Impact of Trauma on Early Brain Development in Children

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Impact on the Brain of Exposure to violence and chaos

Development,

“Plasticity”,

Interconnection

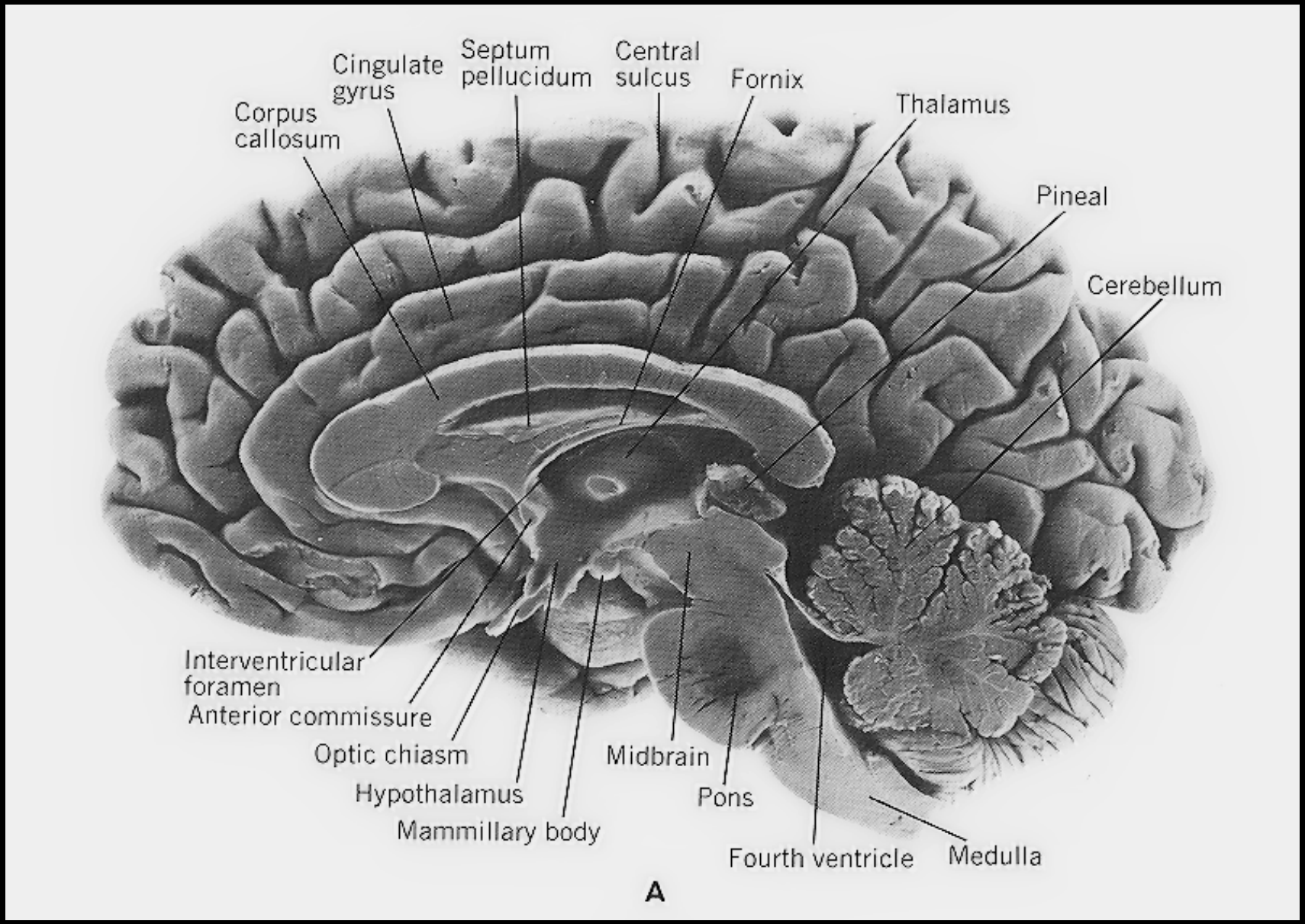
Mutual Influence

Brain Development

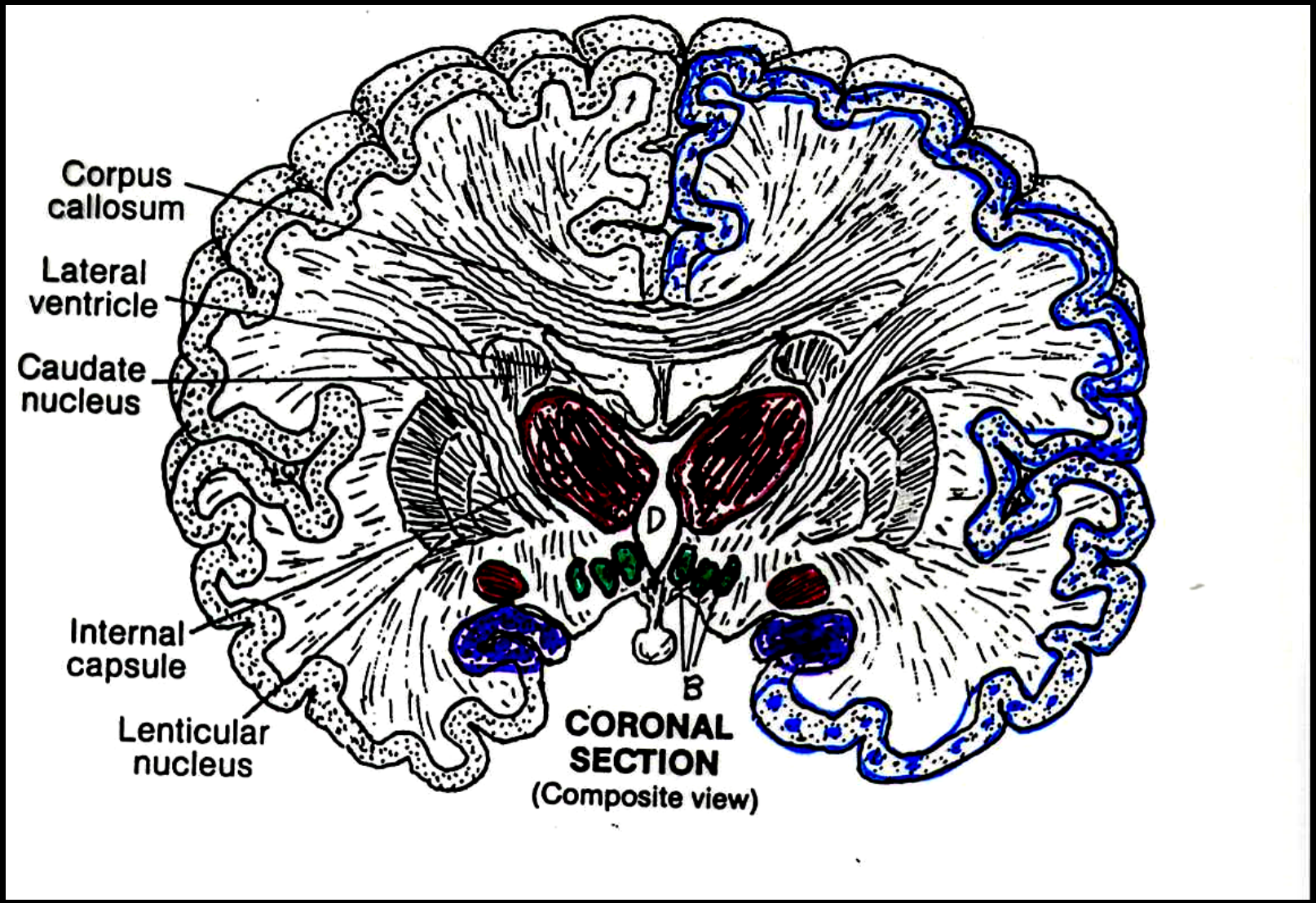
- The brain is always growing
- It is always developing
- It can be “shaped” by experience and stimulation

