Brain Injury, Development, and Juvenile Justice: Recommendations for Success

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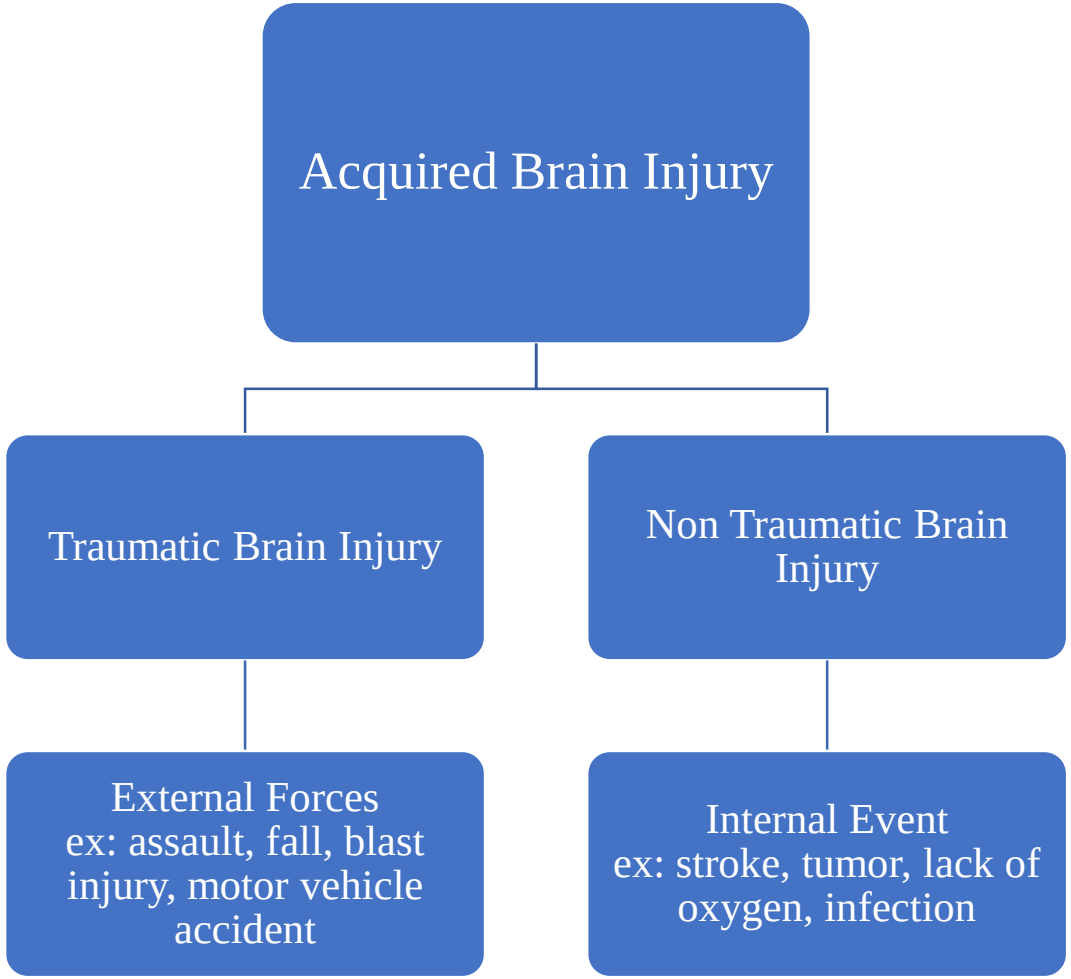
Presented to the Age of Delinquency Task Force (Colorado Commission on Criminal and Juvenile Justice)


Acquired Brain Injury
Traumatic Brain Injury
Non Traumatic Brain Injury
External Forces
ex: assault, fall, blast injury, motor vehicle accident
Internal Event
ex: stroke, tumor, lack of oxygen, infection

Classification of Severity

Mild – **Loss of consciousness 0-30 minutes (Concussion)**

Moderate – **Loss of consciousness 30 minutes to 24hrs**

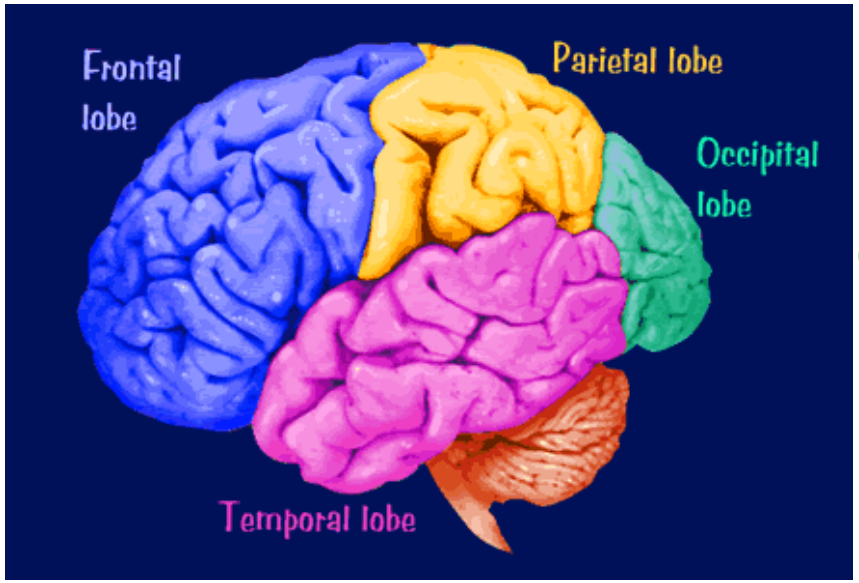
Severe – **Loss of consciousness for over 24 hours**

Brain Anatomy and Brain Development

Simplified Brain Behavior Relationships

Frontal Lobe

- Initiation
- Problem solving
- Judgment
- Inhibition of behavior
- Planning/anticipation
- Self-monitoring
- Motor planning
- Personality/emotions
- Awareness of abilities/limitations
- Organization
- Attention/concentration
- Mental flexibility
- Speaking (expressive language)



Parietal Lobe

- Sense of touch
- Differentiation: size, shape, color
- Spatial perception
- Visual perception

Occipital Lobe

- Vision

Cerebellum

- Balance
- Coordination
- Skilled motor activity

Temporal Lobe

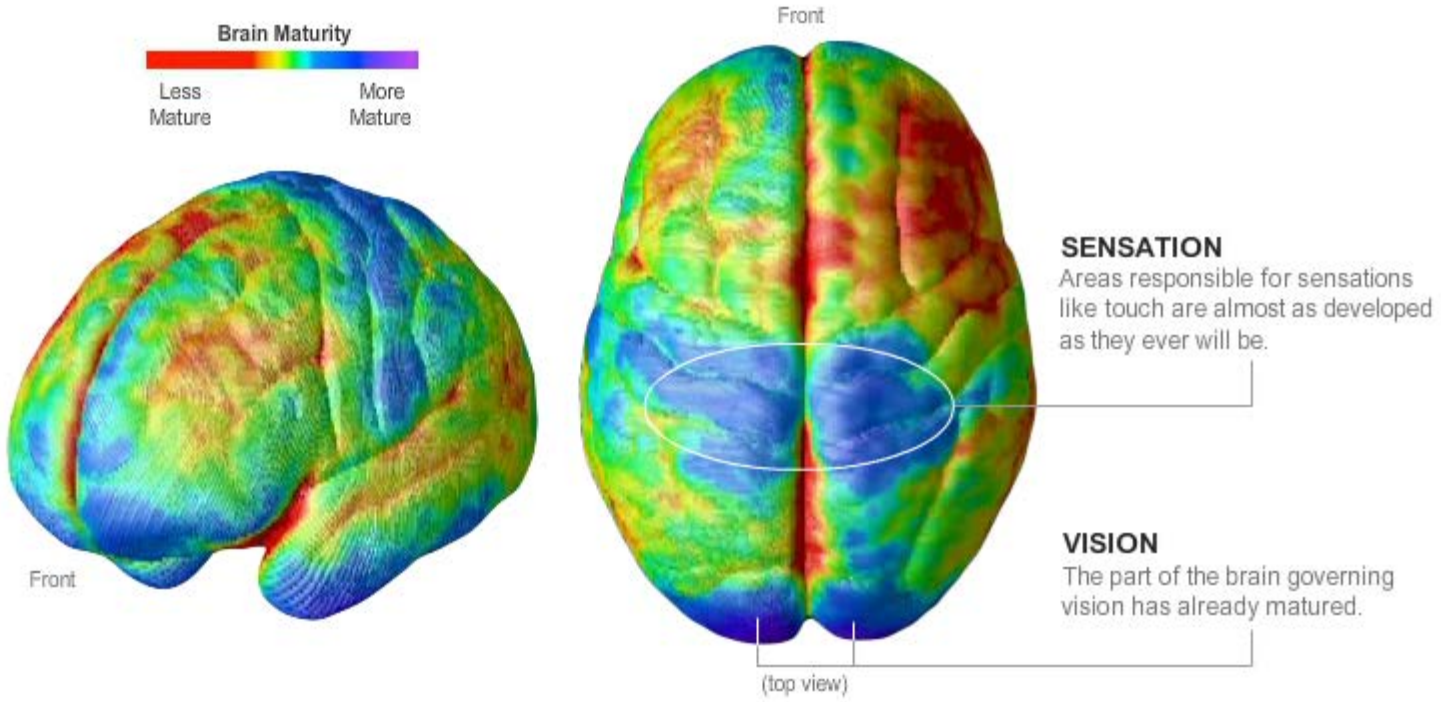
- Memory
- Hearing
- Understanding language (receptive language)
- Organization and sequencing

Brain Stem

- Breathing
- Heart rate
- Arousal/consciousness
- Sleep/wake functions
- Attention/concentration

EARLY DEVELOPMENT

In the first few years of life, areas of the brain devoted to basic function change at a rapid pace. By age 4, primary senses and basic motor skills are almost fully developed. The child can walk, hold a crayon and feed himself.



