A Client's Perspective on Addiction

A Match Between Experience
And
Neuroscience

Addiction
What does neuroscience tell us?

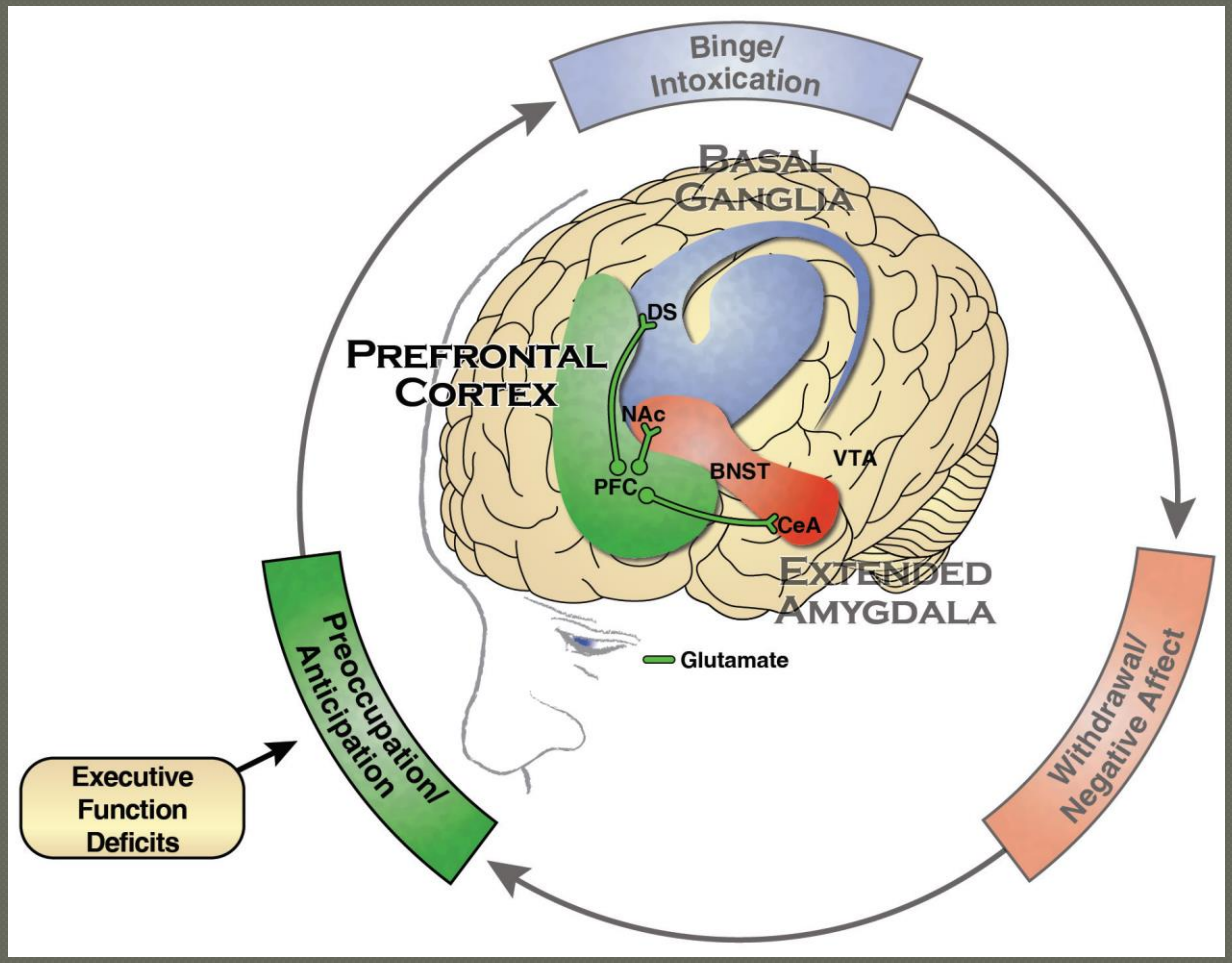
There are three areas implicated in addiction

1. The Basal Ganglia: involved in Binge/Intoxication
2. The Extended Amygdala: involved in Withdrawal/Negative Affect
3. The Prefrontal Cortex: involved in Preoccupation/Anticipation

From: Finding Addiction in America: The Surgeon General's Report on Alcohol Drugs and Health