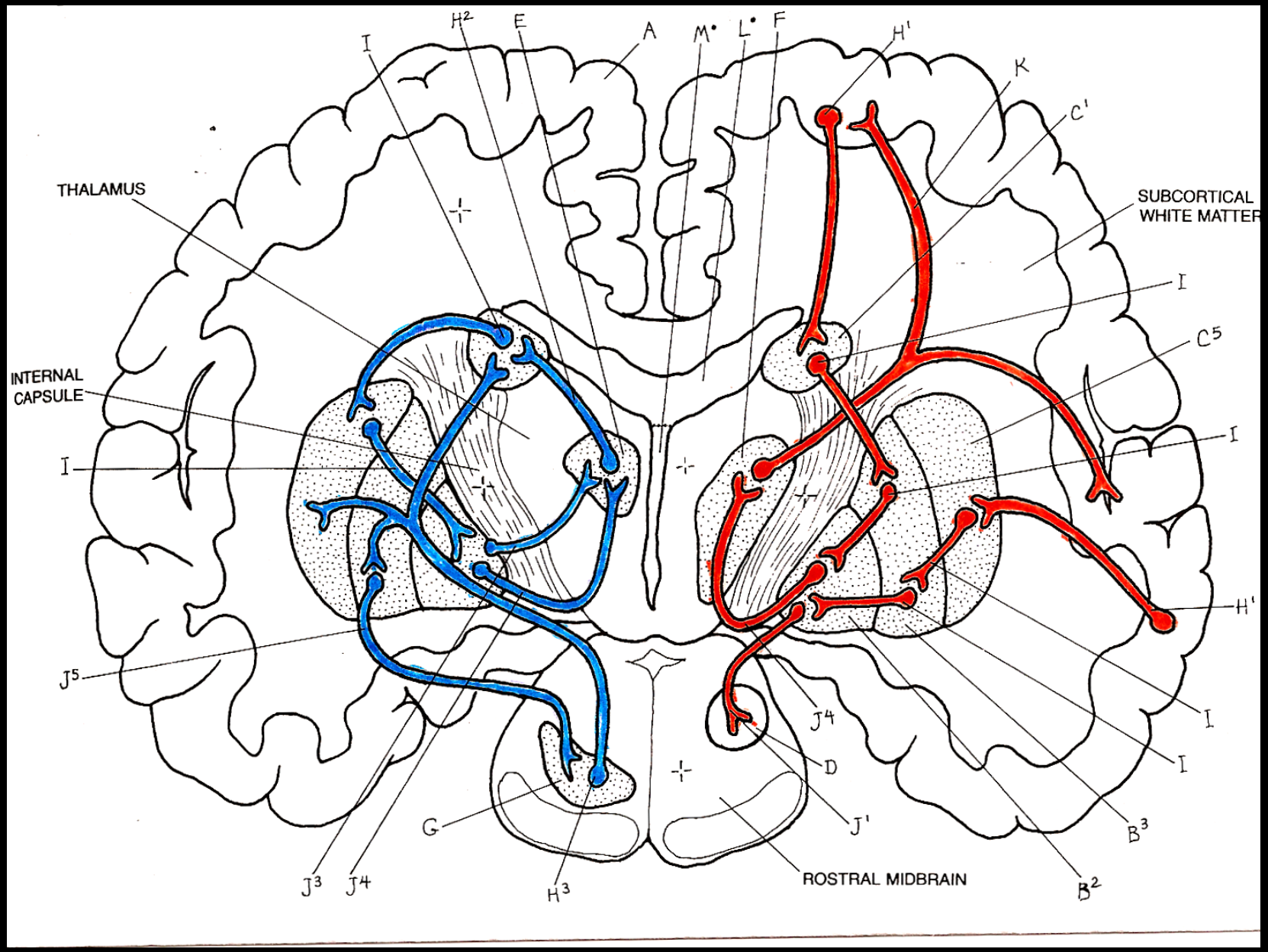
Brain Structure- 3 main levels

- **Cortex** – abstract thought, logic, factual memory, planning, ability to inhibit action
- **Limbic system** – emotional regulation and memories, "value" of emotion
- **Brainstem/midbrain** – autonomic functions (breath, eat, sleep, pain)


Cingulate gyrus
Septum pellucidum
Central sulcus
Fornix
Thalamus
Corpus callosum
Pineal
Cerebellum
Interventricular foramen
Anterior commissure
Optic chiasm
Midbrain
Hypothalamus
Pons
Mammillary body
Fourth ventricle
Medulla

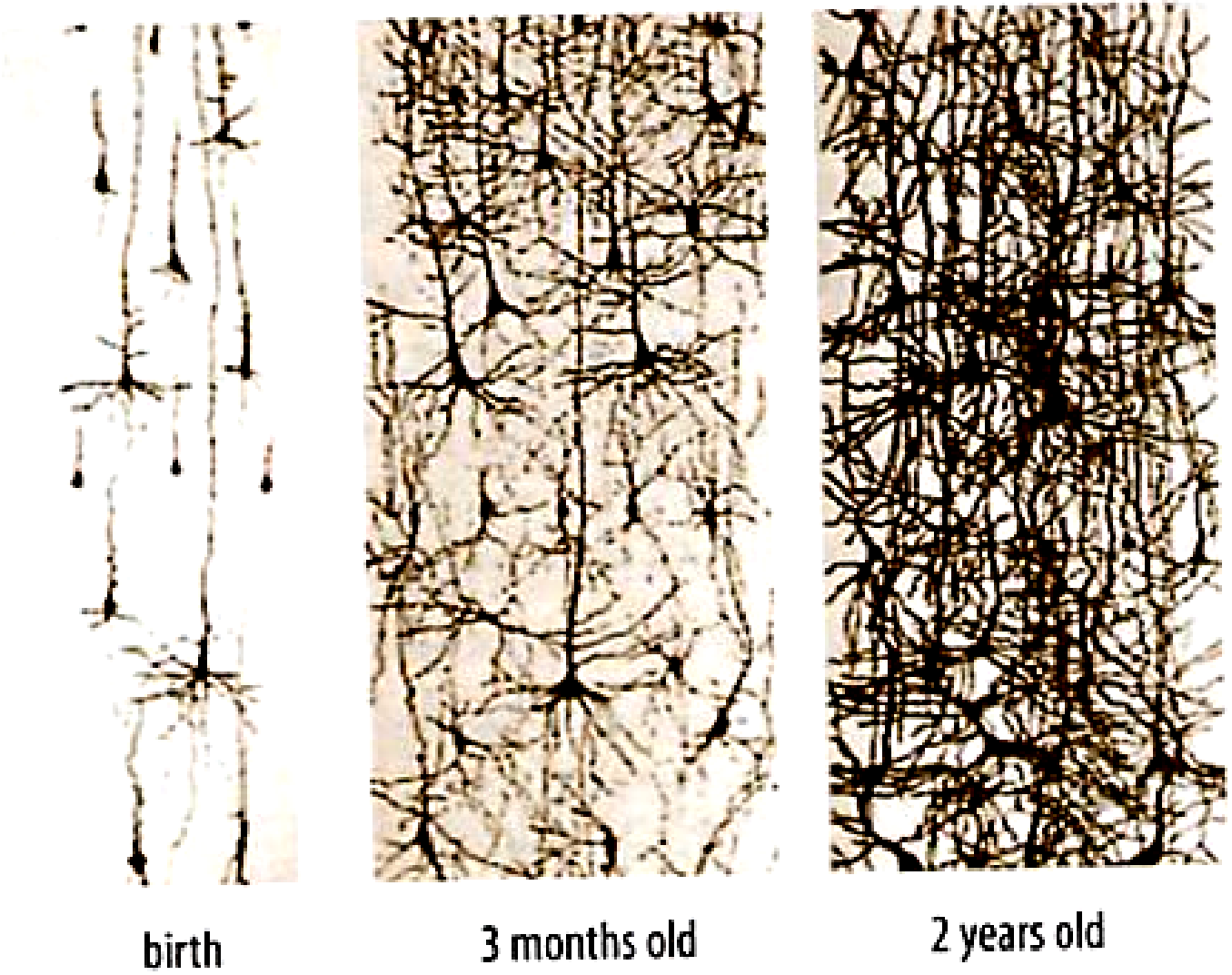
A


Corpus callosum
Lateral ventricle
Caudate nucleus
Internal capsule
Lenticular nucleus
D
B
CORONAL SECTION
(Composite view)


THALAMUS
INTERNAL CAPSULE
SUBCORTICAL WHITE MATTER
ROSTRAL MIDBRAIN
I
H2
E
A
M
L
F
H'
K
C'
C5
J5
J4
J3
H3
G
D
J'
B3
B2

Brain Development

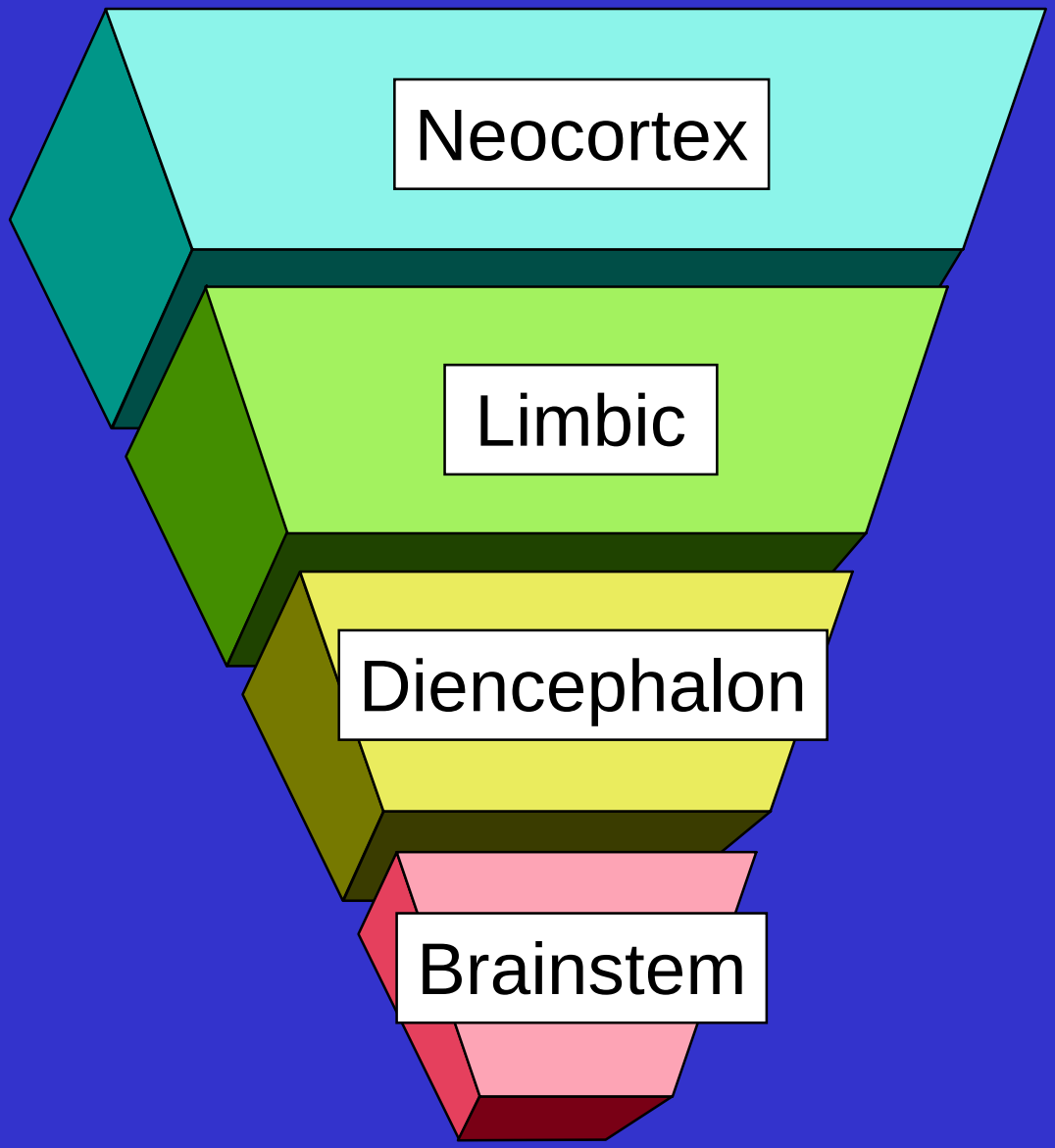
- Prenatal brain has 2-3 times the number of adult neurons
- Maximum numbers neurons are present at birth
- Brain growth (size and weight) over first years of life due to myelination and synaptic connections
- Growth dependent on stimulation and experience