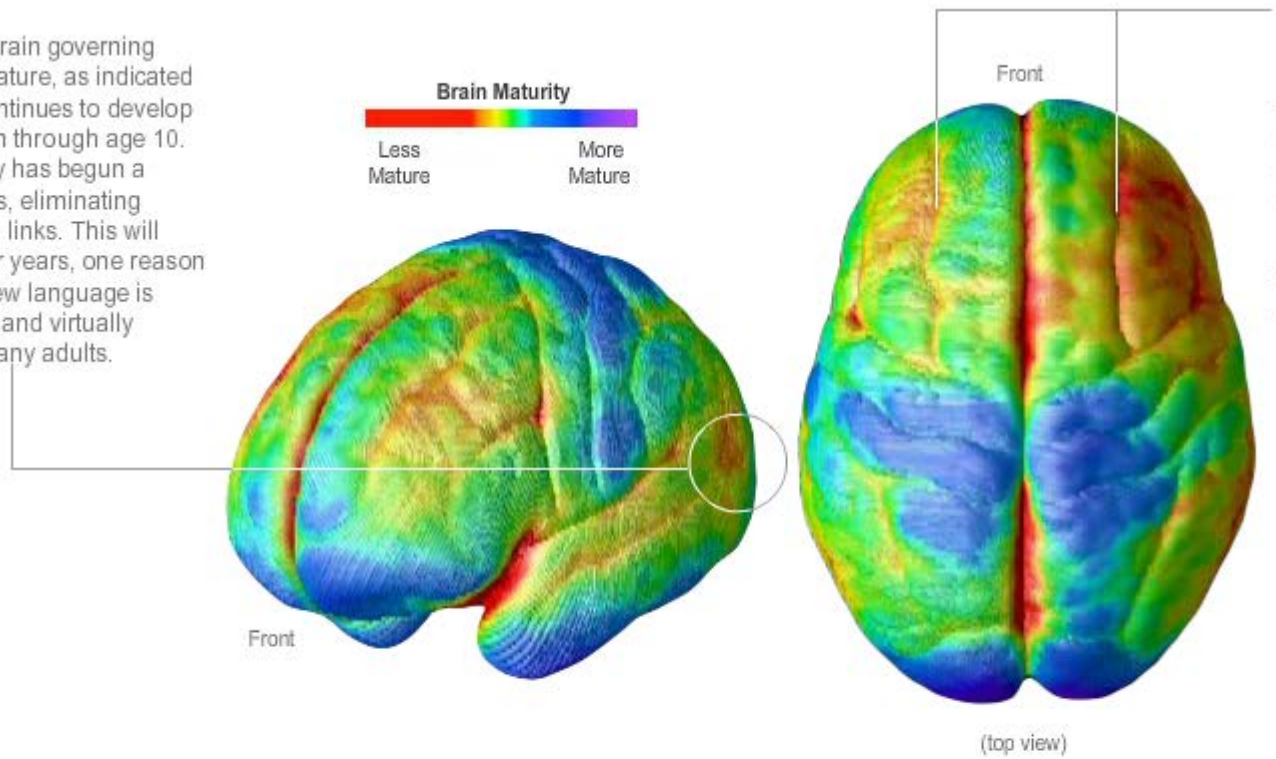
4 years old

Birth | Age 4 | Age 9 | Age 15 | Age 21

Go to Age 6

LANGUAGE

The area of the brain governing language is immature, as indicated in orange, but continues to develop rapidly in children through age 10. The brain already has begun a "pruning" process, eliminating redundant neural links. This will accelerate in later years, one reason why learning a new language is easy for children and virtually impossible for many adults.



REASON

The dappled yellow and red areas of the prefrontal cortex indicate that this part of the brain, which affects abstract thinking, reasoning skills and emotional maturity, has yet to develop. This lack of maturity is one reason young children can't juggle a lot of information and throw tantrums when presented with too many choices.

6 years old

Birth | Age 4 | Age 9 | Age 15 | Age 21

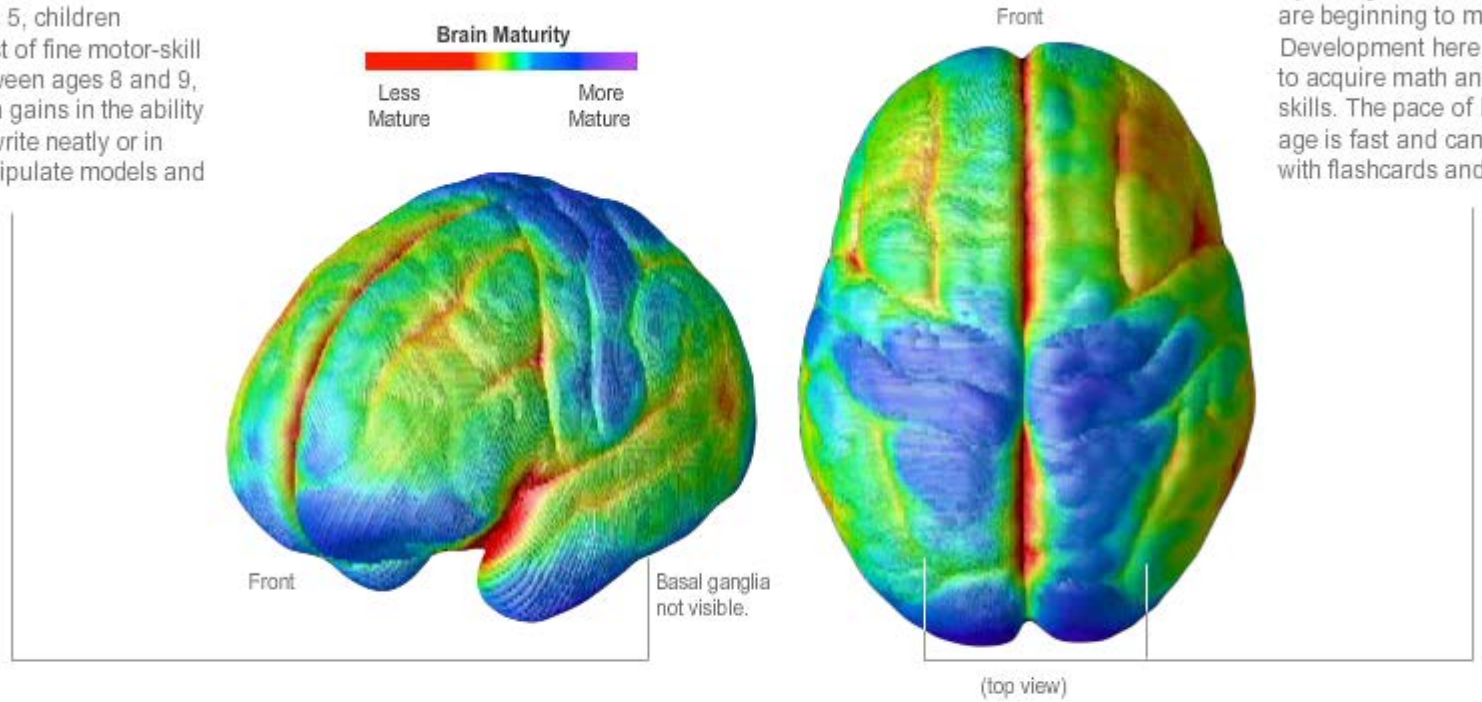
Go to Age 9

FINE MOTOR SKILLS

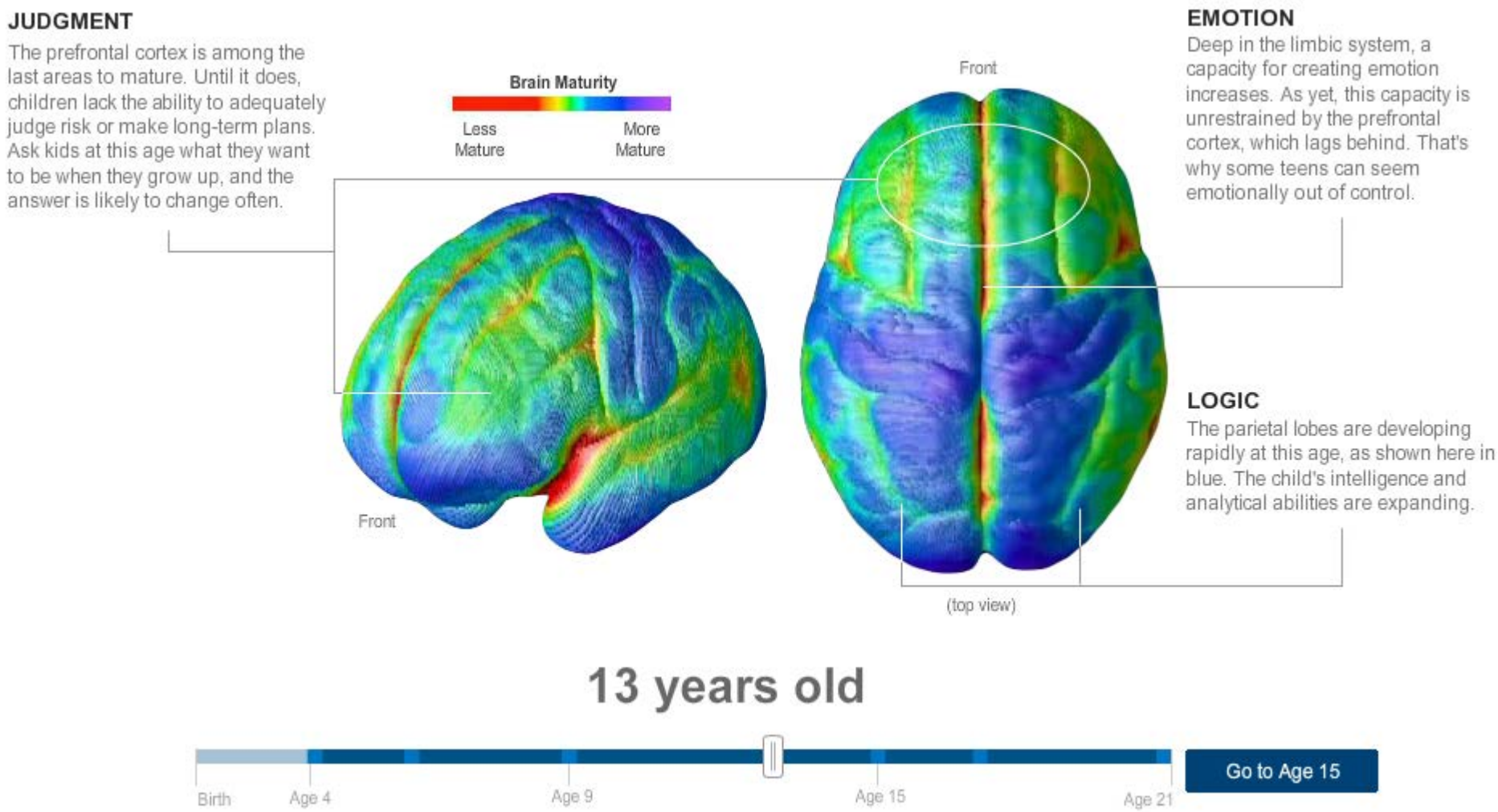
While basic motor skills are well developed by age 5, children experience a burst of fine motor-skill development between ages 8 and 9, helping to explain gains in the ability to use scissors, write neatly or in cursive, and manipulate models and craft projects.

MATHEMATICS

By the age of 9, the parietal lobes are beginning to mature. Development here allows children to acquire math and geometry skills. The pace of learning at this age is fast and can be enhanced with flashcards and math drills.

