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Understanding the Neurobiology of Complex Trauma

Building a framework for effective practice with children, young people and their network of relationships.

Anglicare Victoria 2023



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The Australian Childhood Foundation acknowledges Aboriginal and Torres Strait Islander people as the traditional custodians of this land and we pay our respect to their Elders past, present and future.



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Learning together online

- Participation is always welcome
- Cameras on, unless you need to take a break
- Mute yourself when not talking
- Hands up or use the chat button if you have questions
- Please use headphones if children are in your training space
- Please maintain confidentiality

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Safety

The content of this training can evoke strong emotions and may trigger personal experiences of trauma.

Please be mindful of your own wellbeing during this training and if you need support please do what you need to do to feel safe. We are happy for you to talk to the facilitator if you need to.

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Learning outcomes

- ✓ Learn in detail about brain/body development through childhood and adolescence,
- ✓ Understand the ways that trauma shapes children and young people's states, needs and experiences,
- ✓ Develop creative and evidence based approaches and practice strategies to enable children and young people to communicate and transform their experiences of trauma,
- ✓ Build approaches that resource change across all environments in which children and young people live, learn and relate.



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Holding the child at the centre...



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I need connection to my CULTURE



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Culture is part of development

Our culture influences our brain development.

How has it influenced yours? Think about:

- Sense of safety
- Relationships
- Meaning making



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The Importance of Culture

A protective factor

Safety: Belonging

Relationships: Connection

Meaning making: Identity



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The CHILD



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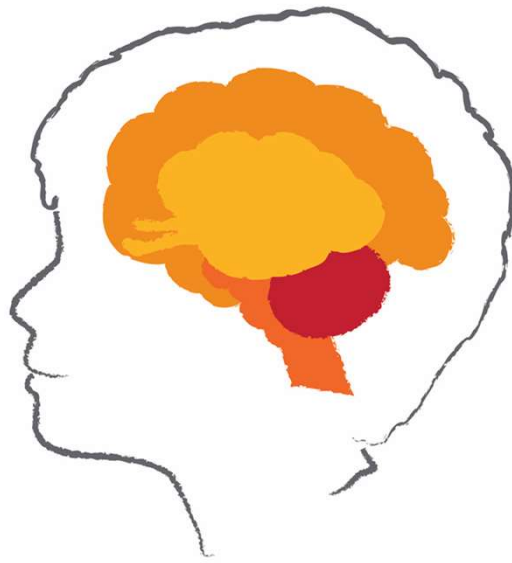
BRAIN DEVELOPMENT

and the impacts of trauma



Brain development

- The brain develops through a mix of genetics and environmental factors.
- Key to this development are relationships
- The brain develops sequentially from the bottom up



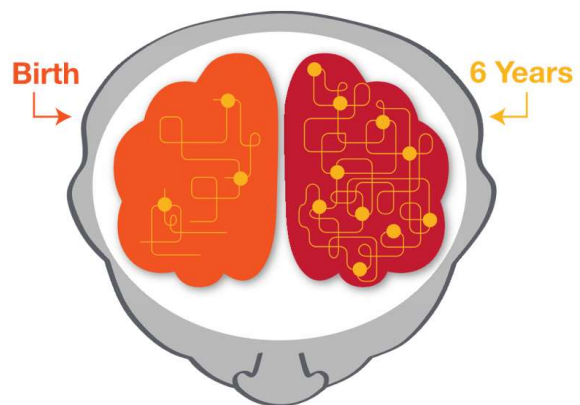
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Neuronal connections

- The neural system has the ability for one neuron to communicate with up to 10,000 other neurons
- The newborn brain has approximately 100 billion neurons

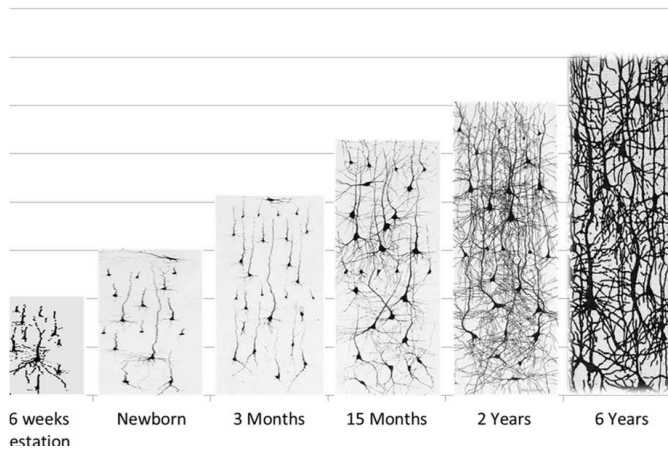


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Neuronal development



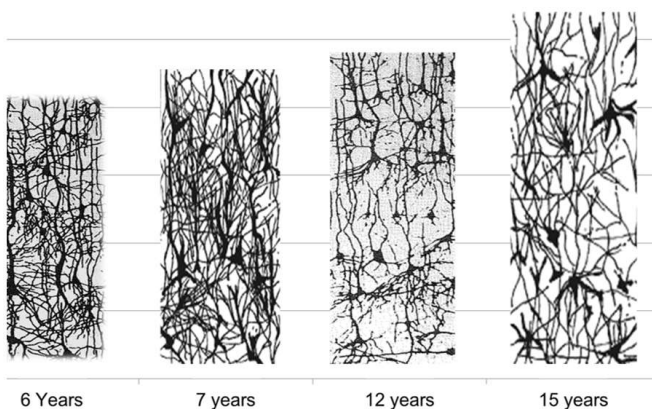
- Rapid growth occurs from birth to 6 years
- **Critical period** of development
- Healthy neuronal development occurs through **relationships, regulation, repetition**



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Neuronal development



- Early years – period of **rapid growth**
- Followed by onset of puberty in which **synaptic pruning and formation of new neurons** occurs.