U.S. Department of Health and Human Services 2016

The Addicted Brain



The Basal Ganglia Binge/Intoxication

1) Initial use may begin with a moment of impulsivity, the person tries the substance
2) Continued use depends on the effect of the substance on the person
    a) The experience is pleasurable and so the use is positively reinforced
    b) The experience removes something dis-pleasurable and so the use is negatively reinforced

Positive Reinforcement

Could come directly from the effects of the drug:

- The drug experience is enjoyable

Could come from other consequences of the drug use such as:

- acceptance from a peer group
- Being with others

Negative Reinforcement

Could come directly from the effects of the drug

- Relief from painful emotional experiences such as Stress, Anxiety, or Depression

Could come from other consequences of drug use such as:

- Relief from social isolation
- Relief from feelings of being different

Addiction Hijacks the Brain's Reward System

- The Brain's reward system rewards eating and sex which ensures the survival of the species through the release of Dopamine which provides us with a sense of pleasure
- All drugs of abuse effect this system by prompting the release of Dopamine
- The brain then equates these drugs with survival

The Reward System

- Drugs and alcohol activate this system
- Stimuli associated with drugs or alcohol use also activate this system
- These stimuli become triggers or cues to use and promote substance seeking and substance use
- The triggers themselves cause a release of Dopamine which increases the desire to seek the drug

Habit Formation and Compulsivity

- The release of Dopamine is reduced in people taking drugs or alcohol
- The desire for the release of dopamine causes habit formation, because the habit of using is reinforced by the release of dopamine
- The habit eventually leads to compulsion to avoid the negative consequences of not using which is the reduced release of dopamine

The Extended Amygdala Withdrawal/Negative Affect

- The Brain's Stress System
- When activated it produces:
  - Corticotrophin Releasing Factor (CRF)
  - Norepinephrine
  - Dynorphin
- These produce:
  - Depression
  - Anxiety
  - Irritability

Tolerance and Withdrawal

- Tolerance: Drug and alcohol use effects on dopamine diminish over time and more is required to achieve the same effect
- When drugs or alcohol are not taken there is little release of dopamine and the person experiences Anxiety, Depression and Irritability because the stress system is activated

The Trap

- Negative feelings that accompany withdrawal strongly motivate continued substance use
- Taking substances relieves the negative feelings of withdrawal
- Withdrawal symptoms increase over time

The Prefrontal Cortex Preoccupation /Anticipation

Controls our Executive Functioning

- The ability to organize thoughts and activities
- Prioritize tasks, manage time, make decisions
- Regulate one's actions, emotions and impulses

The Go System/The Stop System

- The Go System:
- is often used to engage in behaviors that help us achieve goals
- Activity here increases the urge to repeat the behaviors that are pleasurable
- Increases dramatically in the presence of substance related triggers or cues
- Increases the habit response system so that behaviors become automatic and subconscious

The Go System/The Stop System

- The Stop System:
- Inhibits the activity of the Go System
- Controls habit responses
- Reduces the ability of triggers or cues to produce relapse
- Controls the brain's stress and emotional system

The Problem

- People with substance abuse disorders have impairments in executive functioning
- They have increased activity in the Go System
- They have decreased activity in the Stop System
- People with substance abuse disorders and people with PTSD have smaller volume in the Prefrontal Cortex

Factors that contribute to and affect the development of addiction

- Genetics
- Mental Health
- Trauma History (ACE Studies)
- Personality
- Social Support
- Sense of Self
- Connection to Others
- Resiliency
- Age of use, length of use, poly-drug use
- Attachment history
- Previous head injury or a compromised brain

Other Issues

- Adolescents have greater risks associated with use because they have an undeveloped prefrontal cortex
- Heavy use can affect the development of their brains
- Those who have more severe long term use may have had pre-existing differences in the volume of their prefrontal cortex
- Co-Occurring mental health issues are common in people with Substance abuse disorders particularly PTSD

The ACE Studies Vincent J Felitti 2003

- 17,000 people participated
- Adverse Events:
  1. recurrent physical abuse
  2. recurrent emotional abuse
  3. contact sexual abuse
  4. alcohol and/or drug abuse in household
  5. incarcerated household member
  6. family member chronically depressed, mentally ill or suicidal
  7. mother treated violently
  8. one or no parents
  9. physical neglect
  10. emotional neglect