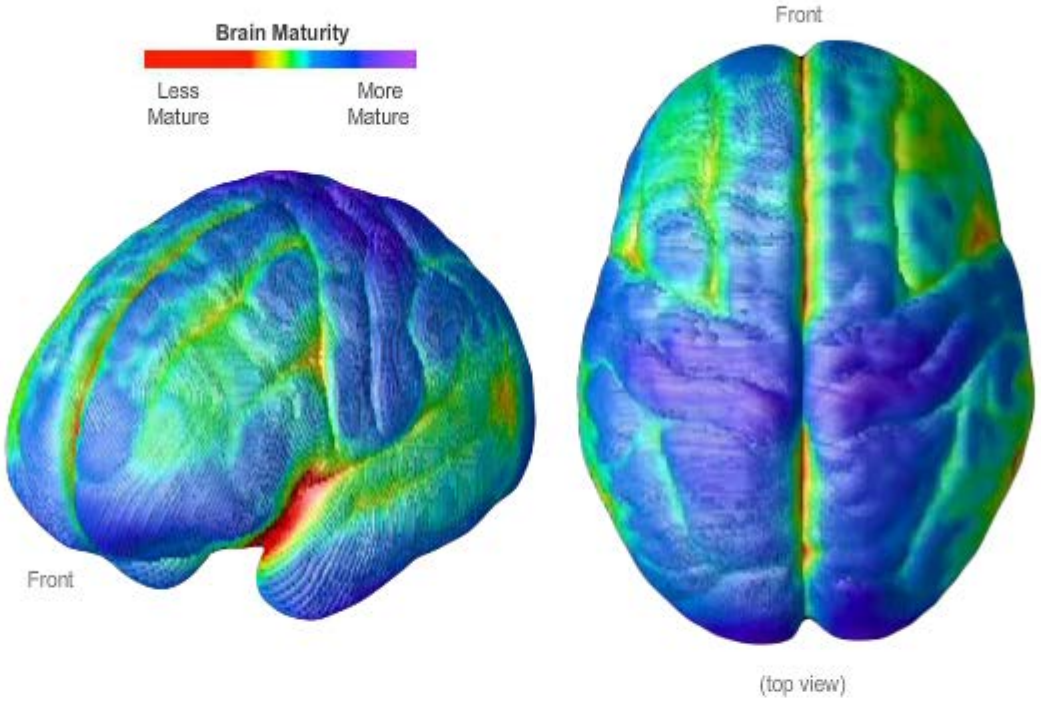


9 years old


JUDGMENT
The prefrontal cortex is among the last areas to mature. Until it does, children lack the ability to adequately judge risk or make long-term plans. Ask kids at this age what they want to be when they grow up, and the answer is likely to change often.
Brain Maturity
Less Mature
More Mature
Front
Front
(top view)
EMOTION
Deep in the limbic system, a capacity for creating emotion increases. As yet, this capacity is unrestrained by the prefrontal cortex, which lags behind. That's why some teens can seem emotionally out of control.
LOGIC
The parietal lobes are developing rapidly at this age, as shown here in blue. The child's intelligence and analytical abilities are expanding.
13 years old
Birth
Age 4
Age 9
Age 15
Age 21
Go to Age 15

SPECIALIZATION

In the teen years, an abundance of neural links continue to be discarded. Underused connections will die to help more active connections thrive. As a result, the child's brain will become more specialized and efficient.



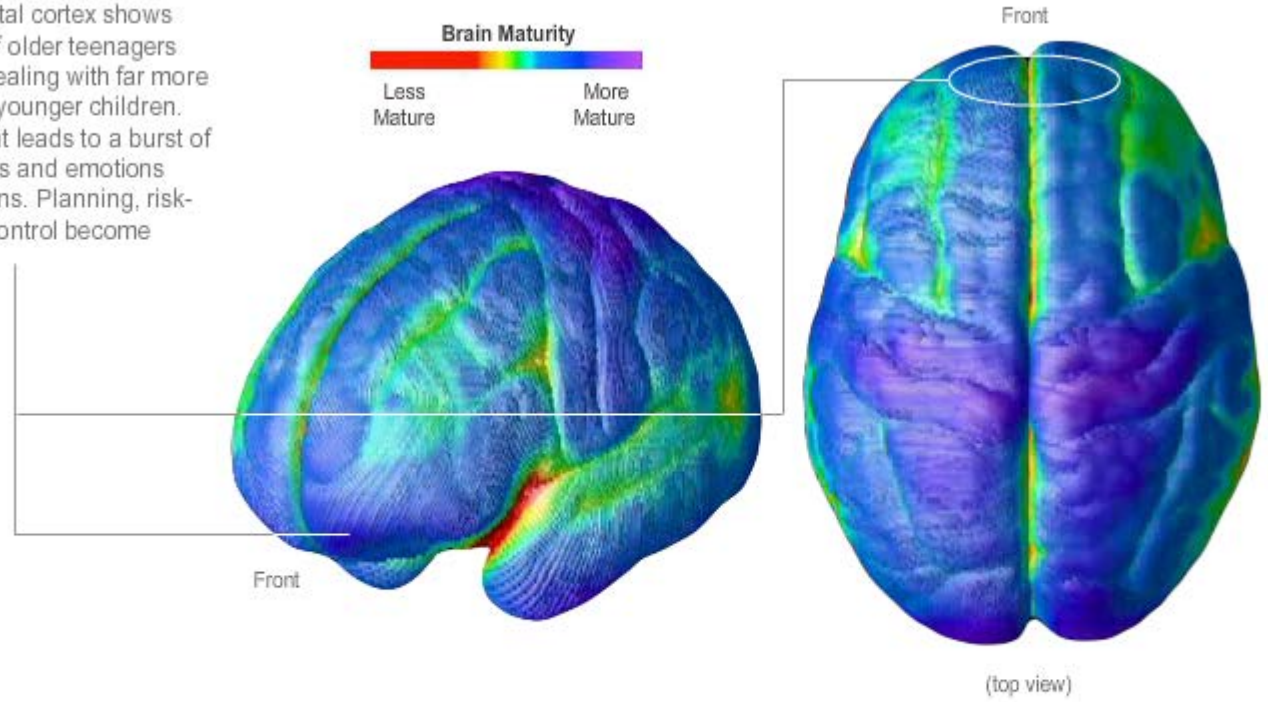
15 years old

Birth | Age 4 | Age 9 | Age 15 | Age 21

Go to Age 17

ABSTRACT THOUGHT

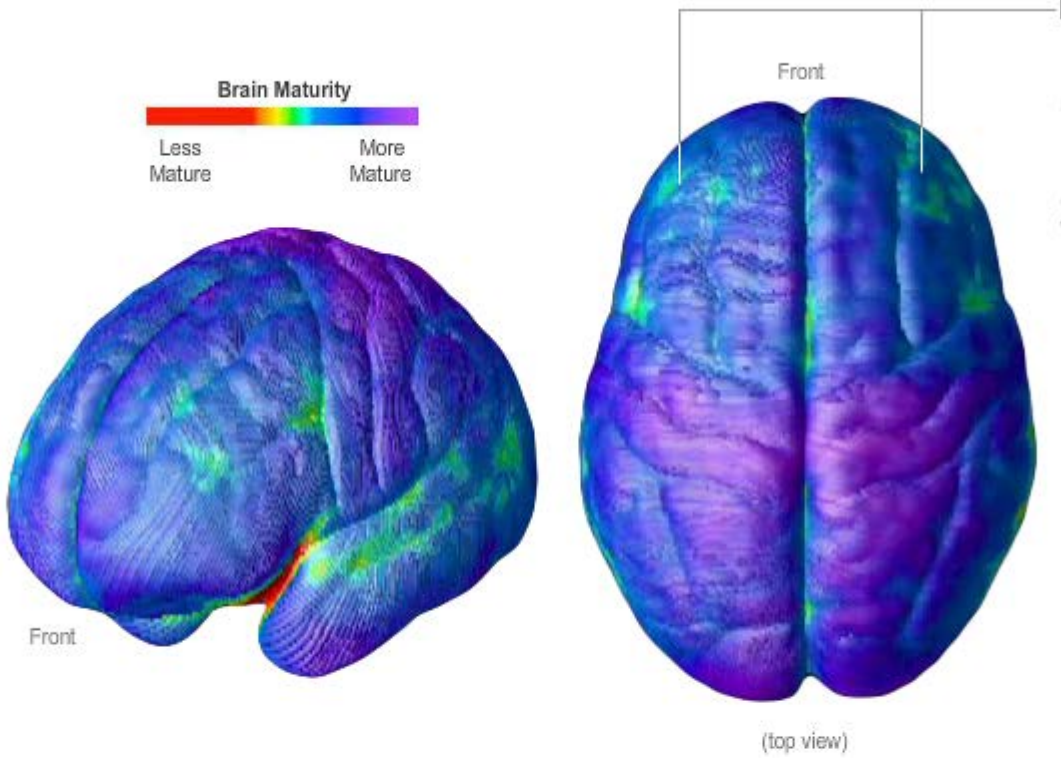
The deep blue and purple of the maturing prefrontal cortex shows why the brains of older teenagers are capable of dealing with far more complexity than younger children. This development leads to a burst of social interactions and emotions among older teens. Planning, risk-taking and self-control become possible.



17 years old

EXECUTIVE FUNCTIONS

Although the brain appeared to be almost fully developed by the teen years, the deepening blue and purple areas here show that tremendous gains in emotional maturity, impulse control and decision-making continue to occur into early adulthood.

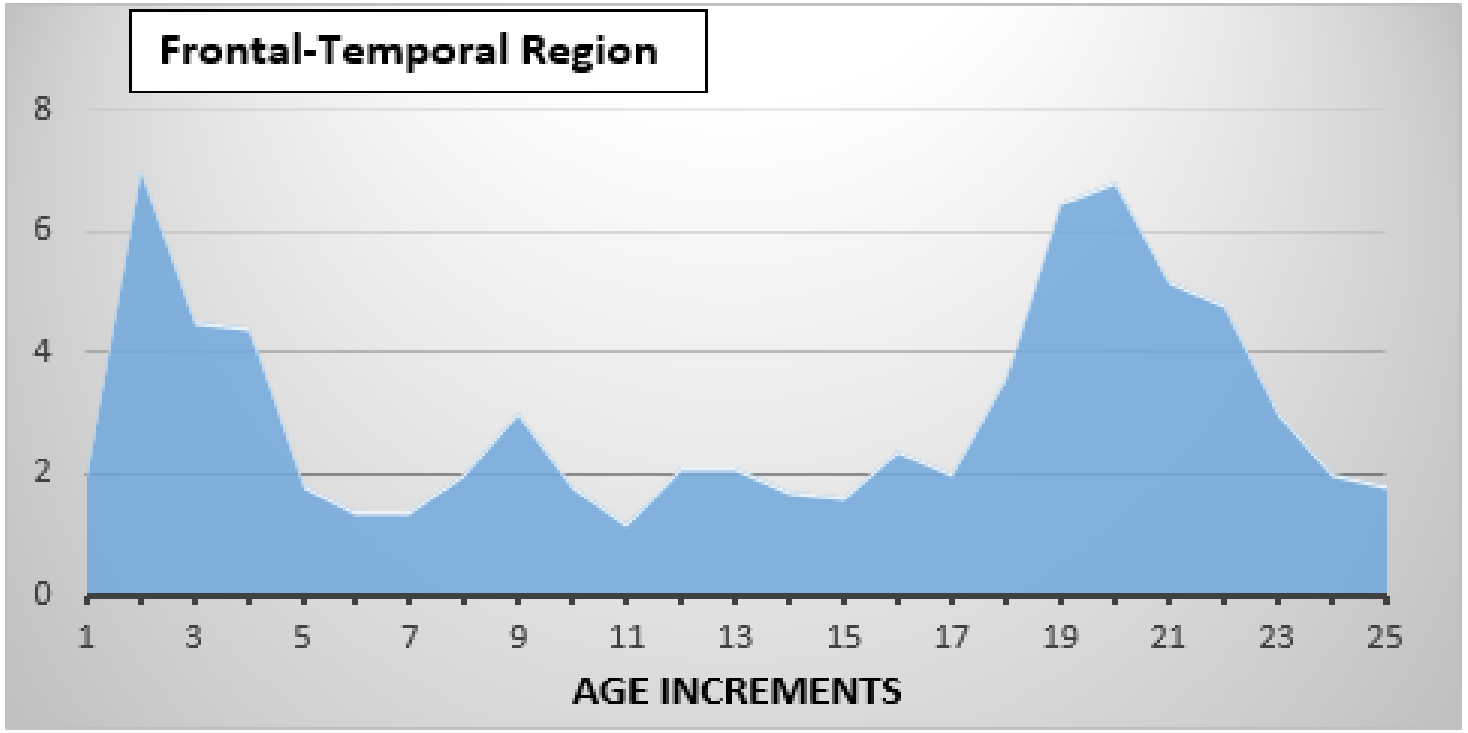


MATURATION

The 21-year-old brain is mostly mature, but the areas of green show that even at the threshold of legal adulthood, there is still room for increases in emotional maturity and decision-making skills, which will come in the next few years.

