

What is Happening in the FASD Brain?



Alcohol

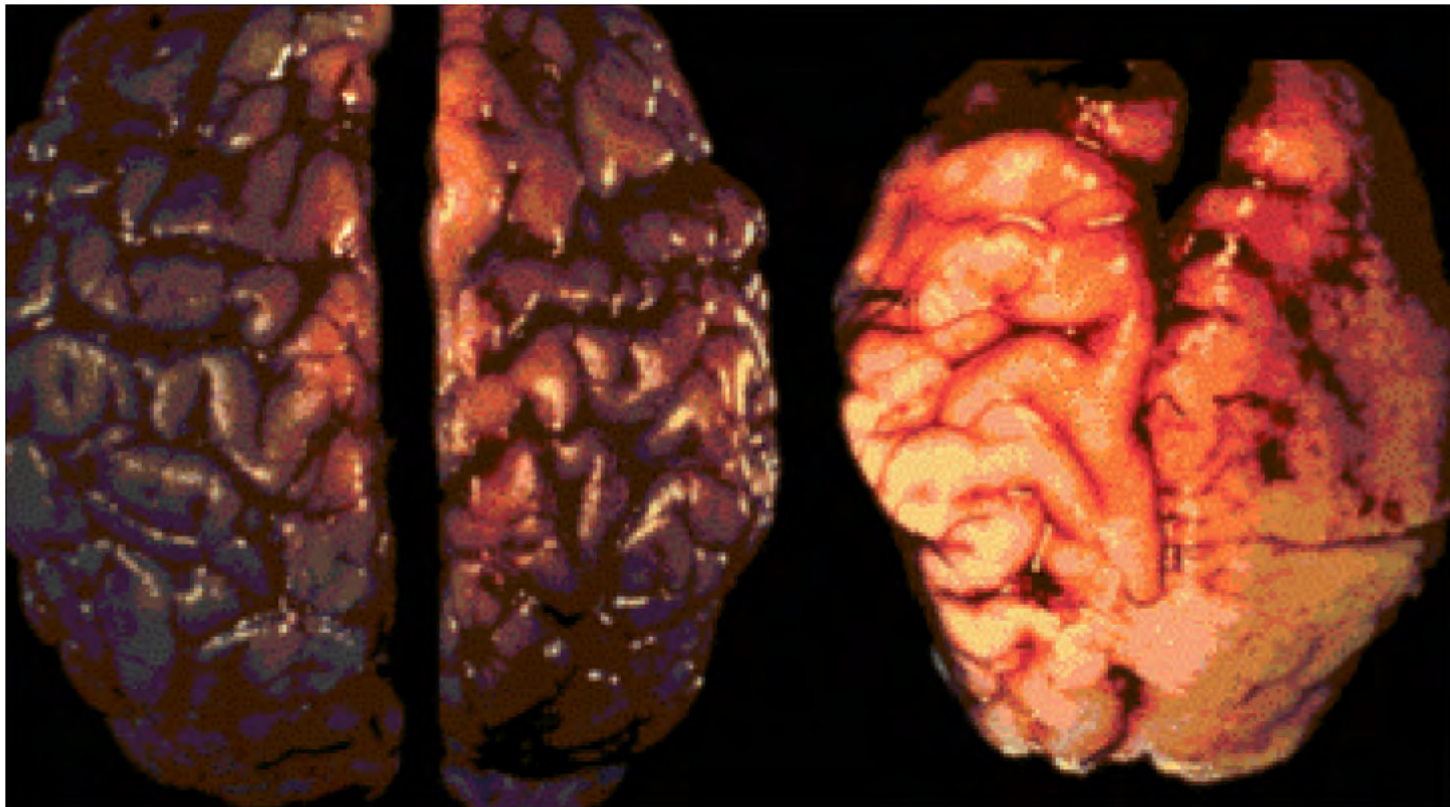
- Ethyl Alcohol is a chemical that is made up of oxygen, carbon and hydrogen. It dissolves and is stored in both water and fat in the body (most of the body is water and fat).
- The fetus lacks an enzyme known as alcohol dehydrogenase which is responsible for getting rid of alcohol from floating around in the body and brain.