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Sequential brain development – building blocks



	The Thinking brain 3-5 Years
	The Emotions and Memory Brain - Birth to 4 years
	The Movement Brain Birth – 2 years
	The survival brain Pre birth to 8 months

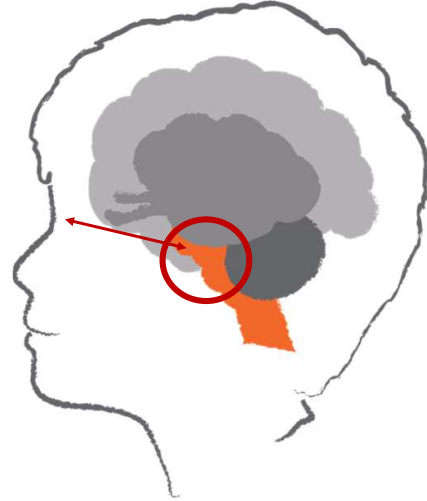
Brainstem - basic life functions

- Basic life functions
- First part of our brain to develop
- This is the most developed brain part at birth
- Responsible for our heart beat, breathing, sucking, temperature control, blood pressure



Superior Colliculus

- Processes visual threats – looming objects identified by cells in the retina of the eye
- Retinal neuronal input received by Superior Colliculus which engages the body in **Avoidance and defensive behaviours**



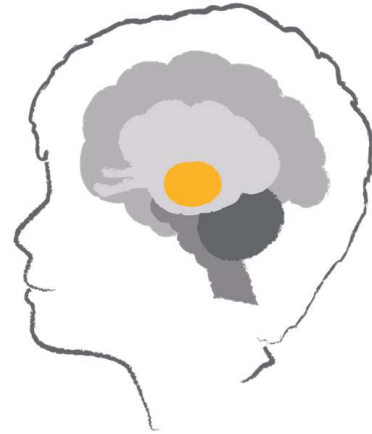
Cerebellum- movement and balance

- Helps us to know where our body is in space
- Helps us with our posture and balance
- Helps us not to fall over and to control our movements
- Has its own connective pathways between the 2 halves- cerebellar vermis



Diencephalon - sorting & sending centre

- This area of the brain develops mainly after birth
- It sorts out messages coming into the brain and sends them
- It uses hormones to send signals to body
- Hormonal signals tell your body what it needs, eg. food, water, love



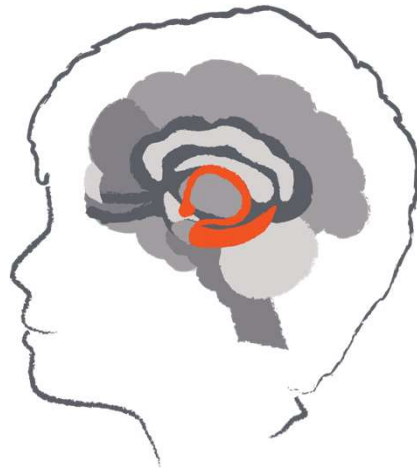
Limbic lobe- emotional gateway

- The part of the brain that helps us attach an emotion to an experience or memory
- This part of the brain is particularly involved with the emotions of fear and anger
- Also heavily involved in attachment processes
- This area develops mainly after birth



Hippocampus – Brain’s historian

- Explicit memory system
- Develops approximately 2-3 years of age
- Provides context to memory and embeds long term memory



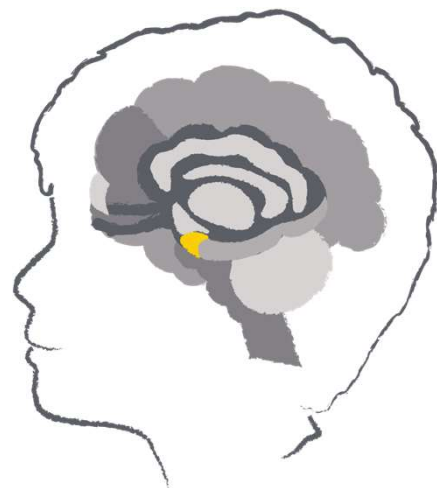
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Amygdala – smoke alarm

- Detects threat
- Develops from birth
- Learns by association
- Involved in implicit memory processes



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Cerebral cortex- complex thinking

- The largest part of the brain
- Associated with higher brain function such as thought and action
- Examples of functions:
 - Reasoning
 - Logic
 - Judgement
 - Voluntary movement



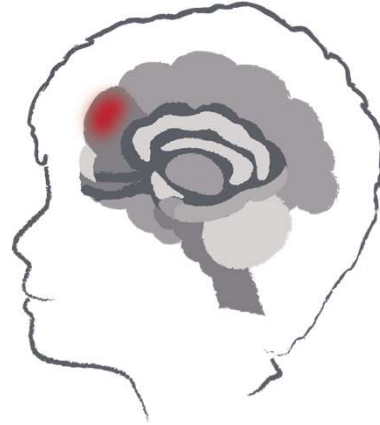
The prefrontal cortex- executive function