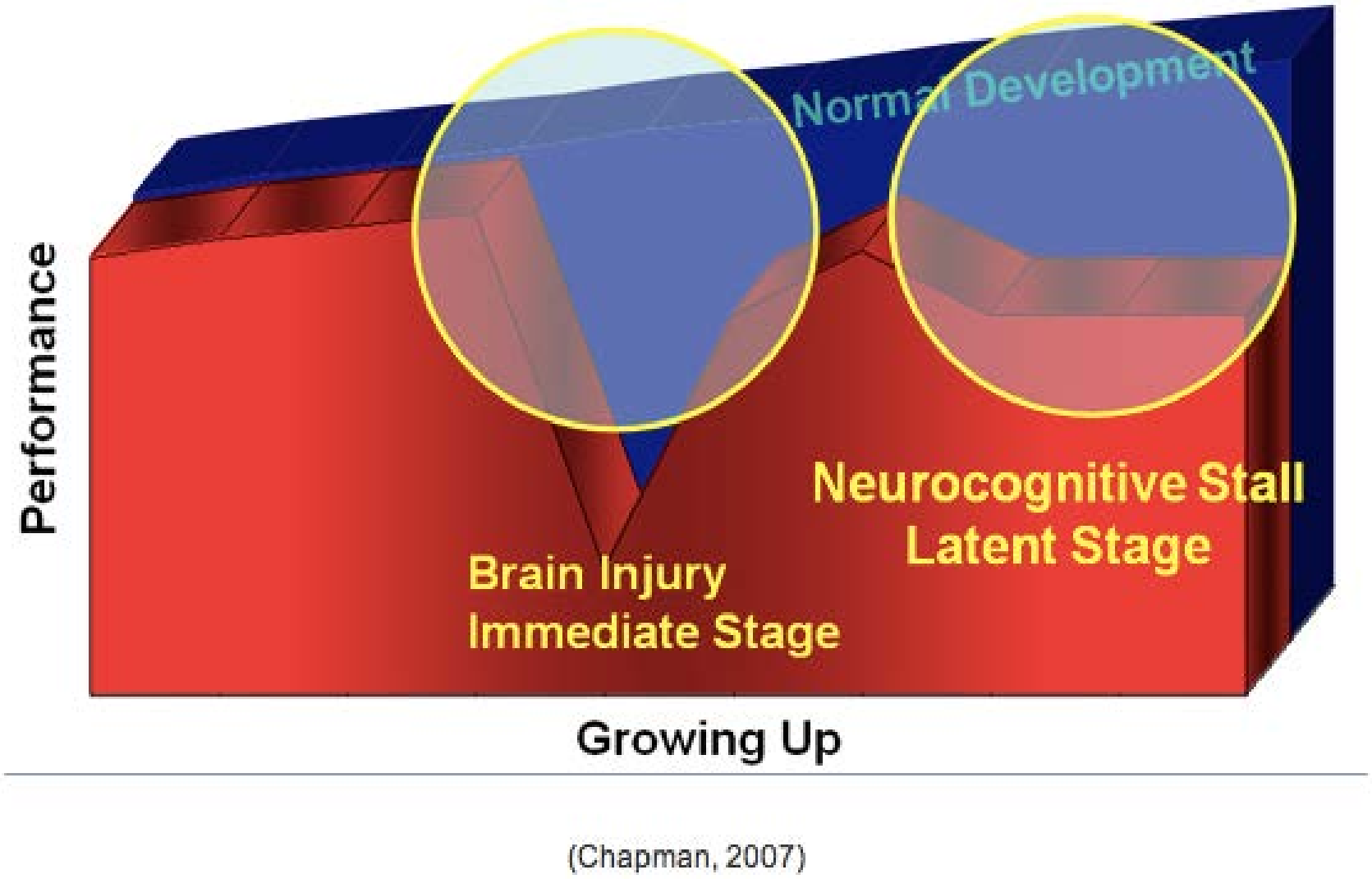
21 years old

Maturation & Foundation



(Adapted from Savage, 1999)

Pediatric TBI: Two Stages of Recovery



(Chapman, 2007)

Highlights from Past Research

- 60% of inmates have a history of brain injury prior to incarceration (Shiroma, et al., 2010)
- Criminal behavior appears to increase after TBI (Farrer & Hedges, 2011; Brooks et al., 1986; Fazel et al., 2011; McIsaac et al., 2016; Timonen et al., 2002; Elbogen et al., 2015)
  - Relationship of TBI to offense was stronger the more severe the injury
- Rate of TBI is 3 to 8 times higher among juvenile offenders (Hughes et al., 2015)
- Half of youth offenders have a history of loss of consciousness, with repeat injuries being very common (Davies et al., 2012; Kaba et al., 2013)

What we found

Criminal Justice Entity	Total OSU Screened	Positive Screens	Percent Positive
Boulder County Jail - JET unit	198	139	70%
Boulder County Jail - JBBS unit	369	215	58%
Denver County Jail - RISE unit	1352	360	27%
Denver County Jail - Transition unit	732	449	61%
Larimer County Jail	480	287	60%
17th Judicial District (JD) FOP	31	30	97%
17th JD Veterans	111	47	42%
17th JD SOISP	69	28	41%
2nd JD Drug Court	686	299	44%
2nd JD Juvenile	445	82	18%
1st JD Recovery Court	81	49	60%
18th JD	51	28	55%

JET – Jail Education and Transition

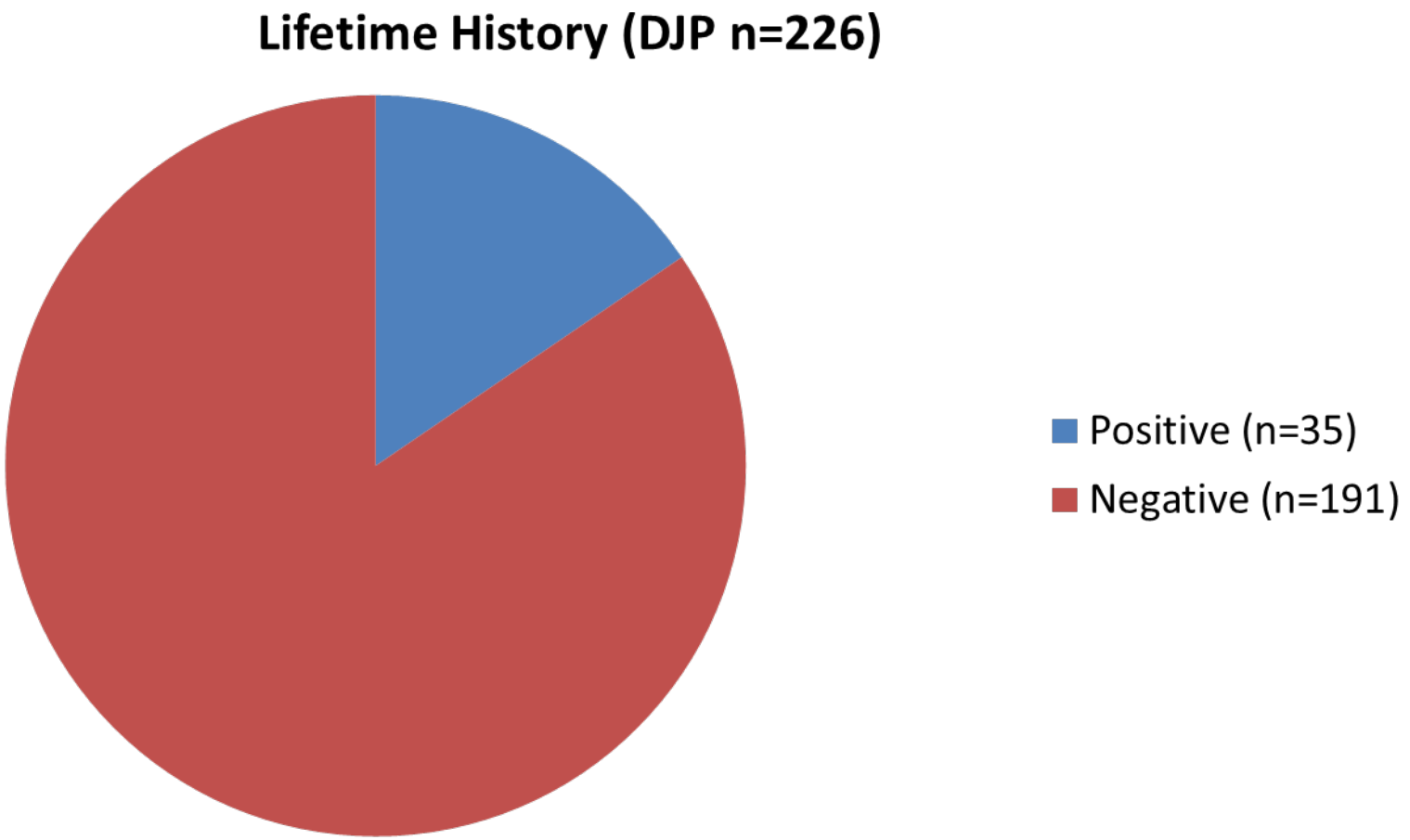
JBBS – Jail-Based Behavioral Services

RISE – Restoring Individuals Safely and Effectively (competency restoration)