- Fetal liver and kidneys are immature, drugs are slow to be broken down and excreted.
- The level of alcohol can build up in the fetus, particularly in the brain.



Infant Brains

Sterling Clark MD



Infant brain no prenatal alcohol exposure

Infant brain with excessive alcohol exposure



Genome

- Malleable and flexible protein structure that bends and flows in response to the environment.
- The attachment system is part of the environment and influences replicating micro gene transcription occurring every second of every day.

Genes

Epigenetic information is an extra layer of information attached to DNA that helps regulate gene activity, turning them on or off and affecting one's physical traits.

Epigenetic Model



Epigenetic information is an extra layer of information attached to DNA that helps regulate gene activity, turning them on or off and affecting one's physical traits.

Epigenetics

- The differences in timing and dosage of the introduction of alcohol have been shown to affect the developing brain at three critical times:
 - Preconception!
 - Preimplantation of the fetus
 - Fetal Development

Dad' s Too

In more recent studies, mental and physical defects consistent with those of FASD were observed in offspring sired by men chronically exposed to alcohol in the absence of maternal alcohol consumption.

Ouko, et al. 2009

Even low levels of alcohol can have demethylating effects

The FASD Frontal Cortex

- Orbitofrontal dysfunction in particular seems to release the typical brakes on aggressive and hostile impulses while dorsolateral dysfunction contributes to an inability to learn from consequences.
- This area is an area of prominent damage in FASD.

Resonance of Emotion

Mirror Neurons

Mirror neurons are neurons that allow our brain to match the movements we observe to the movements we ourselves can perform!