-from Mapping the Mind

Brain Development

- Relatively few synapses present at birth
- Learning requires forming new synapses as well as strengthening and discarding existing synapses
- Early synapses weak – need repeated exposure to strengthen
- Brain adapts to environment – positive or negative



Abstract thought

Concrete Thought

Affiliation

"Attachment"

Sexual Behavior

Emotional Reactivity

Motor Regulation

"Arousal"

Appetite/Satiety

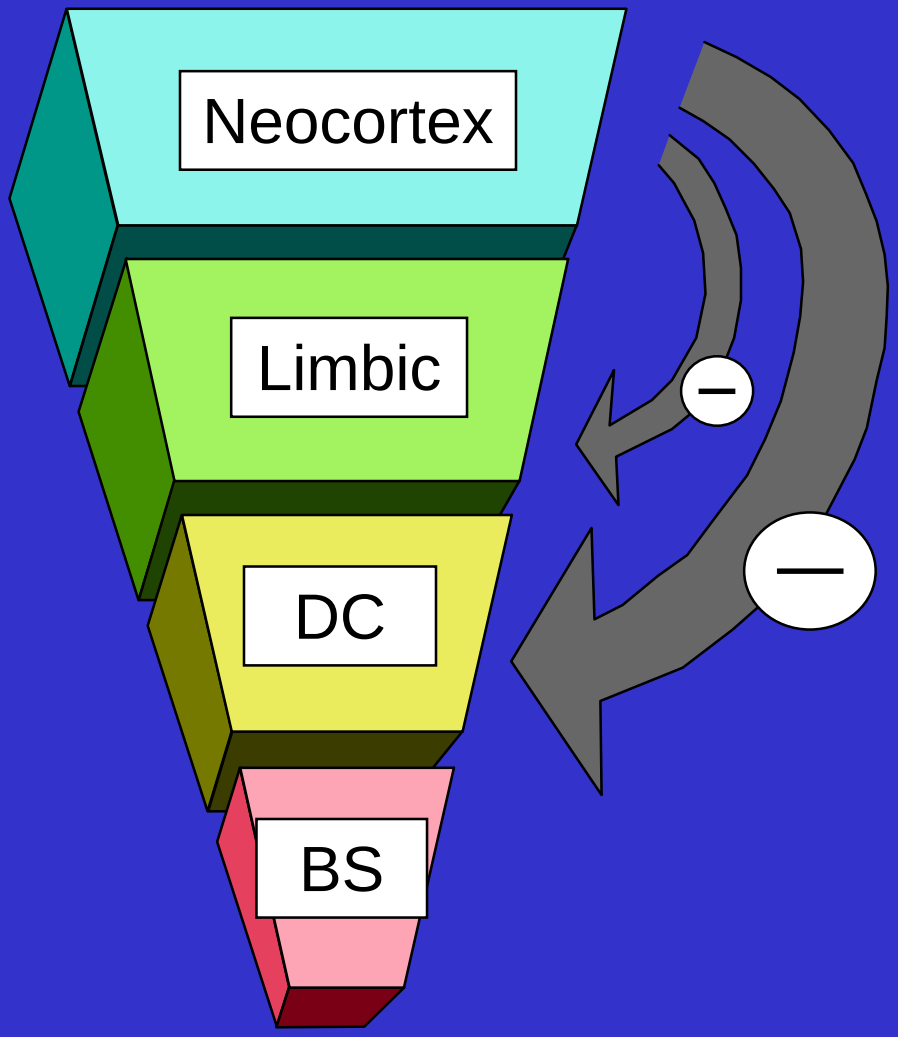
Sleep

Blood Pressure

Heart Rate

Body Temperature

CORTICAL MODULATION



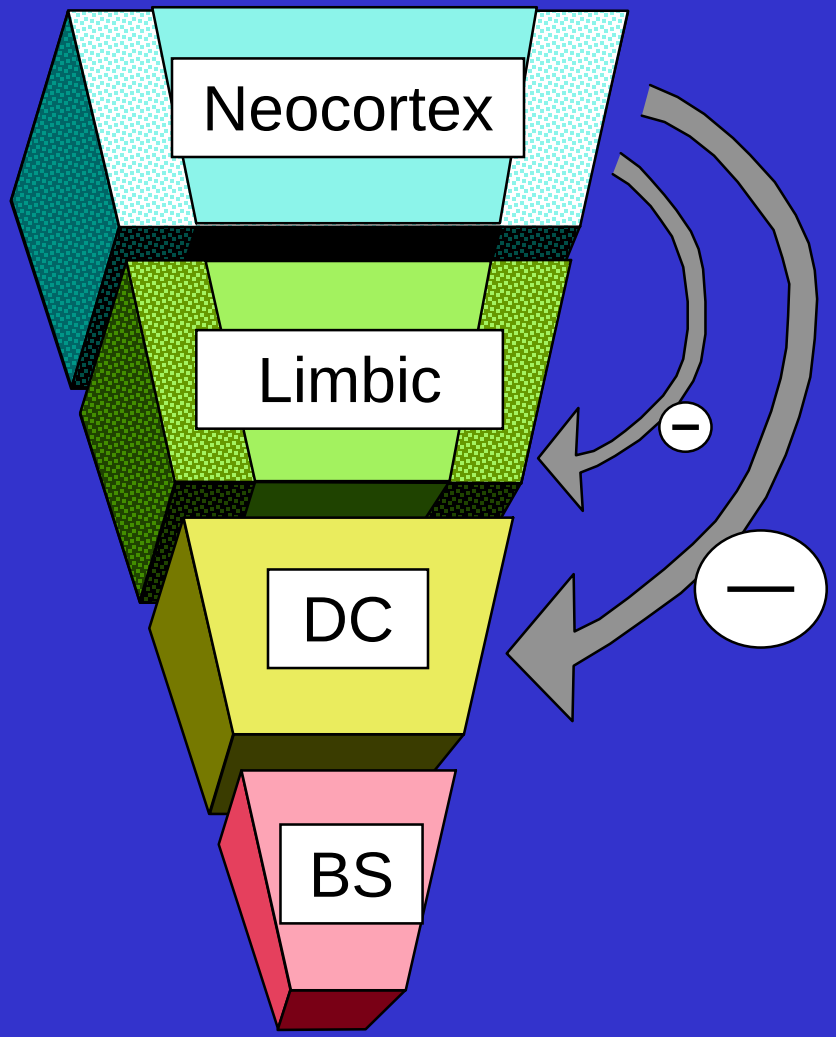
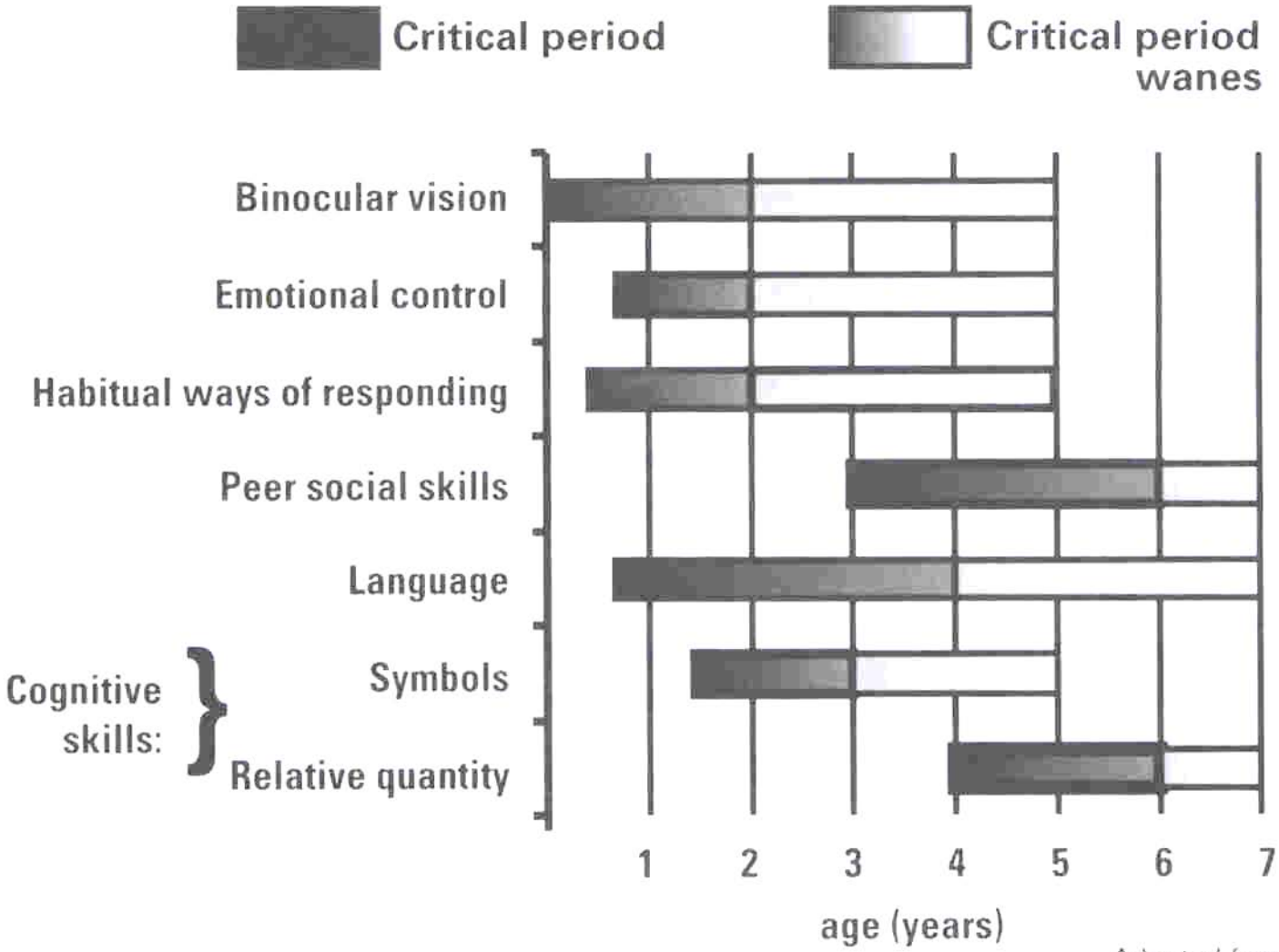
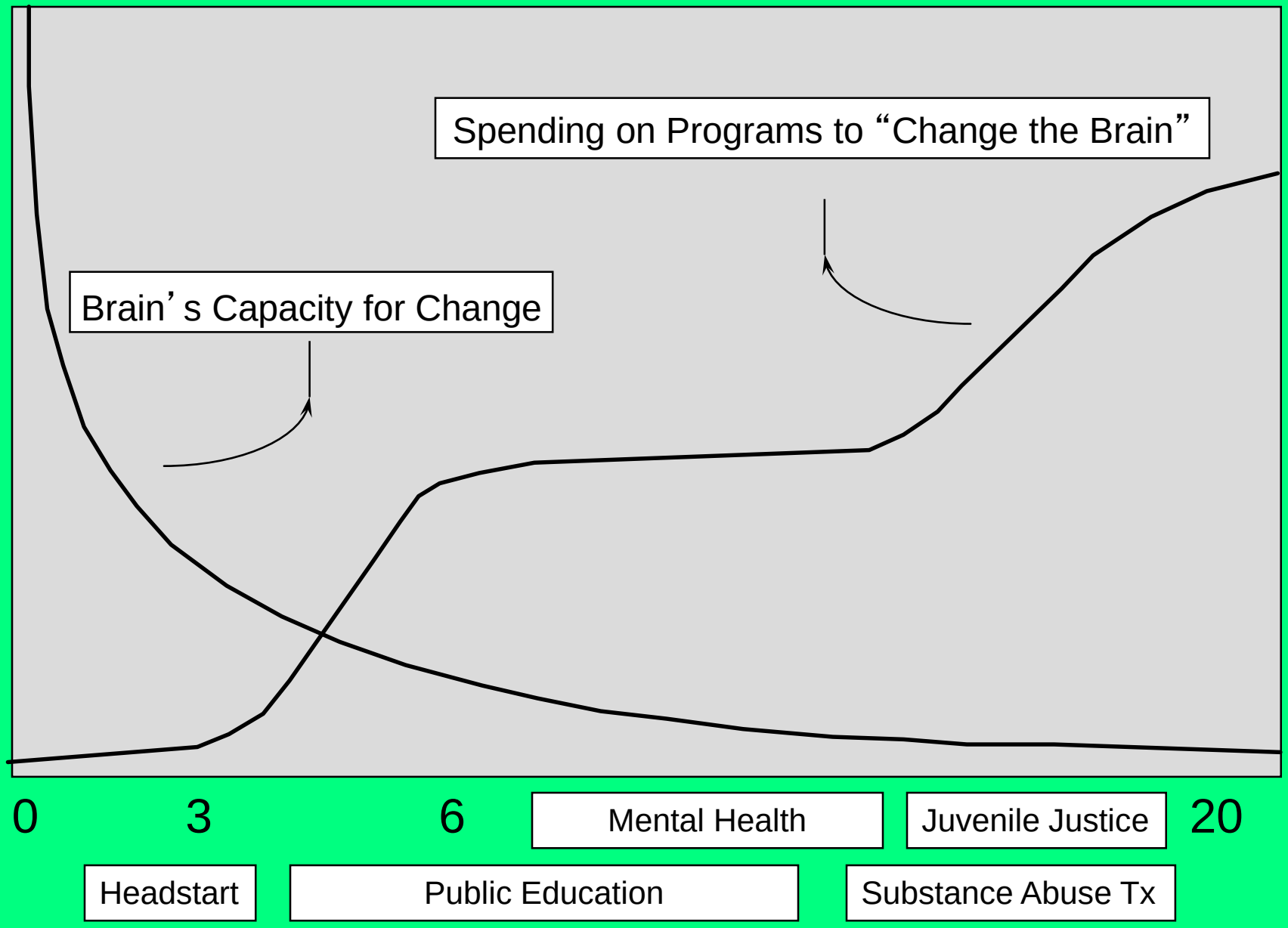


FIGURE 1.2 CRITICAL PERIODS FOR SOME ASPECTS OF BRAIN DEVELOPMENT AND FUNCTION



Adapted from Doherty (1997)


Spending on Programs to “Change the Brain”
Brain’s Capacity for Change
0
3
6
Mental Health
Juvenile Justice
20
Headstart
Public Education
Substance Abuse Tx
Bruce Perry, MD, 2004
Age
www.ChildTrauma.org

Troubles early; troubles late