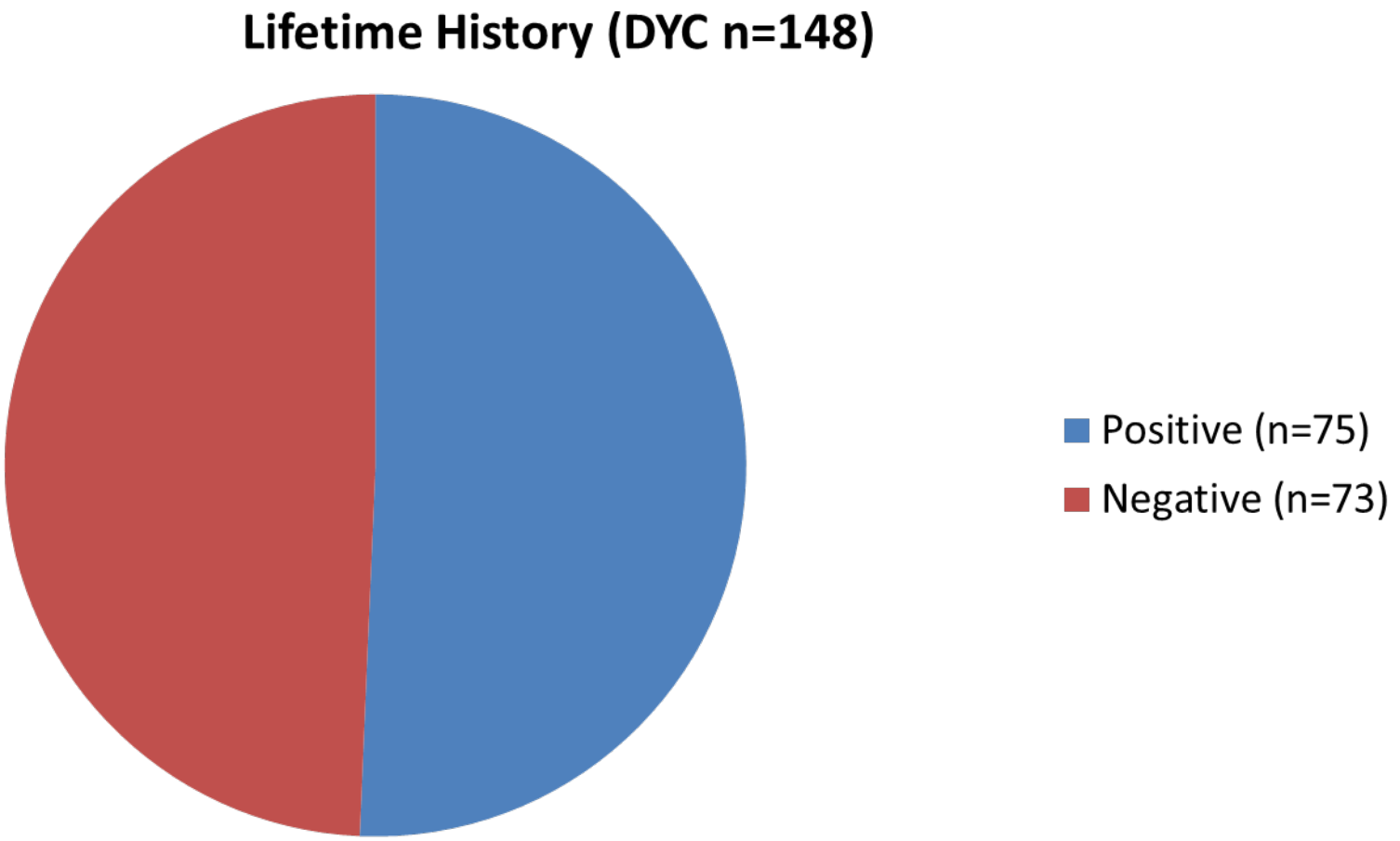
FOP – Female Offender Program

SOISP – Sex Offender Intensive Supervision Program

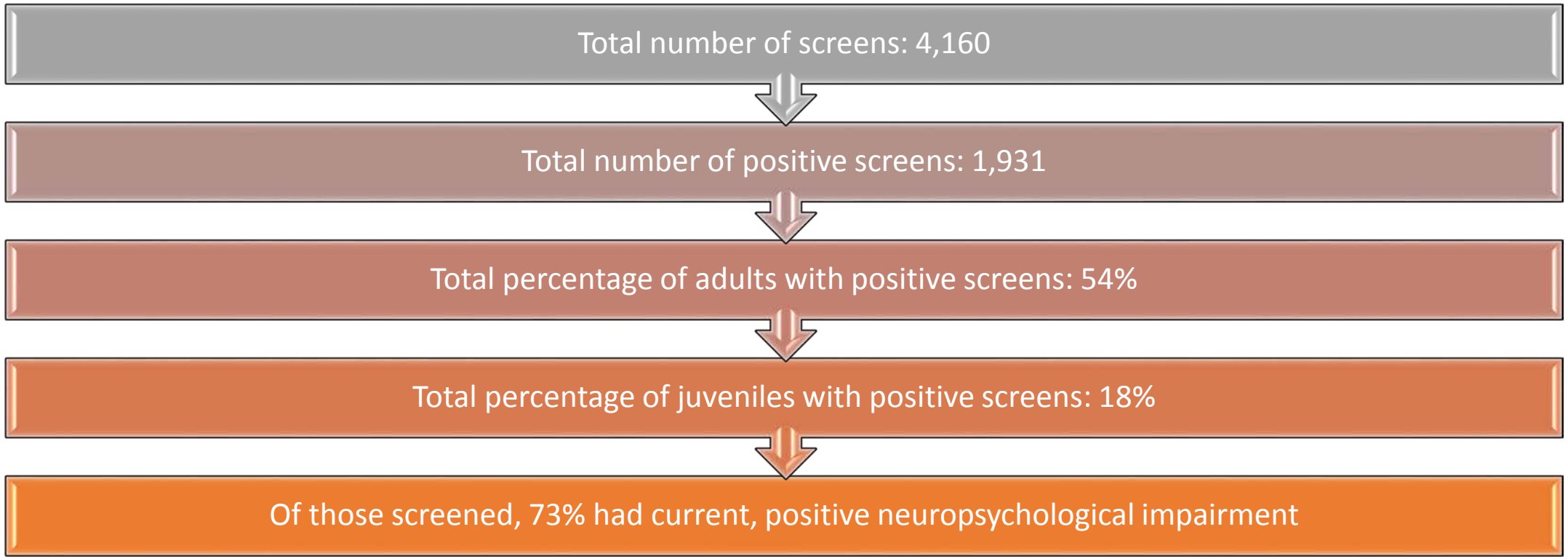
Juvenile Probation



Division of Youth Corrections



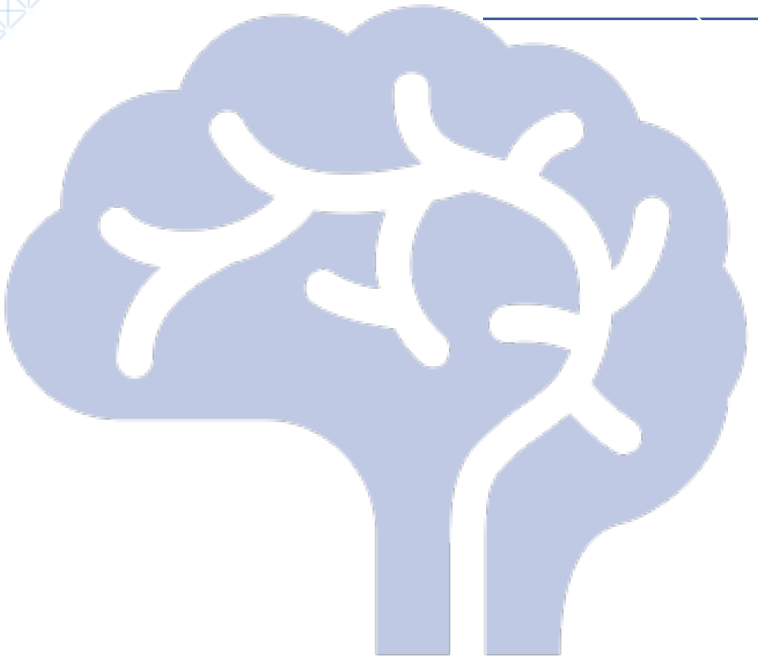
What does this tell us?



Deeper dive

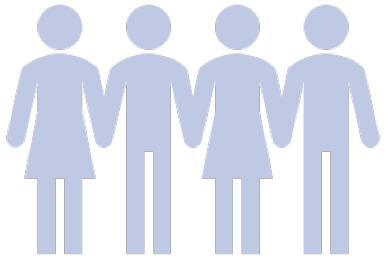
Childhood Violence	Adult Victimization	Suicide Attempts	School suspension	Substance Abuse	Mental Health
• 60% cohort • 10% general population	• 62% cohort • 2% general population	• 39% at least one attempt cohort • 4% thoughts, 1% plan in general population	• 54% cohort • 26% men; 15% women general population	• 93% history of abuse / misuse cohort • 7% general population	• 75% at least one diagnosis in cohort • 19% general population

Brain Injury Framework for Support



We are NOT treating the brain injury, we ARE treating the behavioral health concern in the context of brain injury:

- Demystifies brain injury for non-brain injury professionals



- Empowers individuals with brain injury and families to advocate for appropriate supports