- Responsible for executive functions, such as judgement, reasoning, and self awareness
- Final part of the brain to reach maturity in one's mid 20s
- Under reconstruction in adolescents from the age of approximately 12 years



Medial prefrontal cortex

- Associated with perceptions of self and similar others
- Known as centre for mindfulness
- Involved in maternal bonding – the parent child dyad and inter-subjectivity



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Hemispheric integration

Left Hemisphere

- Evaluates language content
- Optimistic hemisphere
- Understands beginning, middle and end
- Learns from the past and expects the future
- Looks for patterns



Right Hemisphere

- In the present moment
- Eye contact
- Facial expression
- Tone of voice
- Posture
- Gesture
- Intensity
- Is mute
- Grasps the whole



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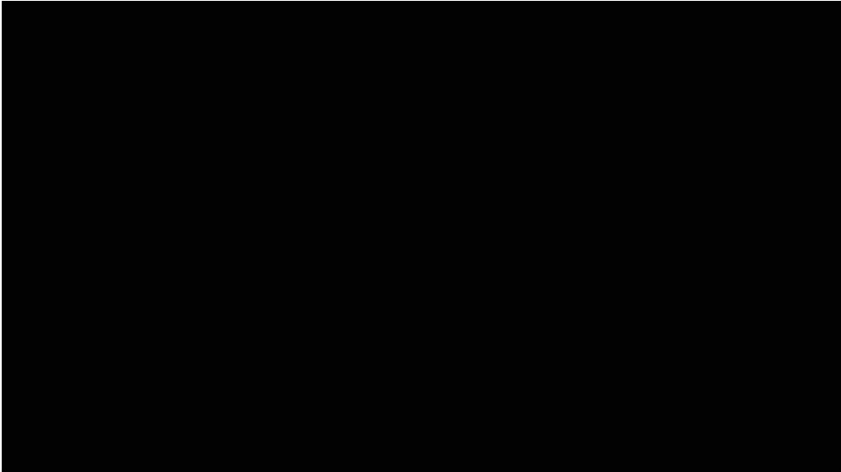
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Corpus Callosum



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Lateral Brain development



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Strategies for building healthy brains

Brainstem & Diencephalon	Basic survival & sensory processing	Pacification or stimulation. Activities in the child's preferred sensory modality
Cerebellum	Coordination of movement	Using music, rhyme and movement activities
Limbic	Emotional processing	Building relational connection through plays, animals, games
Cortex	Thinking processes	Linking experiences and sensations to words and descriptions
Prefrontal cortex	Analytical and abstract thinking	Challenges and safe risk taking activities



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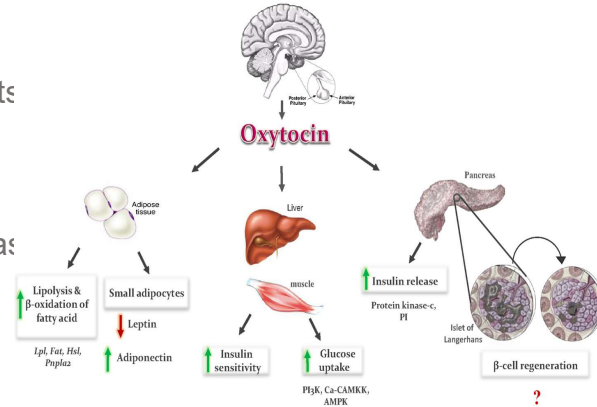
BRAIN & BODY CONNECTIONS - Hormones & Senses



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Oxytocin

- Supports social connection in infants and children as well as enabling adults' capacity for care
- Oxytocin release is linked to the benefits of mutual gaze and touch as developmental needs



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Dopamine

- A neurotransmitter - plays a big part in **motivation and reward**
- **'Feel good'** hormone – nearly all pleasurable experiences come from a release of dopamine – eating, sex, etc



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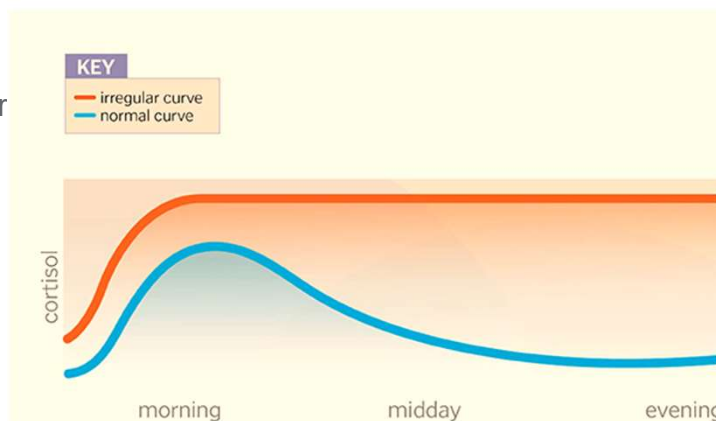
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Cortisol