- The Big Picture
  - Kids at risk of developmental problems remain at risk for a long time. The usual age of identification is 6 or later. The window of opportunity for rapid, significant change is related to brain plasticity. That peak is 0-6; before the age of identification. Attempts to make significant change to people with significant problems much later than 6 are much more difficult.
    - Jeffrey Rowe, MD 2007

Templates

- Humans try to make sense of the world
  - Logic
  - Superstition
  - Scientific method
- Consciously or unconsciously, we come to conclusions about the world
- These conclusions become our “templates”

Types of psychological templates

- Basic trust
- Stranger anxiety
- Attachment
- Gravity (the bowl of Cheerios experiment)
- Separation & individuation

Schemas

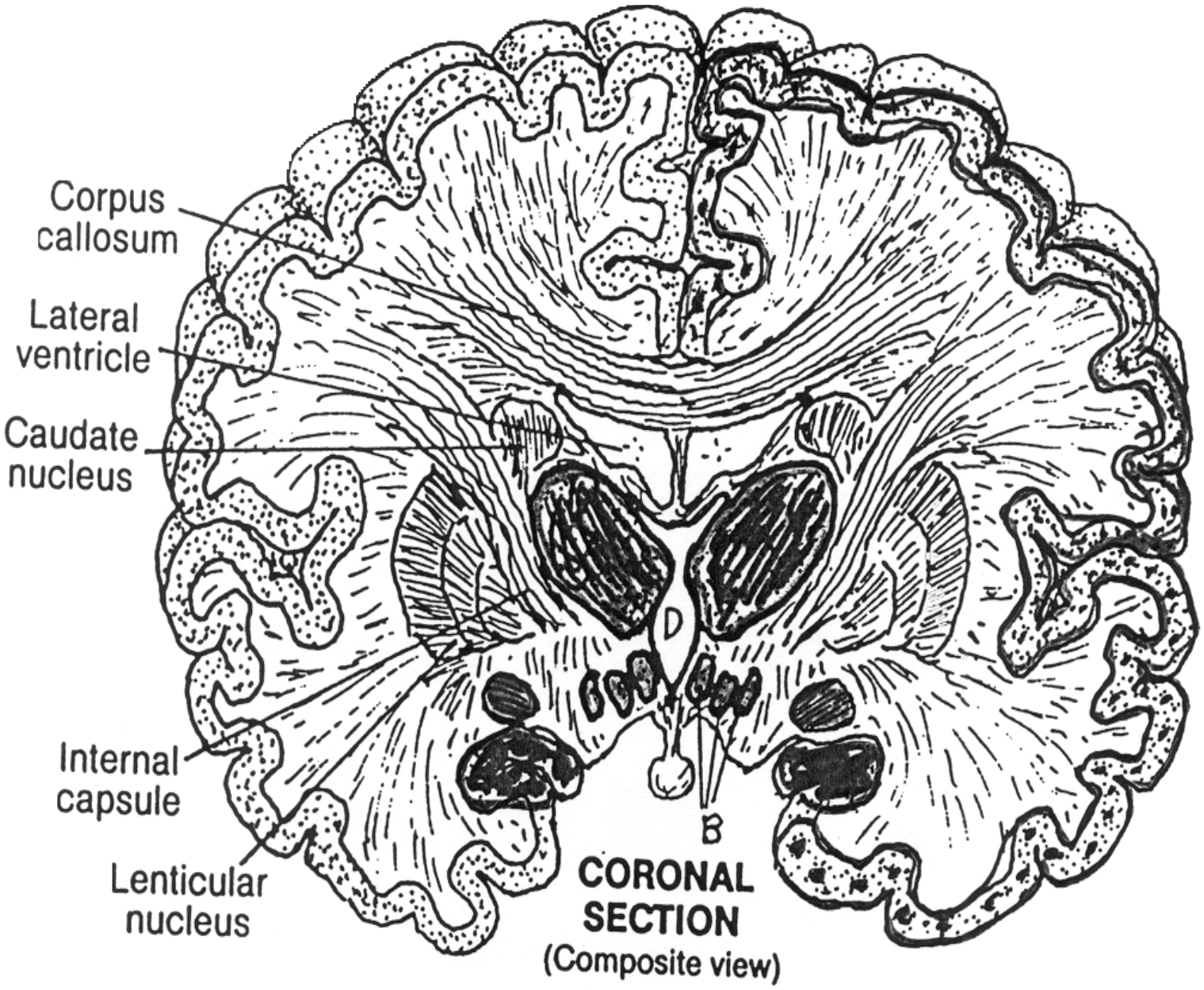
- Time + experience = stronger connections than brand new ones
- Become memories, expectations, “normal” (even if scary)
- Not critically reviewed
- Influence the future meaning of new events or actions