Building Blocks of Brain Development©

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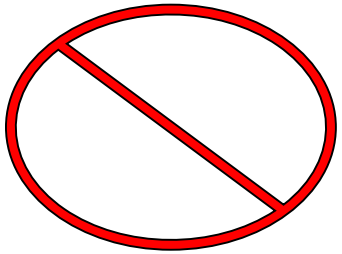
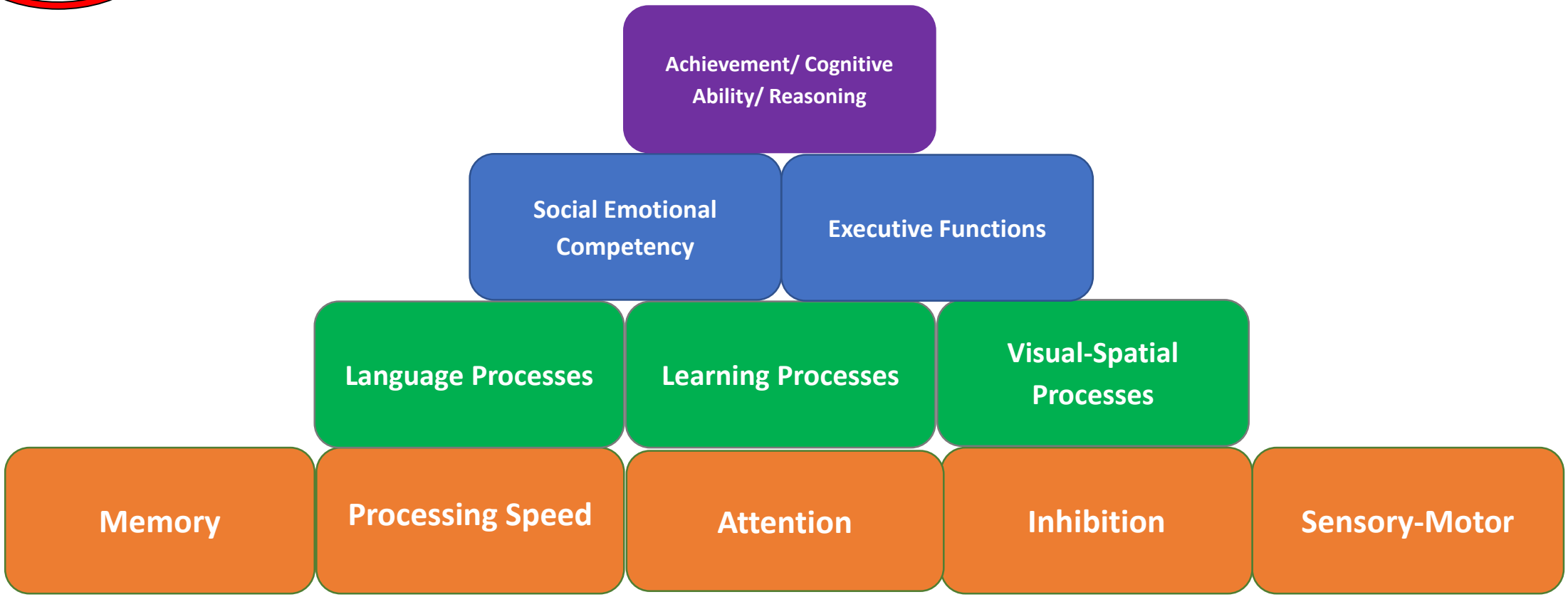
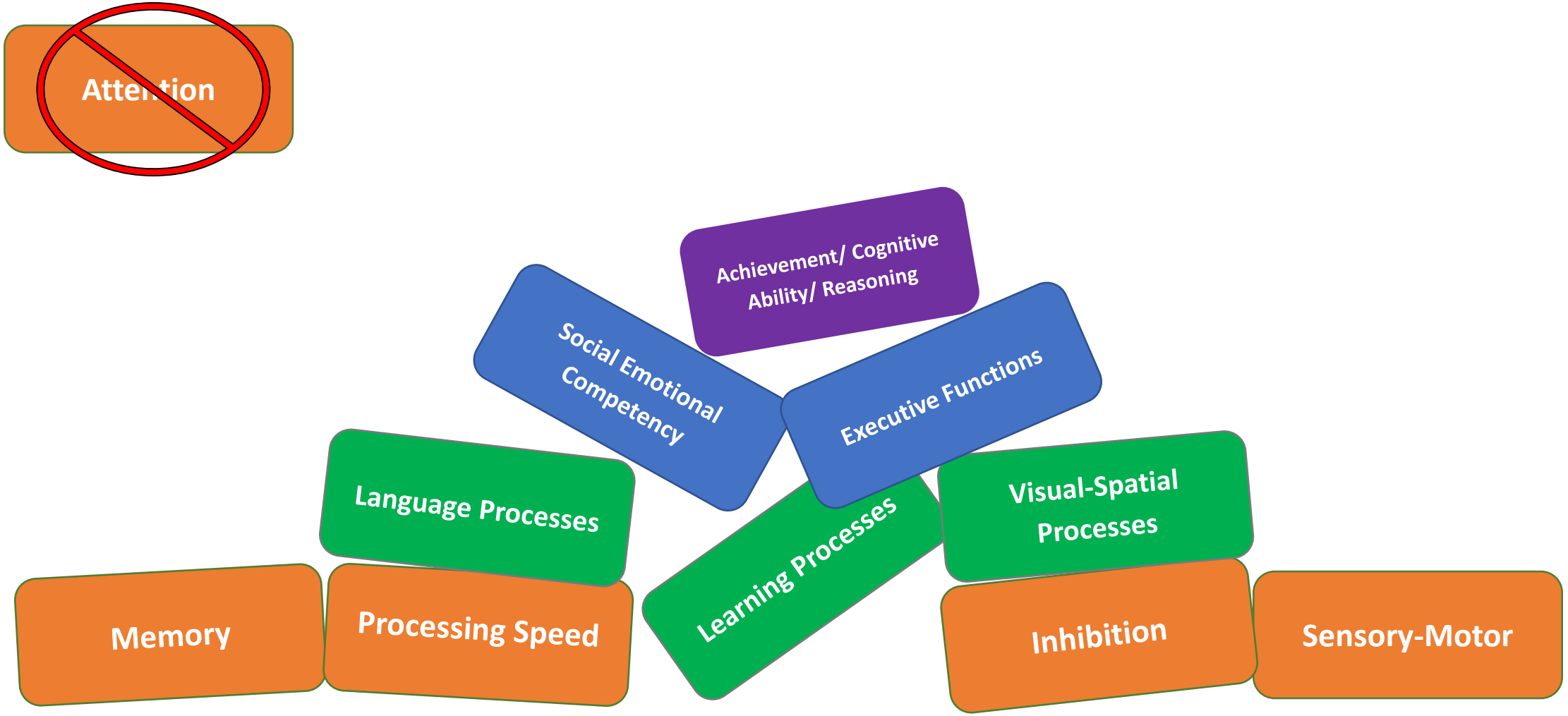
The Building Blocks of Brain Development © – further adapted by the CO Brain Injury Steering Committee, 2016.




Achievement/ Cognitive Ability/ Reasoning
Social Emotional Competency
Executive Functions
Language Processes
Learning Processes
Visual-Spatial Processes
Memory
Processing Speed
Attention
Inhibition
Sensory-Motor


Attention
Achievement/ Cognitive Ability/ Reasoning
Social Emotional Competency
Executive Functions
Language Processes
Visual-Spatial Processes
Learning Processes
Memory
Processing Speed
Inhibition
Sensory-Motor

Addressing Behavioral Concerns Following Brain Injury: A Framework

Behavior Management

Behavior management techniques can be classified into two categories:

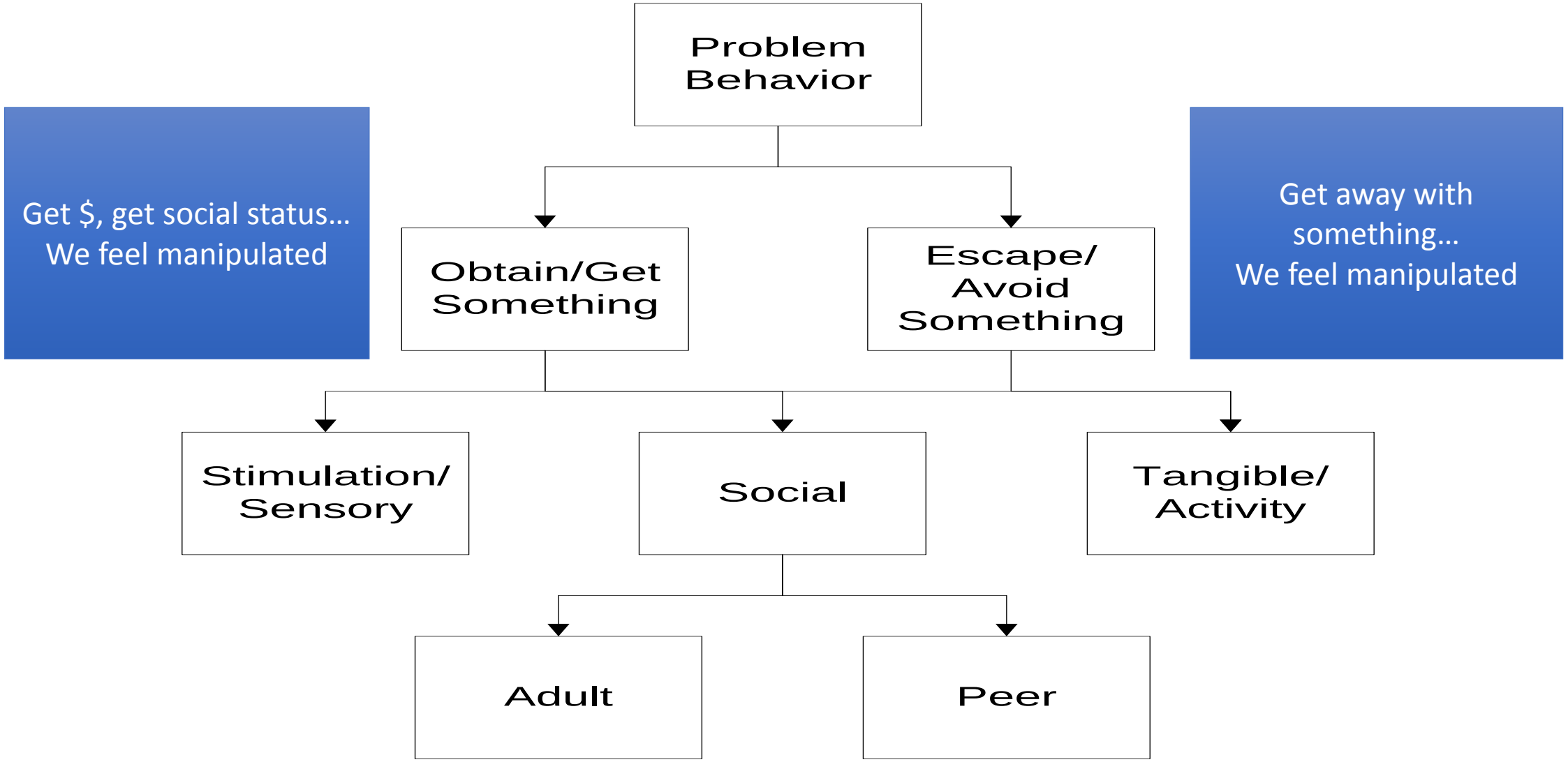
(1) antecedent strategies, which are used before a behavior occurs in an effort to prevent or elicit a behavior, and