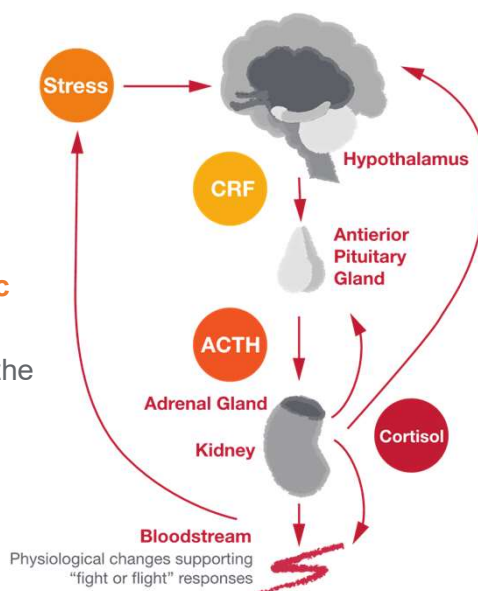
Can help:

- your body respond to stress or danger – **fight, flight, freeze, submit response**
- increase your body’s metabolism of glucose
- control your blood pressure
- reduce inflammation

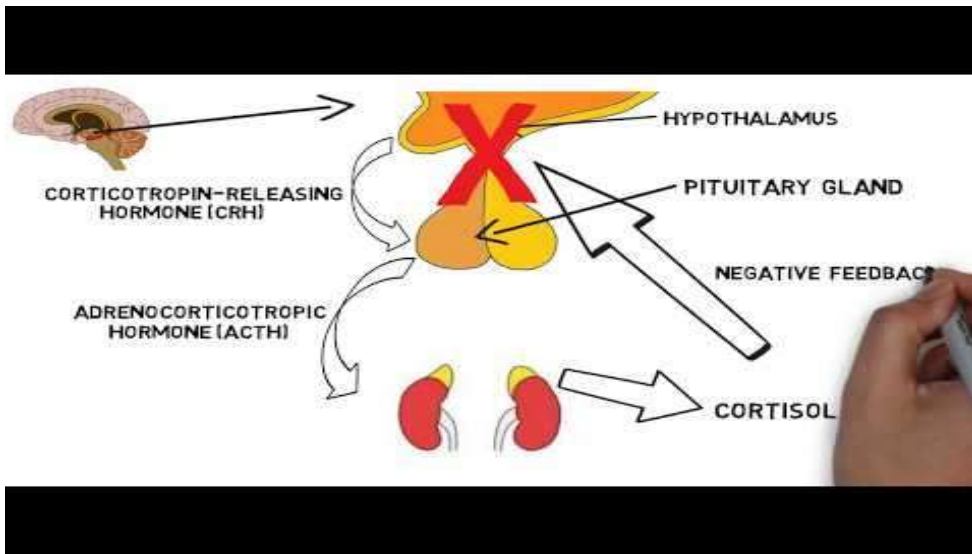


Hypothalamic (Diencephalon) / Pituitary / Adrenal Axis

1. The hypothalamus secretes the hormone **corticotropin-releasing factor** (CRF), which rouses the body.
2. CRF travels to the pituitary gland.
3. The pituitary gland secretes **adrenocorticotropic hormone** (ACTH).
4. ACTH circulates in the bloodstream, traveling to the adrenal gland.
5. The adrenal gland releases **cortisol**, another hormone.
6. Cortisol stimulates many reactions in your body, including a rush of energy and alertness.



HPA Axis



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8 senses

1. **Visual**
2. **Auditory**
3. **Olfactory** (smell)
4. **Gustatory** (taste)
5. **Tactile System** (touch)
6. **Vestibular** (sense of head movement in space)
7. **Proprioceptive** (sensations from muscles and joints of body)
8. **Introception** (awareness of basic primary functions – hunger, toileting, breathing)



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Auditory - Ohm dad



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Olfactory



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Activities to support body awareness



Round – Straight
Sit – Stand
Small – Large
Freeze – Melt
Push – Pull
Wide – Narrow
Left – Right
Hot – Cold

Light – Strong
Under – Over
Yes – No
In – Out
Tall – Short
Loud – Soft
Up – Down
Fast – Slow

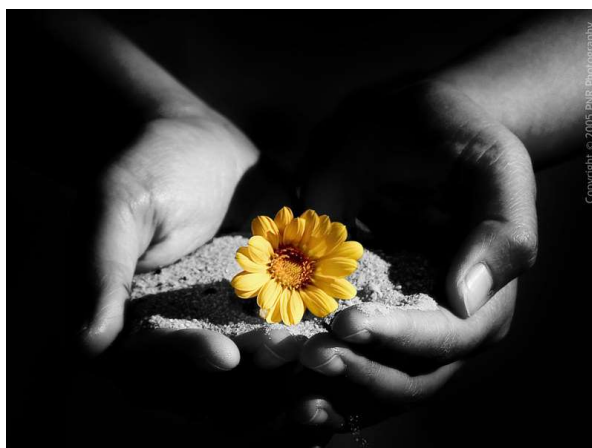


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Holding the child at the centre



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TRAUMA





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What is Trauma?