Brain Development/Abuse

- With Excessive or Prolonged Stress…
  - Anxiety/fear response pathways over-developed
  - Focus on survival and response to threats
  - May not activate pathways involved in complex thought
  - Abnormal cortisol secretion seen in abused children (too high, too long)

Brain Development/Abuse

- Fear
  - Chronic activation of fear can impede functioning of the **hippocampus**
  - Interfere in development of subcortical/limbic systems
  - Fear memories are created (hard to change these)


Corpus callosum
Lateral ventricle
Caudate nucleus
Internal capsule
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D
B
CORONAL SECTION
(Composite view)

Fear Conditioning

- Complex adaptational mechanism with psychological, behavioral, and neurobiological components
- Protects the organism from re-exposure to danger
- Encoding, consolidation, and reconsolidation of memory play a big role, difficult to extinguish

Fear Conditioning- more

- Takes place in the amygdala (with projections to hypothalamus and brain stem)
- Includes autonomic, behavioral, and endocrine responses that signal “danger”
- CRH, cortisol, and NE play a role *- significant emotional events - why remembered - fight, choke out*

Stress Emotion Systems

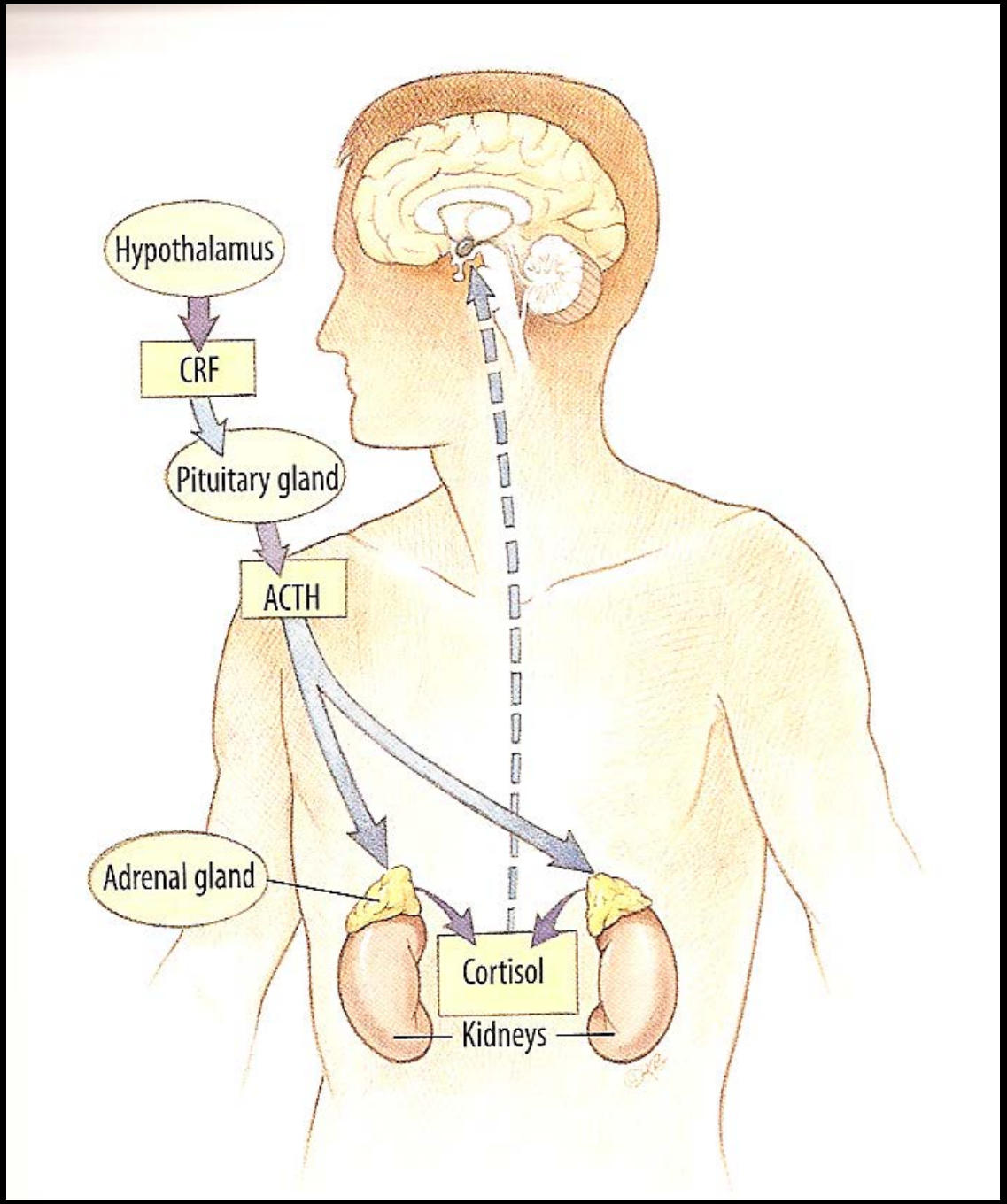
- The multiple, integrated systems that both alert us to danger and prevent “overshoot”
  - HPA
  - Locus Coeruleus
  - SAM (Brain stem and sympathetic NS)

  - Parasympathetic NS
  - Cortical inhibition

Why is a child more vulnerable?

- Immature regulation of alert/alarm systems

- Dependency on caregiver for context and support
  - Lack of physical ability to shield self
  - Lack of emotional resources- defenses, perspective, ability to discriminate novelty from threat
  - Need for child to stay with caregiver even if caregiver is the source of arousal/trauma