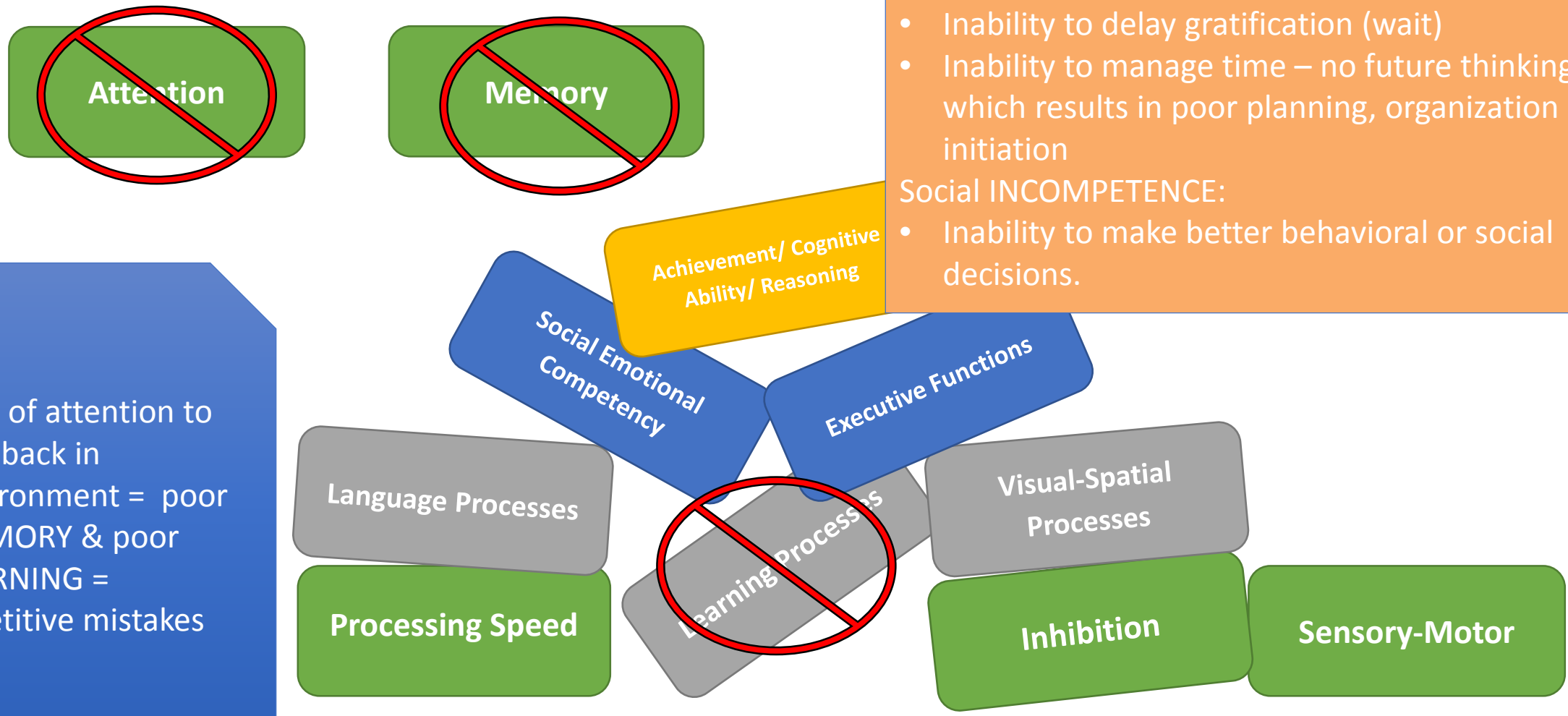
(2) consequent strategies, which are used after a behavior occurs in an effort to prevent the continuation and recurrence of a behavior or to reinforce a behavior.

Although both can be effective … in their own way, when applied at the right times.

Crisis Prevention instead of Crisis Management

Look For: The Function of the Behavior





Executive DYSFUNCTION:

- Inability to delay gratification (wait)
- Inability to manage time – no future thinking which results in poor planning, organization or initiation

Social INCOMPETENCE:

- Inability to make better behavioral or social decisions.

- Lack of attention to feedback in environment = poor MEMORY & poor LEARNING = repetitive mistakes

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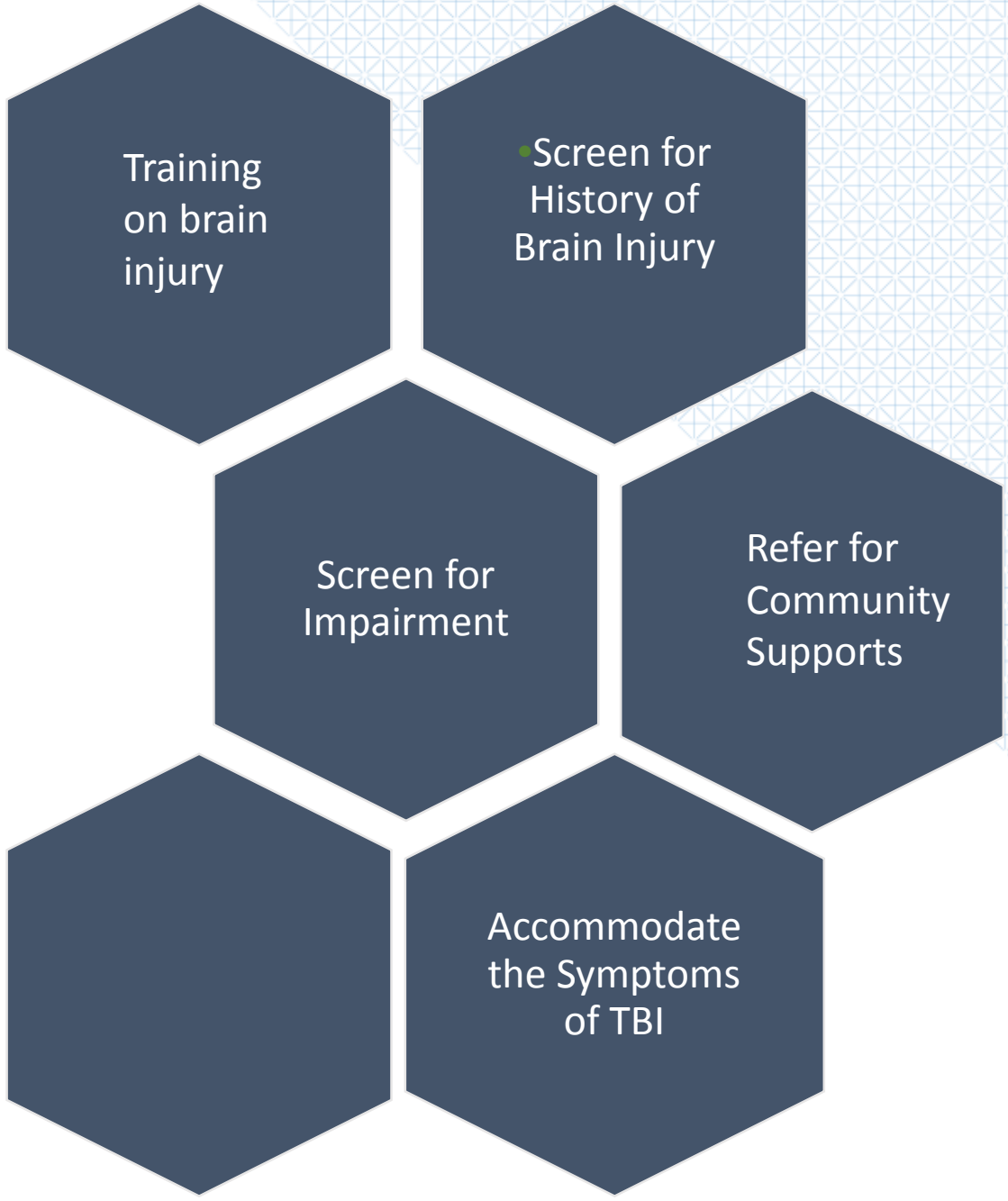
The Building Blocks of Brain Development © – further adapted by the CO Brain Injury Steering Committee, 2016.
Adapted from Dr. Karen McAvoy

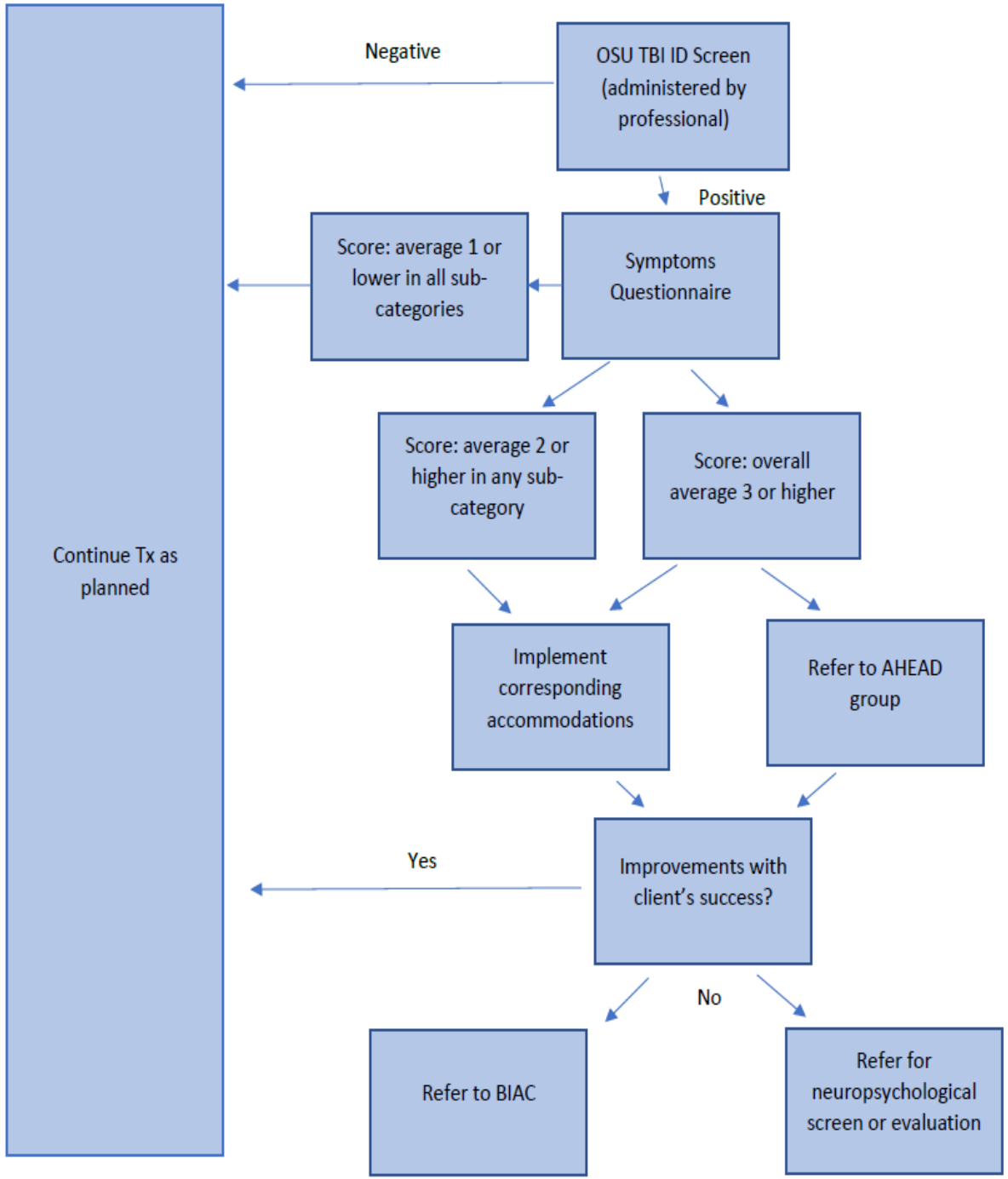
Skill Vs. Will

If think they have the skill but choose to not use it, likely to think punishment

If think they don't have the skill, less likely to think punishment, more likely to think of teaching the skill

Recommendations




OSU TBI ID Screen (administered by professional)
Negative
Positive
Symptoms Questionnaire
Score: average 1 or lower in all sub-categories
Continue Tx as planned
Score: average 2 or higher in any sub-category
Score: overall average 3 or higher
Implement corresponding accommodations
Refer to AHEAD group
Improvements with client's success?
Yes
No
Refer to BIAC
Refer for neuropsychological screen or evaluation

Importance of Screening for Brain Injury

One study found that 42% of persons who indicated they had incurred a TBI as defined by the CDC did not seek medical attention *(Corrigan & Bogner, 2007)*

- Brain injury increases risk for problem behaviors *(Williams, Mewse, Tonks, Mills, Burgess & Cordan, 2010)*
- Clients may be eligible for case management support/services
- Psychotherapies can be adapted for neurocognitive deficits. Examples:
  - Minimize environmental distractions
  - Educational therapies (e.g. CBT, DBT) should emphasize pacing, provide frequent opportunities for clients to respond, generate feedback, and provide reinforcement to maintain client engagement
  - Written material/handouts where possible
  - Repetition of key points
  - Non-electronic devices might include checklists, pictures or icons, photograph cues, post-it-notes, calendars, planners, and journals
  - Therapies should be introduced with a simple rationale

Credible History

"The gold standard for determining prior TBI is self/parent-report as determined by a structured or in-depth interview" *(Corrigan & Bogner, 2007)*

- Comprehensive Health History Interview

Health history must be an interview; it cannot be a form mailed to the parent/caregiver

- Credible history of TBI requires a skilled interviewer to know how to ask certain questions, to ask pointed questions multiple times and in a variety of ways, to establish the details of the injury.