Any single, ongoing or cumulative experience which:

- is a response to a perceived threat, usually to survival
- overwhelms our capacity to cope
- feels/is outside our control
- evokes a physiological and psychological set of responses based on fear or avoidance



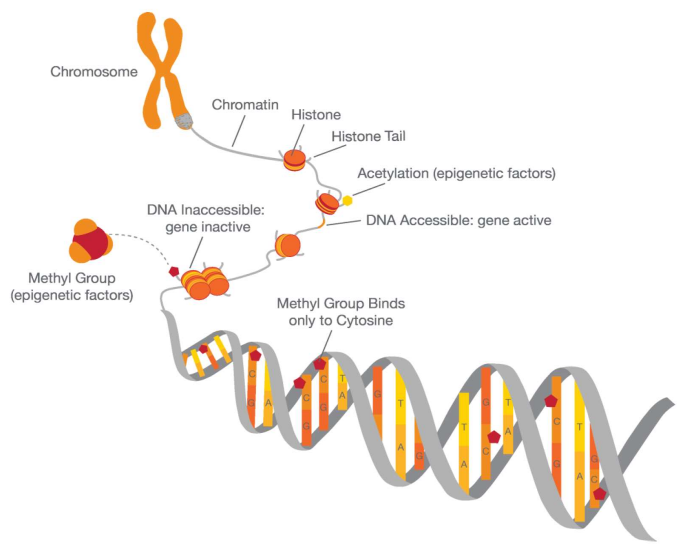
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Epigenetics

“The study of inheritable changes in gene function without the change in the DNA sequence”

Journal of Science



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Epigenetics



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Sequential brain development – disrupted by trauma



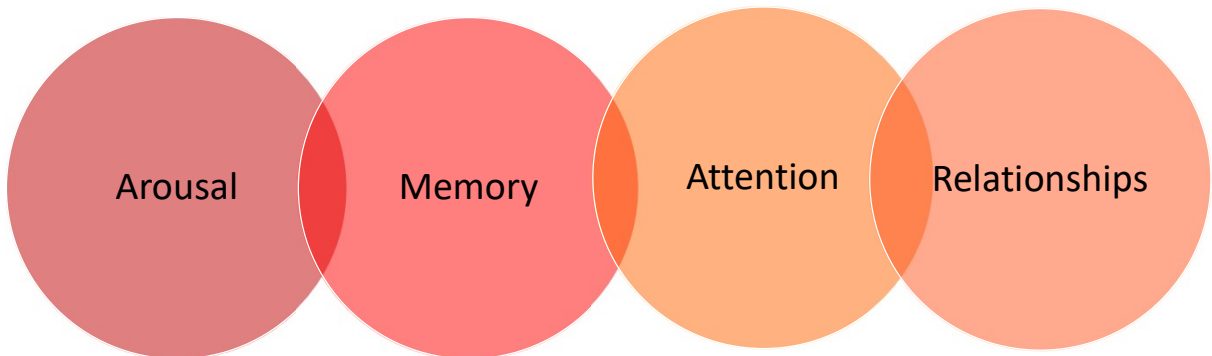
- The Thinking brain**
3-5 Years
- The Emotions and Memory Brain - Birth to 4 years**
- The Movement Brain**
Birth – 2 years
- The survival brain**
Pre birth to 8 months



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Trauma impacts




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Arousal



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Arousal - Affect dysregulation

Extremes of affect state:

- **Terror** replaces fear
- **Despair** replaces sadness
- **Rage** replaces anger




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Activity



A photograph of two rainbow-colored beach chairs on a sandy beach. The chairs are facing each other, and the ocean is visible in the background under a sunset sky. The chairs have a rainbow pattern with red, orange, yellow, green, and blue stripes.