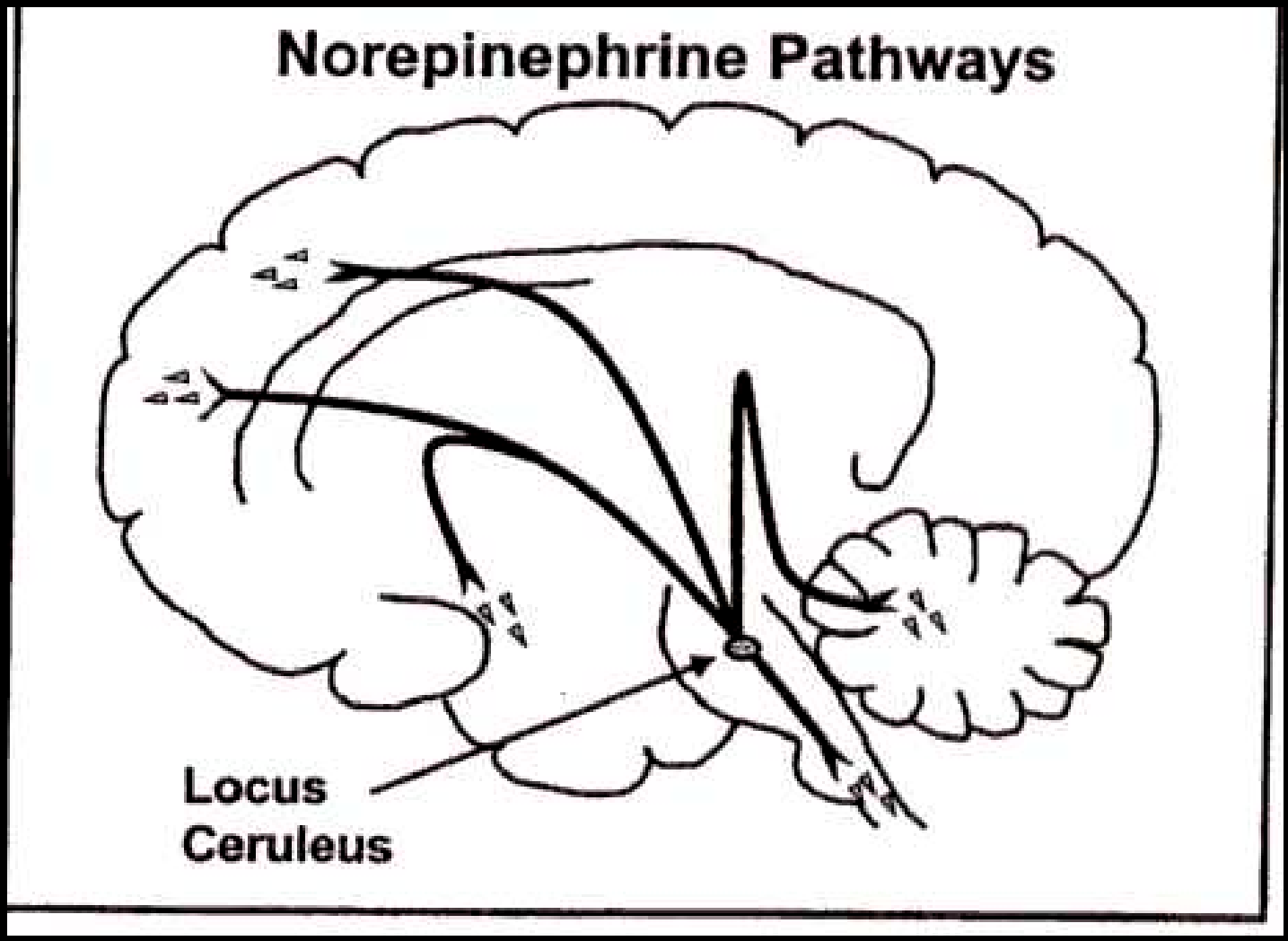


HPA Axis-

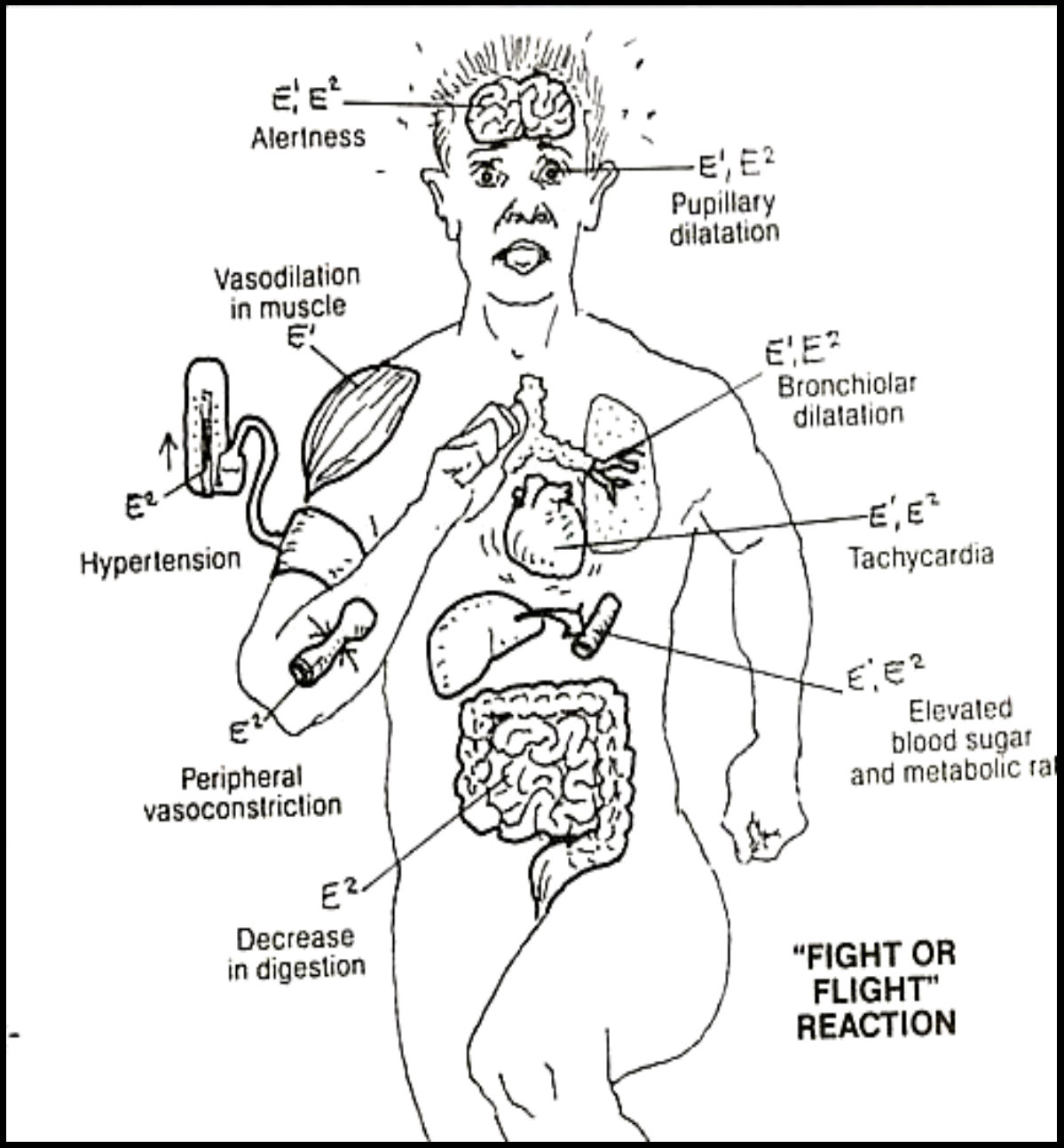
Hypothalamus
Pituitary
Adrenal

+

Hippocampus
Prefrontal
cortex



Locus Coeruleus and
Norepinephrine-
Alert, alarm, and anxiety



The "Freeze, Fight, or Flight" response

NE effects

Glucocorticoid Effects

- Works through regulating gene expression
- Has 4 types of effects- permissive, stimulatory, suppressive, preparatory
- The allostatic load is the dysregulation of cortisol secretion- baseline is too low, stress levels are too high and sustained to long

Frequent or prolonged stress activation

- Impaired brain growth and organization (hippocampus)
- Chronically suppressed immune function
- Lowered threat threshold- easier activation of these systems

Chronic Stress Response

- Chronic fear causes changes in central nervous system neurotransmitters:
  - Interferes with self regulation
  - Interferes with Hippocampus growth and development
  - Interferes with cognitive development
- Bad memories
- Anxiety, moodiness, problems relating to others

Emotional Effects

- Infants (0-1 year)
  - Developmental delay
  - Attachment disorder
  - Failure to thrive
  - Hyperarousal

Emotional Effects

- Toddlers/preschoolers (1-3, then 3-6)
  - PTSD
  - Developmental delay
  - Aggression
  - Attachment disorder
  - Hyperarousal, sleep problems
  - Attention problems

Arousal State Chart

Sense of Time	Extended Future	Days Hours	Hours Minutes	Minutes Seconds	Loss of Sense of Time
Primary *secondary* Brain Areas	**NEOCORTEX** *Subcortex*	**SUBCORTEX** *Limbic*	**LIMBIC** *Midbrain*	**MIDBRAIN** *Brainstem*	**BRAINSTEM** *Autonomic*
Cognition	Abstract	Concrete	Emotional	Reactive	Reflex
Mental State	CALM	AROUSAL	ALARM	FEAR	TERROR

Working with Dysregulated Kids

- "Dysregulation" means the youth is experiencing problems in self-regulation
  - ability to think and be logical
  - ability to calm themselves when aroused
  - ability make sense of physical sensations
  - ability to make good, safe choices for themselves is impaired
    - Stress cannot be handled, prepared for, nor understood
    - Negative emotion will cause the person to act in a way to relieve that feeling (this causes other problems)

How do we prevent the occurrence of this dysregulation?

- **Helping parents** to be better able to care for their kids prenatally and in the first five years
- Identifying **early regulatory disturbances**
- Identifying **dyadic problems**
- Identifying **developmental delays**
- Identification of **high risk groups** (substance abusing parents, DV)
- **Early intervention** while brain plasticity is high

How do we identify and intervene early?

- Home visiting with all first time mothers and high risk mothers (pre- and postnatal)
- Universal developmental screening of kids and their caregivers in the first 5 years (PEDS, ASQ-SE)
- Early interventions- don’t wait for them to “grow out of it”
- Family friendly interventions (inviting, supportive, local)

Lots of efforts already in place

- Home visiting- PHN
- C3
- DEC
- DSEP at PCC
- CCC
- **HDS (Regionally located**
- KidSTART
- Early Start- Reg. Ctr.
- Hope Infant
- Head Start
- FIT Project
- 0-3 Public Schools

What do the kids look like?

- In the first 5 years, trauma and chaos disrupt homeostatic regulation, social relations, growth, and normal development

- The problems will appear in these areas
  - Eating, sleeping, elimination
  - Speech and language
  - Physical growth (height, weight, head circ.)
  - Motor function
  - Social relations
  - Emotional regulation

What kind of interventions can we use on little kids?

- Individual and dyadic treatment
  - Parent Child Interaction Training (PCIT)
  - Parent Child Attunement Training (PCAT)
  - Trauma Focused Cognitive Behavioral Therapy (TF-CBT)
  - Child Parent Psychotherapy (CPP), IPP
  - OT, PT, Speech and Language Therapy
    - Infant Massage
  - Others

What kind of 2nd prevention interventions can we use?

- Preschool
  - Second Step
  - Incredible Years
  - Triple P

Prevention in elementary school?