Screening for Lifetime History

Ohio State University Traumatic Brain Injury Identification method (OSU TBI-ID)

Sites administer OSU TBI-ID (3-5 minutes)
Determined positive if meet **ONE** or **MORE** of the following criteria:

* Worst: moderate/severe brain injury
* First: injury with loss of consciousness before age 15
* Multiple: 3 or more with altered mental status or 2 injuries within a 3 month period

Name: _____ Current Age: _____ Interviewer Initials: _____ Date: _____

Ohio State University TBI Identification Method — Interview Form

Step 1

Ask questions 1-5 below. Record the cause of each reported injury and any details provided spontaneously in the chart at the bottom of this page. You do not need to ask further about loss of consciousness or other injury details during this step.

I am going to ask you about injuries to your head or neck that you may have had anytime in your life.

1. In your lifetime, have you ever been hospitalized or treated in an emergency room following an injury to your head or neck? Think about any childhood injuries you remember or were told about.
   ☐ No ☐ Yes—Record cause in chart
2. In your lifetime, have you ever injured your head or neck in a car accident or from crashing some other moving vehicle like a bicycle, motorcycle or ATV?
   ☐ No ☐ Yes—Record cause in chart
3. In your lifetime, have you ever injured your head or neck in a fall or from being hit by something (for example, falling from a bike or horse, rollerblading, falling on ice, being hit by a rock)? Have you ever injured your head or neck playing sports or on the playground?
   ☐ No ☐ Yes—Record cause in chart
4. In your lifetime, have you ever injured your head or neck in a fight, from being hit by someone, or from being shaken violently? Have you ever been shot in the head?
   ☐ No ☐ Yes—Record cause in chart
5. In your lifetime, have you ever been nearby when an explosion or a blast occurred? If you served in the military, think about any combat- or training-related incidents.
   ☐ No ☐ Yes—Record cause in chart

Interviewer instruction:
If the answers to any of the above questions are "yes," go to Step 2. If the answers to all of the above questions are "no," then proceed to Step 3.

Step 2

Interviewer instruction: If the answer is "yes" to any of the questions in Step 1 ask the following additional questions about each reported injury and add details to the chart below.

Were you knocked out or did you lose consciousness (LOC)?

If yes, how long?

If no, were you dazed or did you have a gap in your memory from the injury?

How old were you?

Step 3

Interviewer instruction: Ask the following questions to help identify a history that may include multiple mild TBIs and complete the chart below.

Have you ever had a period of time in which you experienced multiple, repeated impacts to your head (e.g. history of abuse, contact sports, military duty)?

If yes, what was the typical or usual effect—were you knocked out (Loss of Consciousness - LOC)?

If no, were you dazed or did you have a gap in your memory from the injury?

What was the most severe effect from one of the times you had an impact to the head?

How old were you when these repeated injuries began? Ended?

Step 1	Step 2						
	Loss of consciousness (LOC)/knocked out				Dazed/Mem Gap		Age
Cause	No LOC	< 30 min	30 min-24 hrs	> 24 hrs	Yes	No	

If more injuries with LOC: How many?_____ Longest knocked out?_____ How many ≥ 30 mins.?_____ Youngest age? _____

Step 3	Typical Effect		Most Severe Effect				Age	
Cause of repeated injury	Dazed/ memory gap, no LOC	LOC	Dazed/ memory gap, no LOC	LOC < 30 min	LOC 30 min - 24 hrs.	LOC > 24 hrs.	Began	Ended

Adapted with permission from the Ohio State University TBI Identification Method (Corrigan, J.D., Bogner, J.A. (2007). Initial reliability and validity of the OSU TBI Identification Method. J Head Trauma Rehabil, 22(6):318-329.

Screening for Lifetime History

Brain Check Survey (school aged children/youth)

- Parent-completed screening tool
- Approximately 15 minutes to complete

Categories:

1. Injury/Illness
2. Behaviors
3. Cognitive
4. Symptoms
5. Education Services

Code: _____ Date Received: _____

Colorado State University

Department of Occupational Therapy
College of Applied Human Sciences
Fort Collins, Colorado 80523-1573
(970) 491-6253
FAX: (970) 491-6290

Brain Check: Screening Tool Project

Parent/Guardian Survey

Student Information

Today's Date: ___/___/___ Child's Age: _____

Child's Date of Birth: ___/___/___ Child's Gender: ☐ Male ☐ Female

Child's race: (circle one or more)	1: American Indian/Alaska Native 2: Asian 3: Native Hawaiian or Other Pacific Islander	4: Black or African American 5: White 6: More than one race Please describe:_____

Child's ethnicity: (circle one)	1: Hispanic or Latino 2: Not Hispanic or Latino	3: Unknown or Not Reported

Injuries or Illnesses

Injury or Illness	Age	Outcomes
Please check all that apply		
☐ **Blow to Head** (from sports, playing, biking, falling, getting hit by an object, etc.)	At what age?____	Check all that apply: ☐ Concussion ☐ Loss of consciousness, *for how long?_____ ☐ Coma, *for how long? _____ ☐ Confusion or altered mental state

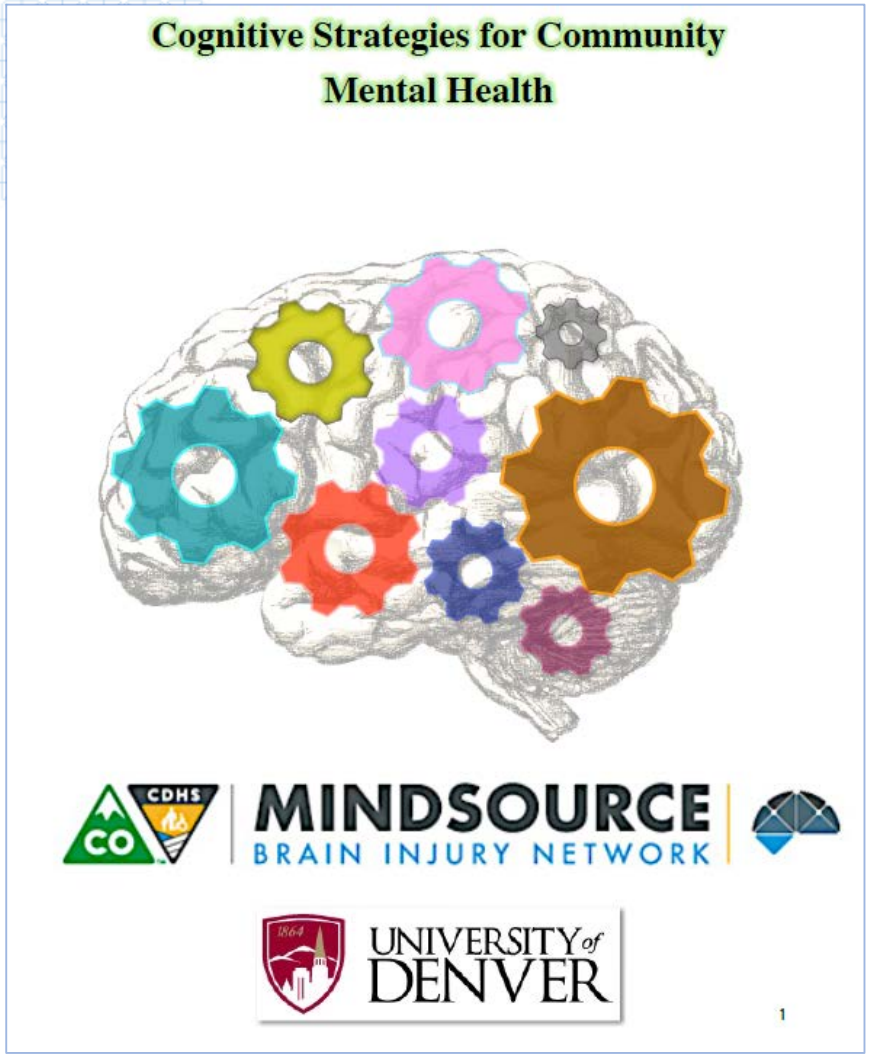
Screening for Impairment

- OSU TBI-ID does not screen for impairment
- Important to understand deficit areas so that appropriate accommodations and strategies can be implemented
- Variety of ways to screen for impairment:
  - Symptoms Questionnaire
  - Neuropsychological Screen
  - Neuropsychological Evaluation

Symptoms Questionnaire

https://mindsourcecolorado.org/questionnaire-test/

Strategies Guidebook



- Memory Problems
- Delayed Processing
- Attention Problems
- Inhibition Problems/Impulsivity
- Physical and Sensorimotor Problems
- Language Problems
- Organization Problems
- Mental Inflexibility
- Emotional Dysregulation
- Appendix – Sleep

A.H.E.A.D.

https://mindsourcecolorado.org/ahead/

Neuropsychological Screen

Clinical Interview Automated Neuropsychological Assessment Metric (ANAM) **Core Battery** (Reeves, Winter, Bleiberg, & Kane, 2007)

- Library of computer-based assessments of cognitive domains including attention, concentration, reaction time, memory, processing speed, and decision-making with a very strong normative database
- Sensitive to the deficits associated with brain injury (Kane, Roebuck-Spencer, Short, Kabat & Wilken, 2007)
- **NORMS**
  - 3400 high school and college athletes ages 12 to 24 years
  - 145 males and females ages 9 to 33 years from pediatric lupus study
  - 444 community dwelling adults ages 18 to 86 years
  - 107,500 active duty military personnel

Neuropsychological Assessment Battery Screening module (NAB-SM; Stern & White, 2000)

- Attention, Language, Memory, Spatial, and Executive Functions
- Sensitive to the deficits associated with brain injury (Zgaljardic, & Temple, 2010)
- **NORMS**
  - 1488 18-97 year old individuals

Effort tests

Recommendations

1. Provide training on brain injury for criminal justice staff
2. Screen for lifetime history of brain injury
3. Screen for impairment
4. Provide simple adjustments/accommodations
5. Implement a psycho-educational curriculum
6. Refer for neuropsychological screen when indicated
7. Refer to the Brain Injury Alliance of Colorado for community based case management and/or education consultation

Thank you for your time!

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