Rizzolatti & Sinigaglia, 2006

Mirror Neurons

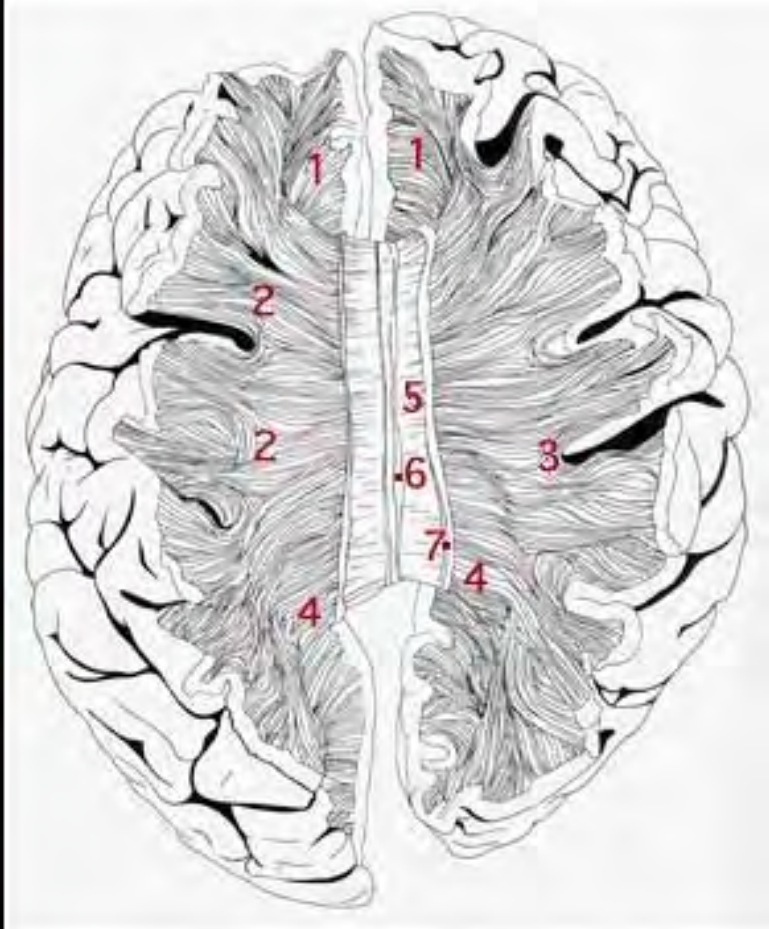
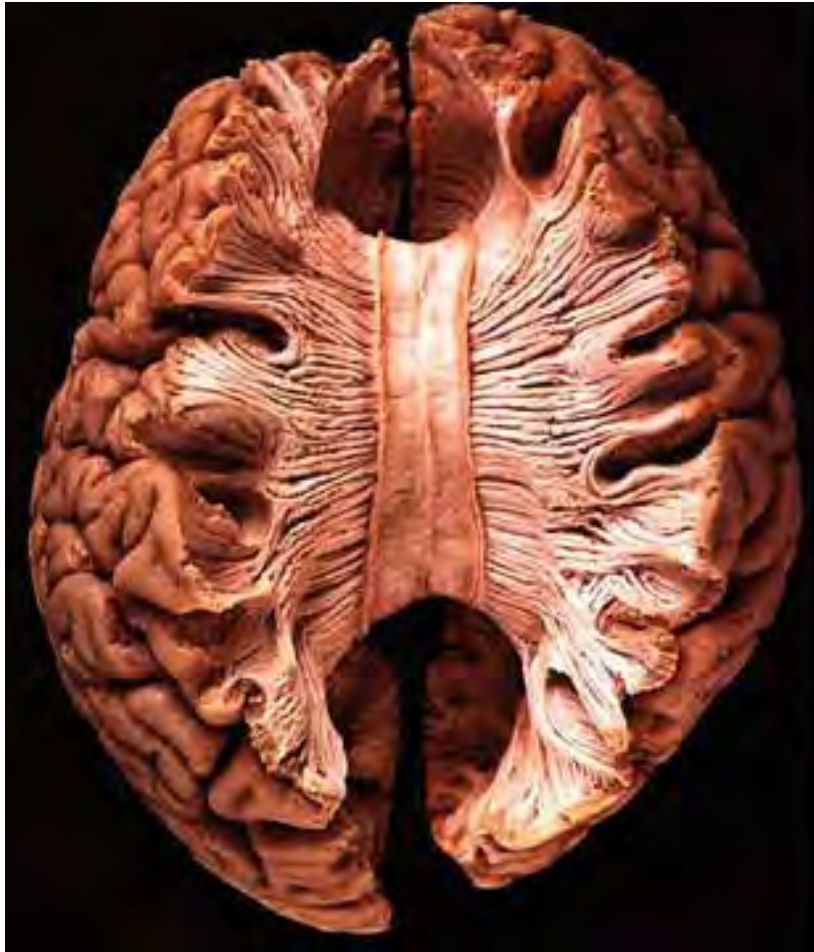


FASD and Mirror Neurons

- The role of mirror neurons is to develop and understanding of what another is doing and how they feel when they are doing it.
- Children with FASD have difficulty both processing and replicating actions that are provided in the environment.

Makes is difficult to understand shared experience.

Corpus Callosum



Corpus Callosum and FASD

- Smaller and less able to pass information from the left brain to the right brain.
- The typical job of the left brain is to inhibit and control the negative moods generated by the right brain.