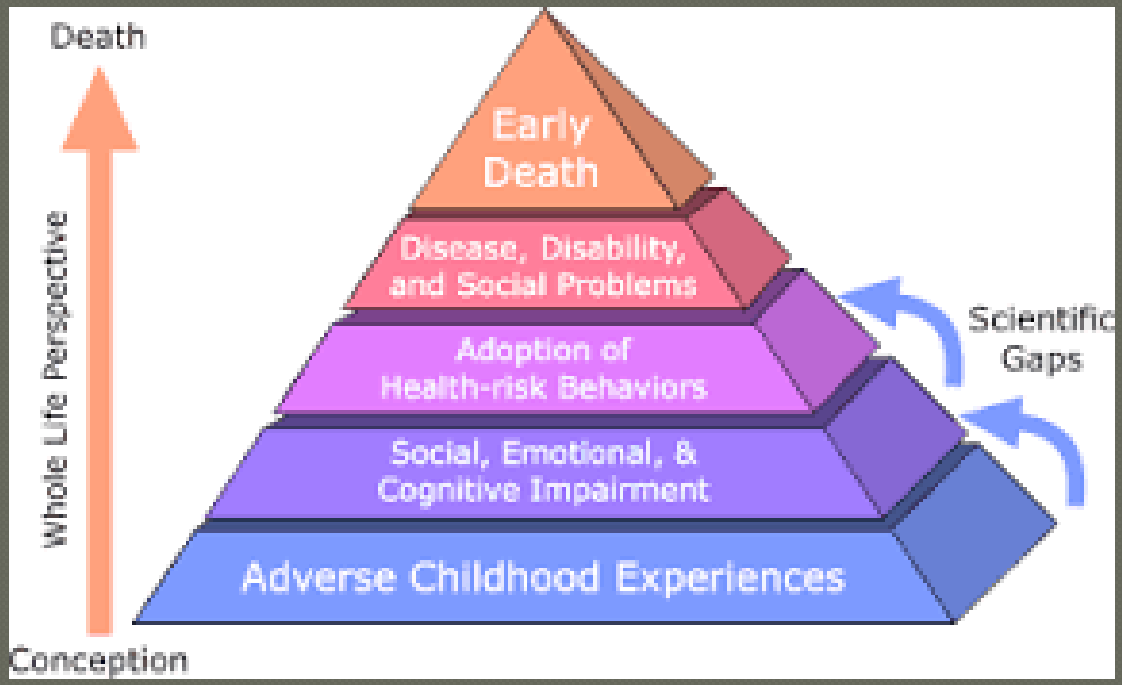
ACE Studies Conclusions:

- Resulting Health Risks
- 1. Cardiovascular disease
- 2. Cancer
- 3. Heart Attacks
- 4. High Blood Pressure
- 5. Stroke
- 6. Diabetes
- 7. Weight Gain
- 8. Exhaustion
- 9. Reduced Growth Hormone Levels
- 10. Compromised Immune Function
- 11. Bone Loss
- 12. Addiction
- 13. Mental illness

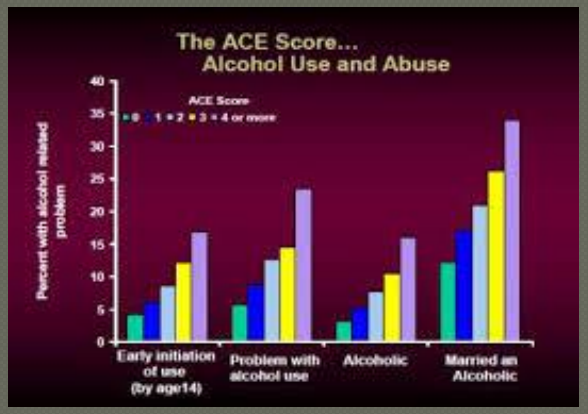
The Importance of The Ace Study

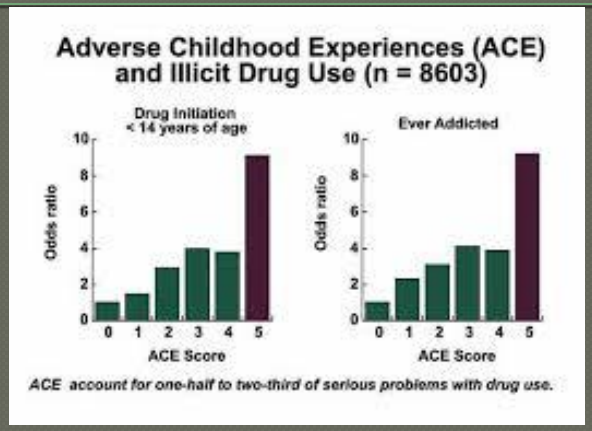
Unhealthy ways of coping with childhood adversity