- Second Step
- Positive Behavioral Supports (PBS)
- Peacebuilders
- Learning Disability Supports
  - Lindamood-Bell Reading Programs
- Treatment of mental health problems (get it while it is small)
- Nutrition, exercise, problem solving skills
- Mentors

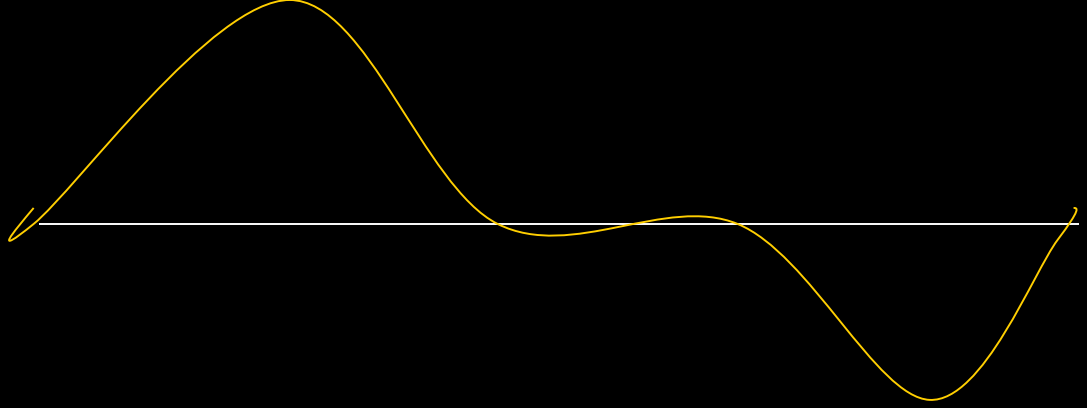
The End

Thank you for participating in this webinar

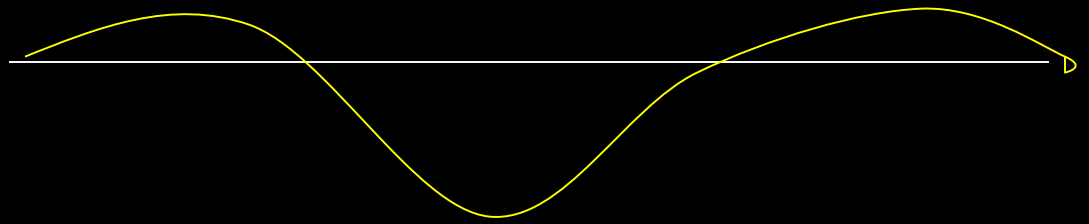
Our Toughest Challenges…

- Angry, aggressive, irritable mood
- Impulsive, hyperactive
- Bored, rarely calm, rarely “feel good”
- Poor social skills, not popular
- Poor hygiene, poor manners
- Narcissistic, grandiose or boastful
- Oppositional, won’t take advise
- Sexually advanced or inappropriate
- Poor sleep, appetite
- Occasionally, briefly psychotic
- Boy or girl!

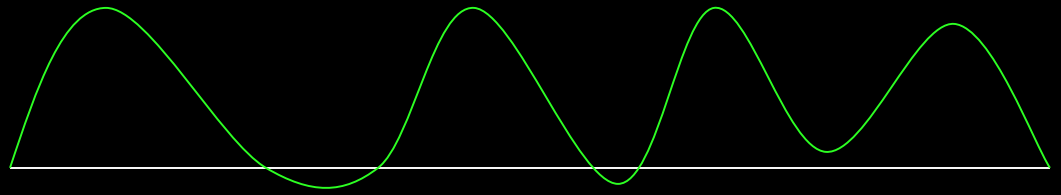
Bipolar I



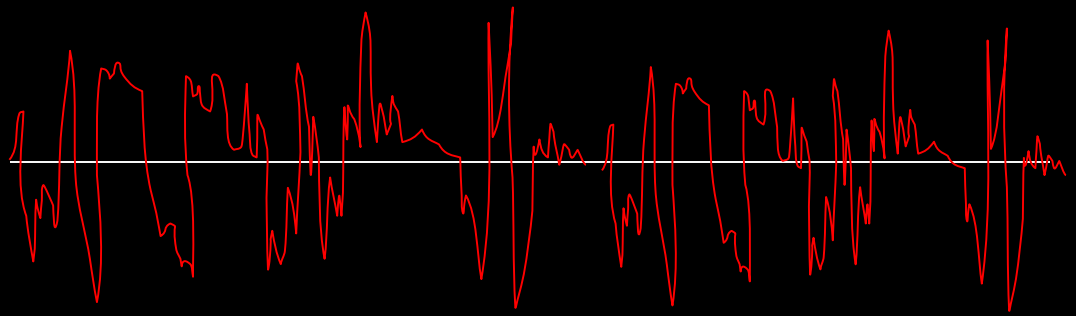
Bipolar II



Rapid Cycling Bipolar



Acquired Mood Disorder

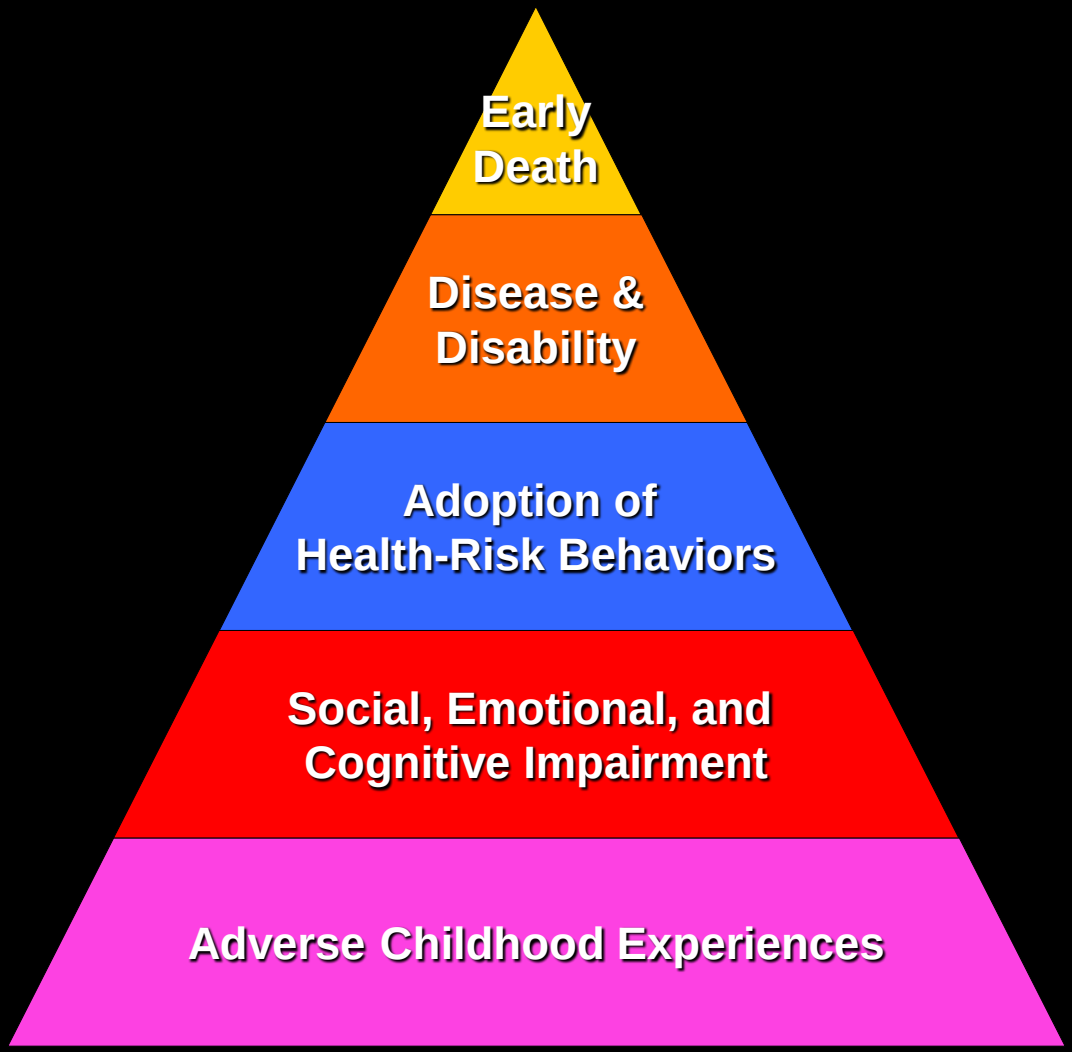


Dysregulated Youth - Behaviors to reduce negative arousal

- Talk with trusted friend
- Exercise
- Yoga, meditation
- Massage
- Read book
- Breathing techniques
- Sleep
- Distract self

- Eat too much
- Watch TV too much
- Play videogames
- Drink alcohol, do drugs, smoke cigarettes
- Act aggressively
- Act out sexually
- Avoid confrontation

Adverse Childhood Experiences Influence To Adult Health Status



Felitti, Vincent J., MD & Anda, Robert F., MD, MS; ACE Study

What are Adverse Childhood Experiences (ACEs)?

- Recurrent physical abuse;
- Recurrent emotional abuse;
- Sexual abuse;
- Alcohol or drug abuser in household;
- Incarcerated household member;
- Family member who is emotionally ill (chronic depression, suicidal, institutionalized);
- Mother treated violently;
- No or one biological parent; and
- Emotional or physical neglect.