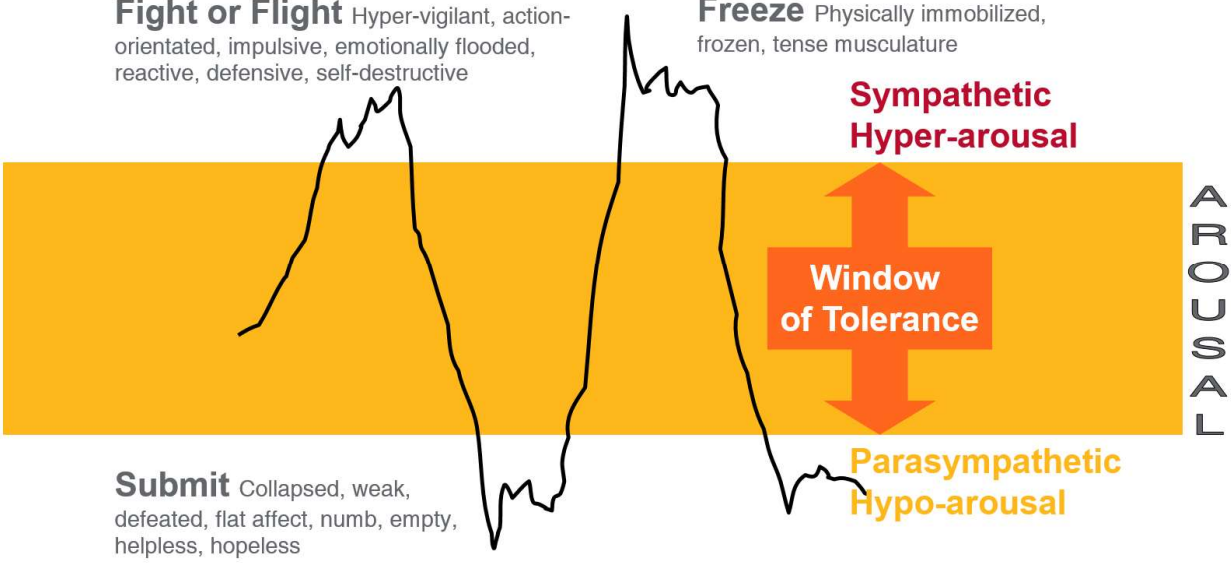
 

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Dys-regulated Arousal



The graph shows a line representing arousal levels over time. The line starts at a low level, rises to a peak labeled 'Fight or Flight', then drops to a low level labeled 'Submit'. It then rises to a higher peak labeled 'Freeze', and finally drops to a very low level labeled 'Submit'. A yellow shaded area represents the 'Window of Tolerance', which is bounded by 'Sympathetic Hyper-arousal' at the top and 'Parasympathetic Hypo-arousal' at the bottom. The word 'AROUSAL' is written vertically on the right side of the graph.

Fight or Flight Hyper-vigilant, action-orientated, impulsive, emotionally flooded, reactive, defensive, self-destructive