Amygdala and Survival



Gatekeeper of the Emotional Brain

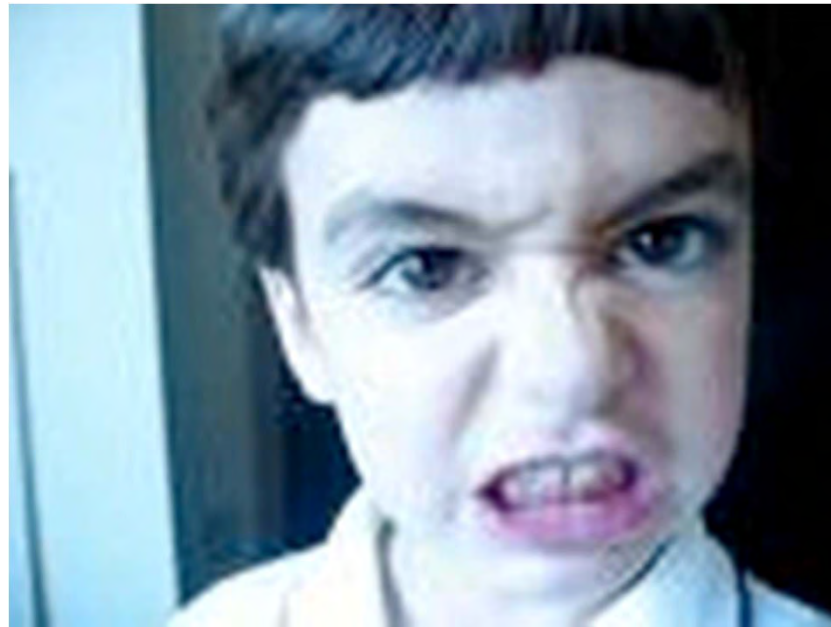
The FASD Amygdala

- Smaller, lazier amygdala or hyper-responsive amygdala
- Delayed or hyper-responsive stress response
- Lack of fear or exaggerated fear