So bad early care and exposure to trauma lead to…

- Bad schemas
- Dysregulation and negative internal arousal
- Attempts to relieve arousal
- Secondary problems due to the attempts (ACE study)

Repairing a broken person

So bad early care and exposure to trauma lead to…

- Bad schemas
- Dysregulation and negative internal arousal
- Attempts to relieve arousal
- Secondary problems due to the attempts (ACE study)

Context for Interventions

- Meaningful interpersonal relationship
- Ongoing
- Caring, supportive
- Recognizes the strengths, abilities, and qualities of the person
- May take several “doses” to establish new schemas, new allostasis

Designing the treatment for AMD: Principles

- More areas disturbed= need for more intense and more layers of intervention
- Focused; clear understanding of problem necessary
- Meaningful interpersonal relationship
- Rhythmic, repetative

Treatments- intensity of treatment

Least intense

Most intense

Single
Time limited
(5-20 sessions)

Low frequency

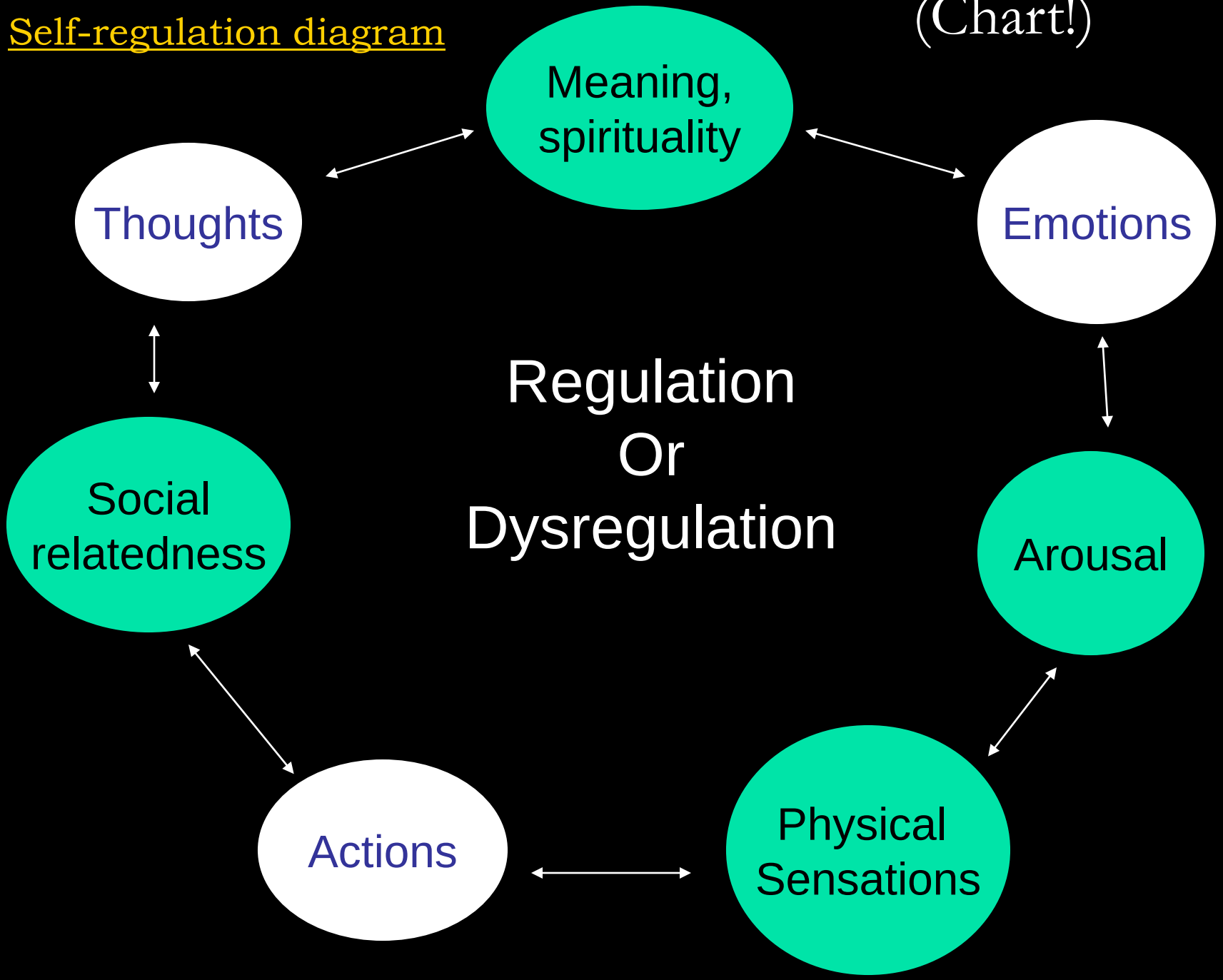
Examples:

Multiple
Layered
Longer duration
(years)
High frequency

Examples:

Self-regulation diagram

(Chart!)



Arousal 1

- Must be dealt with first or other treatments can't be utilized well
- Excessive arousal
  - Blow off steam
    - Exercise program
    - Making music, drum circle
  - Cool down
    - Meditation
    - Journaling
    - Bath
    - Gardening

Arousal 2

- Under-arousal
  - Pleasant stimulation
    - Massage, facial, acupuncture (a somatic stimulation)
    - Music, fan, tapes (auditory stimulation)
    - Cooking class, gardening, aroma therapy (gustatory/olfactory stimulation)
    - Dance, tai chi (motor activity)

Help them develop a language

- Old self story--> New story
- Move from unlabeled emotions and sensations to a cognitive understanding
- Cognitive understanding --> new story and schemas
- Talking about this stuff allows mastery over it
- Drawing can be another way to get to talking

Types of interventions likely to help traumatized kids

- **Cognitive**: TF-CBT, SITCAP-ART, EMDR, DBT
- **Arousal focused**: running program, physical training, dance, martial arts
- **Physical sensation**: massage, music, guided imagery
- **Actions/activities/experiences**: Practicing correct behavior, grieving losses, forgiving others, job skills
- **Meaning/spirituality**: meditation, religious study, seeking purpose, sweat log, new self identity
- **Social relations**: Peacebuilders, small groups
- **Emotion related**: identification of, challenge tests, psychodrama

Trauma focused therapies

- Teach them about “it”
- Prepare for “it”
- Focus/become aware of “it”
- Release “it”
- Have a measure of control over “it”
- Develop new thoughts, understandings, and ways to care for “it”

Physical sensations

- Relieve pain
- Educate about pain and discomfort
- Teach hygiene
  - Skin, teeth, hair
- Stimulate the senses pleasantly and soothingly (not as a reward, but as a way to teach- regular and repetitive)
- Introduce new sensations (smells, tactile)

Emotions

- Teach connection between thoughts, emotions, and actions
  - Emotions are temporary and changeable
- Label emotions
- Modulation techniques
  - Guided imagery, relaxation, substitution
- Role of communication in describing feeling states, sharing feelings, listening and being listened to as a way to manage difficult feelings

Cognitions

- Teach connection between thoughts, feelings, and actions
- Develop methods of expression of internal thoughts
  - Talking, poetry, journal, video, music
- Correct distortions
- Help understand old story, write new one

Meaning/spirituality

- Introduce concepts of meaning, morality, purpose
- Ask about personal ethics and morals, religious beliefs
- Help them develop a “purposeful life” in conjunction with above
- Associate the “purposeful life” with concrete actions

Actions/Purposeful experiences

- The experience of…
  - Being listened to
  - Forgiving others
  - Exposure therapy
  - Required helpfulness
  - Taking responsibility for actions

Taking responsibility

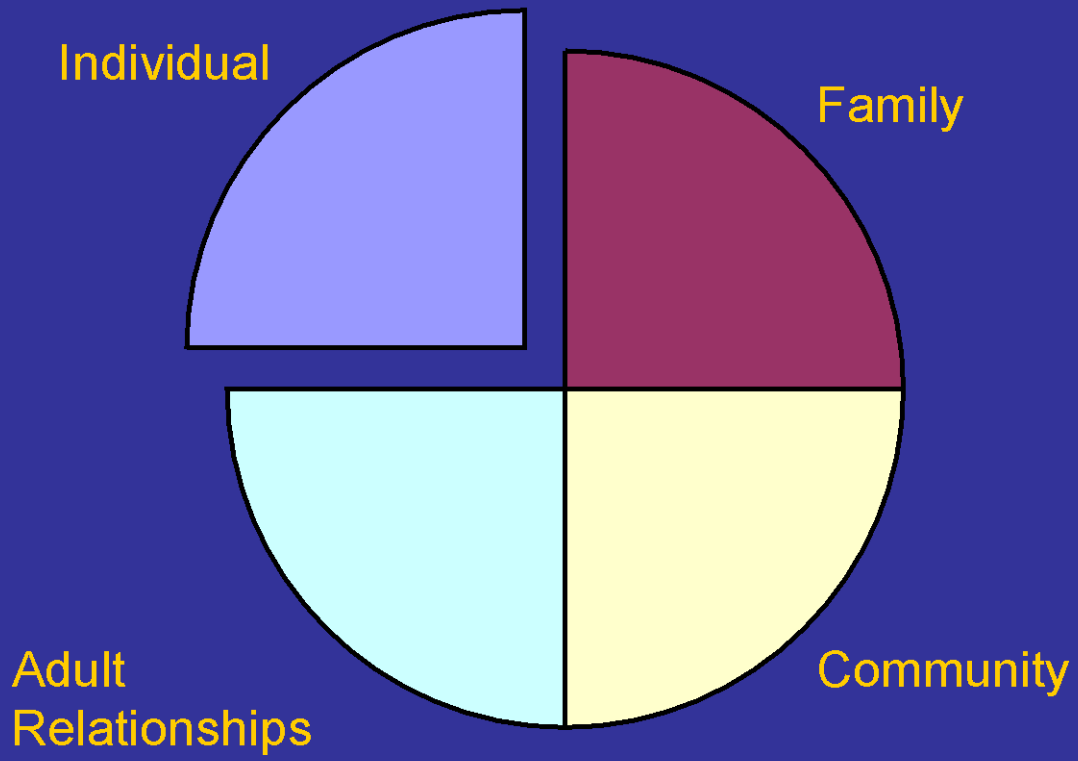
- Confession and religion
- Admission of guilt, public forgiveness
- AA and the 4th, 8th, 9th, and 10th steps

The experience of forgiving others

- The forgiveness project
  - Seligman
  - Zapolsky
  - Baumeister
    - The “Magnitude Gap”
  - Truth and Reconciliation Councils
  - Tariq Khamisa Foundation
    - Azim Khamisa and Plez Felix

Social Relations

- Education about humans and interpersonal interaction- teach the “rules”
  - Families, groups, teams
  - Friendship, romantic, parent-child, boss-employee
- Develop OVERT plan to recognize and reward pro-social behavior
- Required helpfulness, community project
- Practice group interaction- start small and work up


Individual
Family
Adult
Relationships
Community