Freeze Physically immobilized, frozen, tense musculature

Submit Collapsed, weak, defeated, flat affect, numb, empty, helpless, hopeless

Sympathetic Hyper-arousal

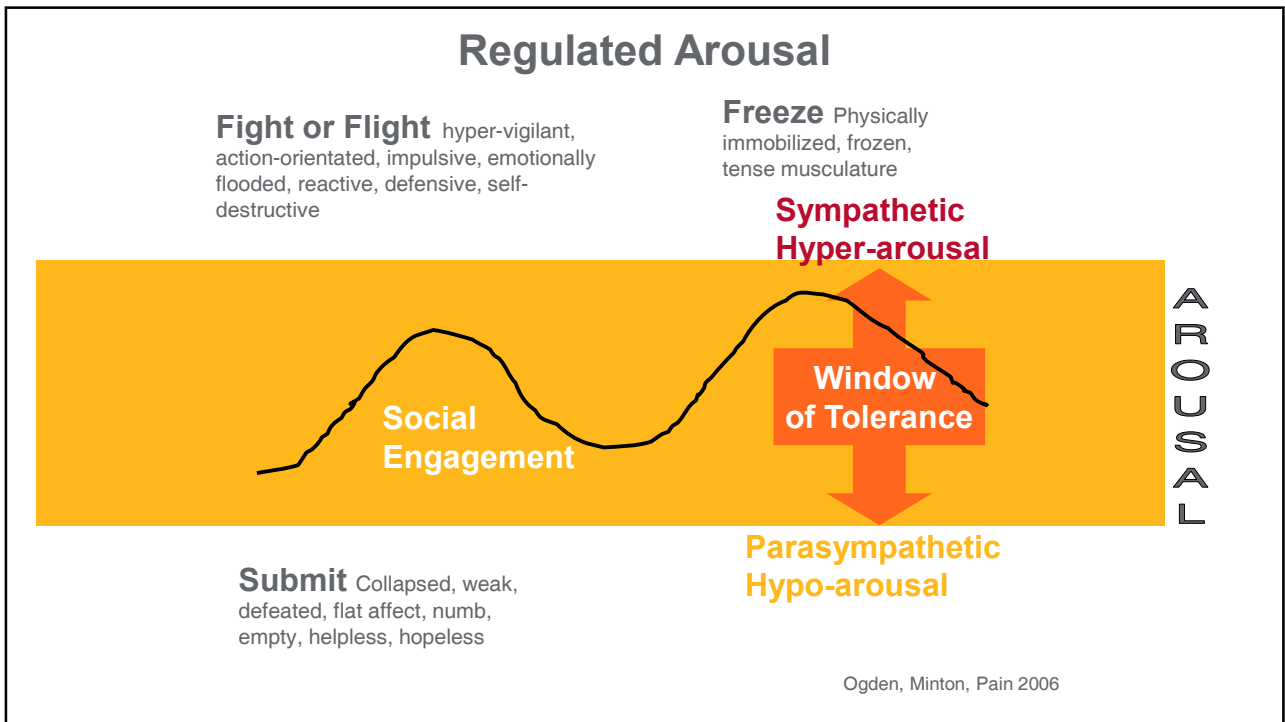
Parasympathetic Hypo-arousal

Window of Tolerance

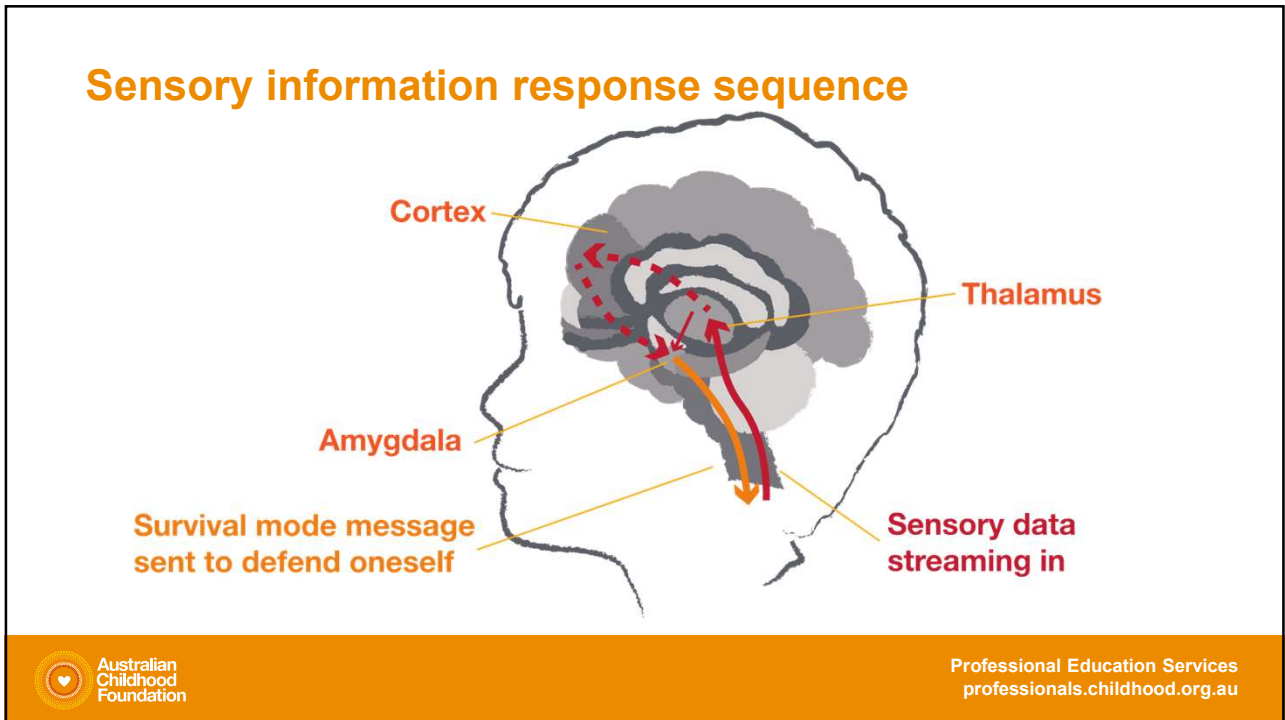
AROUSAL

Ogden, Minton, Pain 2006

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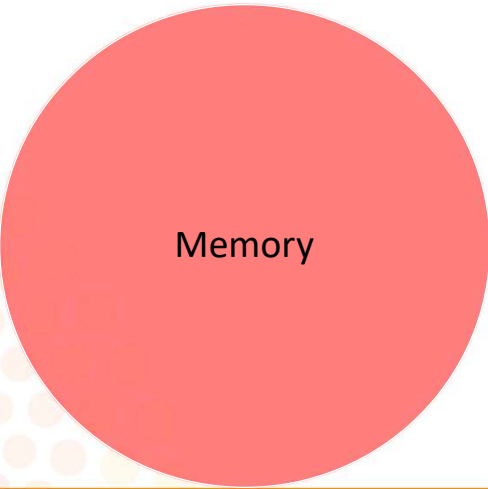
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Strategies for healing...Desktop drumming



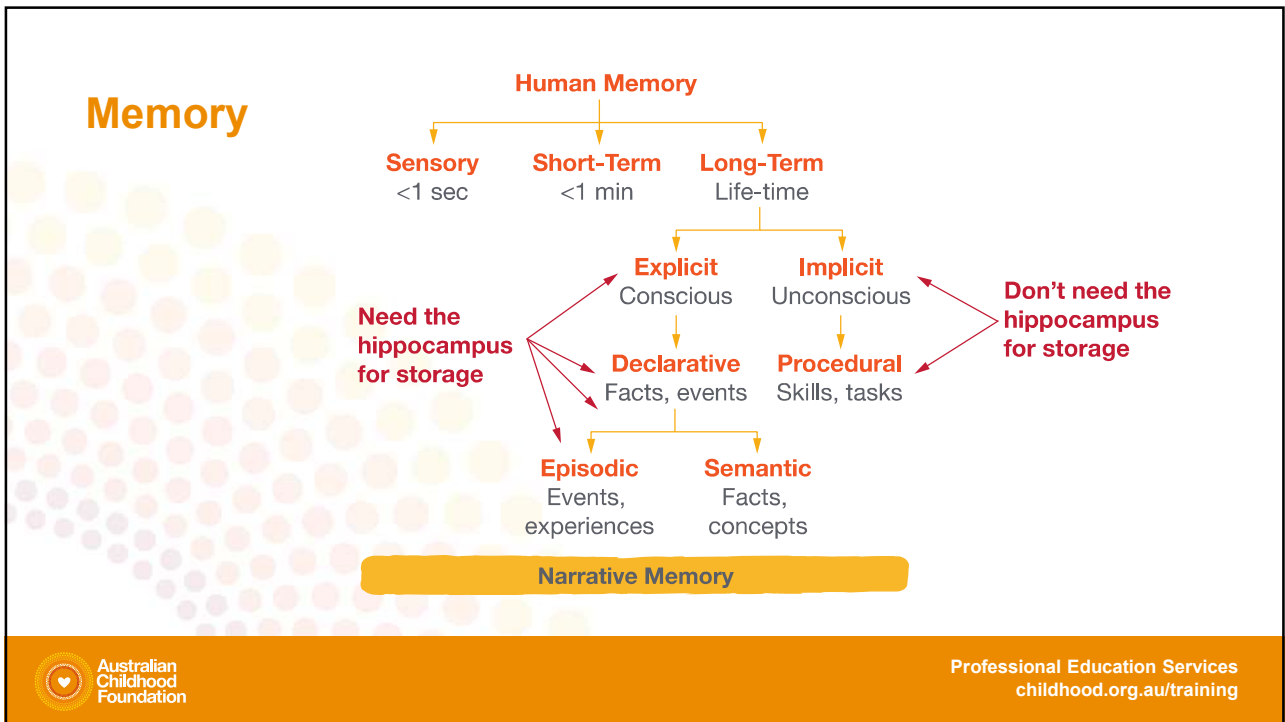
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Encoding memory