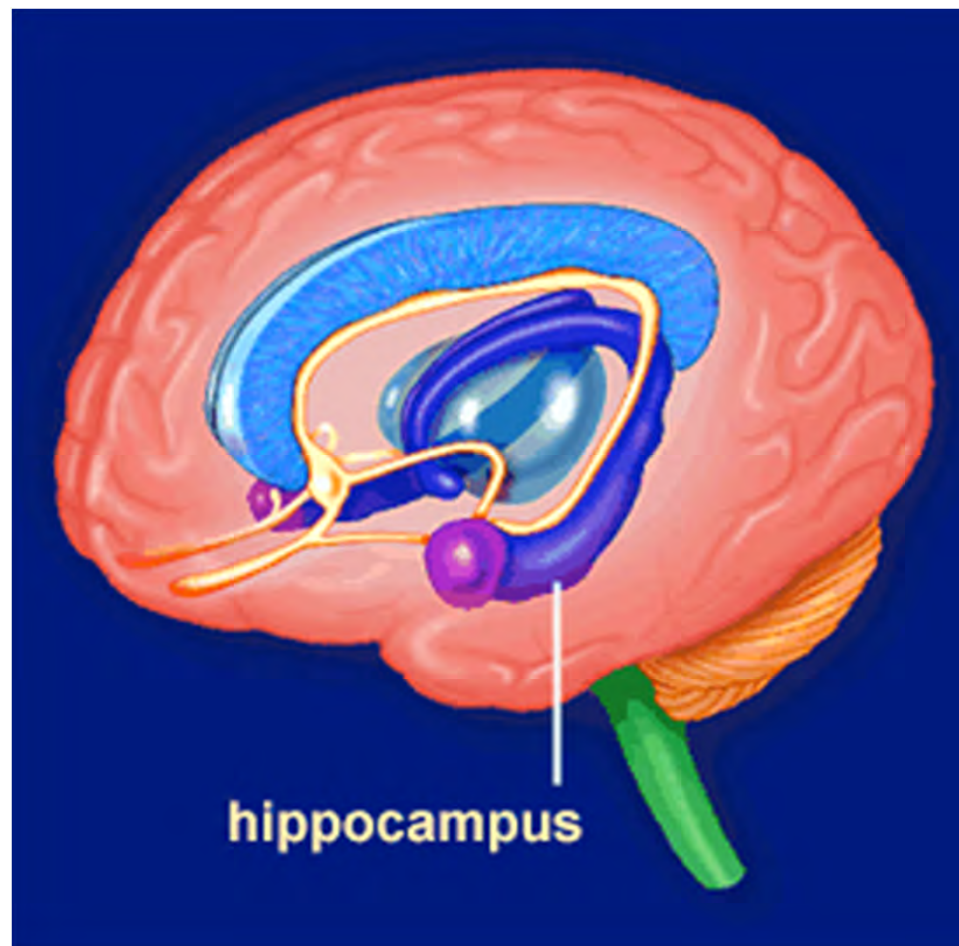
Face Recognition

Amygdala Makes Decisions about Safety

- When we see an angry face, the amygdala tells the body to “run”



Hippocampus helps us Remember



The FASD Hippocampus

- Most impaired structure in the brain of FASD
- Hippocampal impairment results in difficulty learning the obvious cues that would keep them out of trouble.
- The hippocampus helps suppress urges that could lead to socially unacceptable or frankly illegal outcomes.

- If someone gives you a non-verbal cue to change your negative behavior you will alter your response consequentially.
- In FASD non-verbal cues may be misinterpreted and create a maladaptive behavioral response to the cue
- Relational poverty due to impaired attachment will result in diminished experience reading cues also creating a maladaptive behavioral response.

The Right Orbito-frontal Cortex is the Thinking part of the Feeling Brain

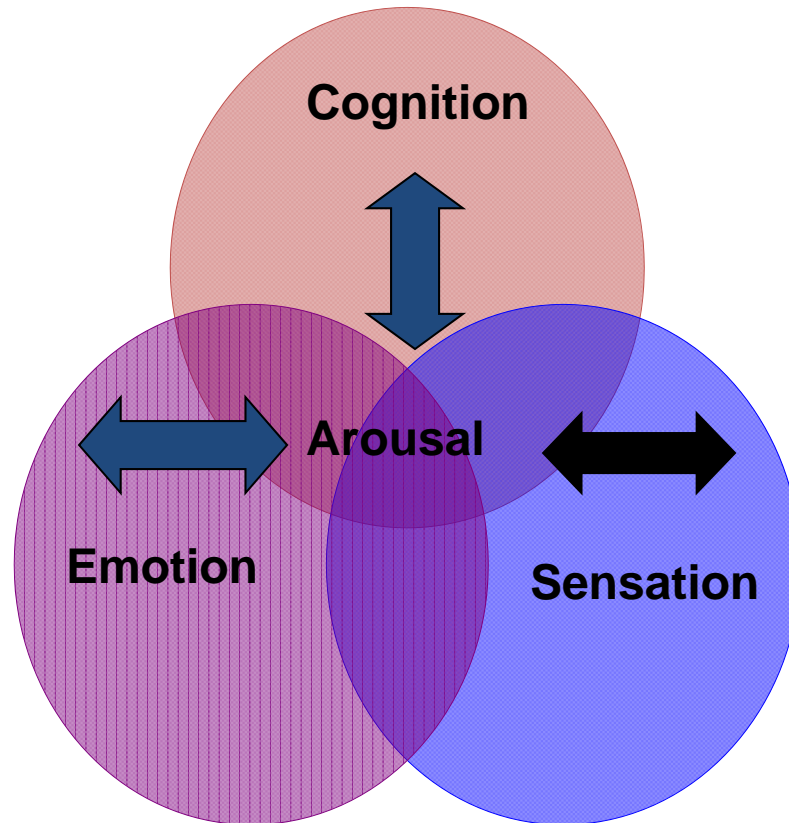
When it is working smoothly, it can **delay emotional** reactions long enough to allow mature, more sophisticated responses to emerge.



FASD and Arousal



Arousal is the Foundation of Behavior



Challenges with Regulation may Result in:

- In-Attention to task
- Poor Impulse Control
- Limited Frustration Tolerance
- Poor Balance of Emotions
- Sleep Disturbances
- Poor Self-calming
- Intolerance of Change
- Anxiety
- Feeding Problems
- Mood Regulation Problems