The ACE Trajectory



ACE Scores and Addiction





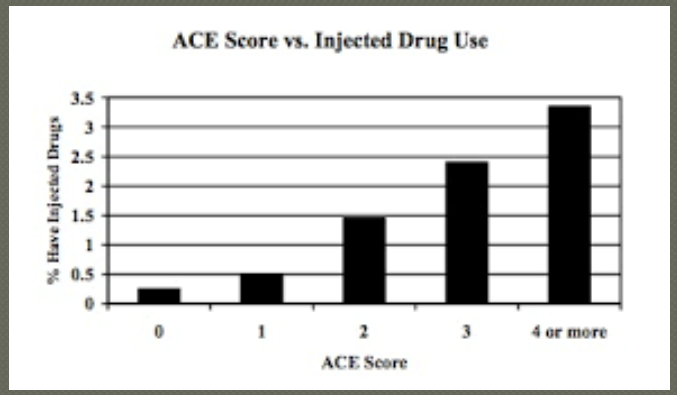
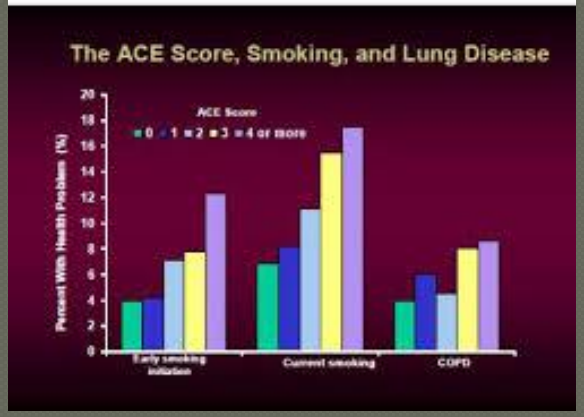


Figure 8.--Relationship of the ACE Score to Smoking and COPD



The Alberta Family Wellness Initiative

- **The Brain Story:**
- 1. The brain's early development is affected by experience
- 2. Good Mothering buffers the effects of stress
- 3. Excessive early life stress affects the brain's development
- 4. Long exposure to stress damages the brain and increases risk of a range of physical and mental disorders
- 5. Early life stress is associated with reduction in volume of hippocampus and the prefrontal cortex
- 6. Both of these are involved in managing the stress response
- 7. When the stress response stays on, stress hormones cause damage
- 8. Unhealthy behaviors are engaged in as a response to long term Stress
- 9. Acute stress has direct effects on the body

The Brain Core Story

- Brain Architecture
  - The experiences we have in the first years of our lives affect the physical architecture of the developing brain
  - Because brains are built in stages with more complex structures built on simpler structures the early years are important
  - Good Brain Development is facilitated by exposing children to positive nurturing interactions at a young age

The Brain Core Story

- Serve and Return
  - Serve and return interactions with children build a solid brain foundation
  - This is done through the various forms of communication that pass back and forth between parents and their children
  - These interactions are the bricks that build a healthy foundation for all future development
  - They are crucial for a young person's developing years

The Brain Core Story

- Toxic Stress
  - Stress is one factor that shapes Brain Architecture in the developing child
  - Traumatic events experienced without supportive caregivers subject children to toxic stress
  - Examples of toxic stress include abuse, neglect, parental addiction, violence or chaotic environments
  - Early exposure disrupts brain development and leaves children at risk for physical and mental health issues

The Brain Core Story

- Air Traffic Control
  - Executive Functions such as integrated cognitive, social and emotional skills require strong brain architecture
  - The child's brain acts like a control tower allowing them to pay attention, plan ahead, deal with conflicts and follow rules
  - Strong skills in this area help children regulate the flow of information, prioritize, and find ways to manage stress

The Brain Core Story

- Resilience
  - This is the ability to stay healthy in the presence of severe stress
  - It requires a strong foundation built into the brain architecture and through air traffic control skills
  - When toxic stress experiences outweigh positive supports, negative life outcomes can result
  - Resilience can be built at any stage of life but it is easiest to build in early childhood

Effects of Acute Stress

- Increased Blood Glucose > Excessive insulin secretion, Type 11 Diabetes
- Increased Blood Pressure > Hypertension, coronary heart disease
- Modulation of immune system> Vulnerability to inflammatory diseases, Asthma, Arthritis
- Reduced Motivation for rewarding stimuli > loss of interest, depression
- Vigilance and arousal > Hyperarousal and anxiety disorders
- Consolidation of aversive memories > Preponderance of aversive memories, PTSD