- Initiates activities related to pleasure
- Plays role in learning new behaviours
- Essential to human evolution
 - Initiating food foraging activities
 - Seeking sexual partner
 - Explore environment



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Limbic System

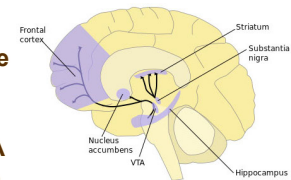
- Dopamine and endorphins are integral to emotional brain
- Processes love, joy, pleasure, pain, anger, fear
- Necessary to initiate and maintain activities necessary to human survival



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Incentive-Motivation Apparatus

- Triggered in the Ventral Tegmental Apparatus (VTA)
- Nerve fibres stimulate Nucleus Accumbens (NA)
- Lab rats wired to VTA with a lever will over-stimulate to the point of exhaustion



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Proximal Separation

- Children experience distress even when parent is physically present but emotionally absent
- Leads to stress and anxiety in infants



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Stress and Anxiety

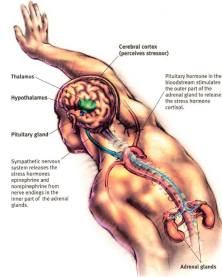
- Physiological response when an organism's coping mechanisms are overwhelmed
 - May be biological or psychological demands
 - Body attempts to maintain homeostasis
- Early childhood stress lowers threshold response
 - Triggered more easily, more anxious and distressed



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Physiological Response

- Release of adrenaline and cortisol in almost every organ and tissue
- Creates a state of readiness to threats
- Fight or Flight origin
- In humans, most threats are emotional



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Questions?



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