Implicit Procedural Memory

- Non-verbal
- Separate fragments
- Emotional/sensational
- Outside conscious awareness

Explicit Memory

- Develops at 2-3 years of age
- Consciously retrieved
- Eg. Autobiographical story

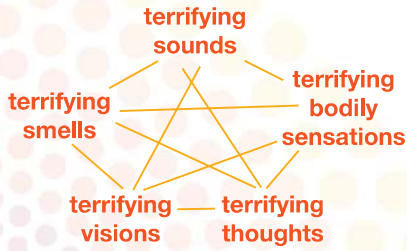
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Encoding traumatic memories

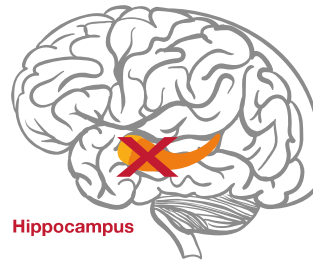
Implicit Procedural Memory

- Non-verbal
- Separate fragments
- Emotional/sensational
- Outside conscious awareness



Explicit Memory

- Develops at 2-3 years of age
- Consciously retrieved
- Explicit memory systems can become shut down when trauma is present



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Attention




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Attention – impacts of trauma

- Affects sustained and focused attention
- Focus remains on the perceived threat
- Difficulty in focussing on task at hand, listening to instructions or following directions
- Shark music – always playing



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Working with attention issues

- **Check yourself** – your body language, tone of voice, facial expressions
- **Check the environment** – reduce overstimulation
- **Know the child** and their triggers
- **Use relationship** to help the child regulate – co-regulation
- **Provide sensory tools** that the child can ground with
- Try music, song, rhythm, to calm the brain stem and reduce bottom up hijacking by the survival brain



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Neuroplasticity

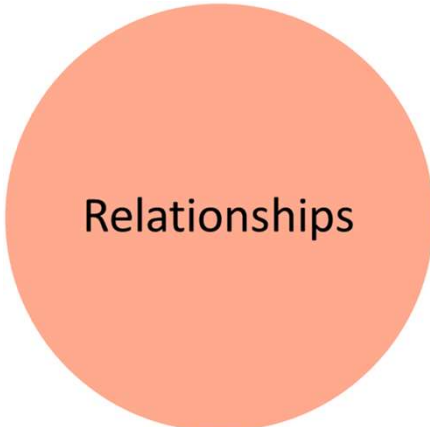



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Relationships

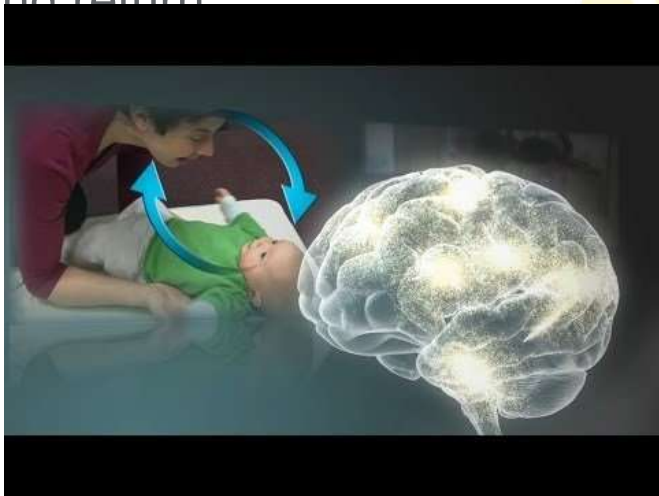


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Serve and return



https://www.youtube.com/watch?v=m_5u8-QSh6A

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Activity

“What I believe to be true about myself is...”

“What I believe to be true about relationships is...”

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Still face paradigm



<https://www.youtube.com/watch?v=bG89Qxw30BM>



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Impacts of trauma on relational systems

- Trauma is **caused by or causes an interruption to the process of dyadic regulation** through reciprocal relational engagement
- Children are **not offered opportunities to learn to re-shape their internal arousal**
- Children's interactions with violent or neglecting carers **result in the amplification of arousal levels**
- Children do not have their feelings and states noticed and acknowledged
- Children eventually learn to **ignore what they feel and what they perceive**

Impacts of trauma on relational systems

- Children develop **internal working models of relationships** which are based on threat, ambivalence, confusion and unpredictability
- **These models are often repeated** with carers, teachers, peers and other key relationships
- The relational environment fails to provide children with the **opportunity to recast these working models and develop adaptive capacity**

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I need to feel SAFE...



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Safety principles

Safety is embedded in our physiology
Safety is a relational experience
Child abuse is a deep violation of a child's sense of safety



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A hierarchical nervous system response

Safety

S= social engagement

S= mobilised play

S= immobilised for sexual intimacy



Danger

D= social engagement

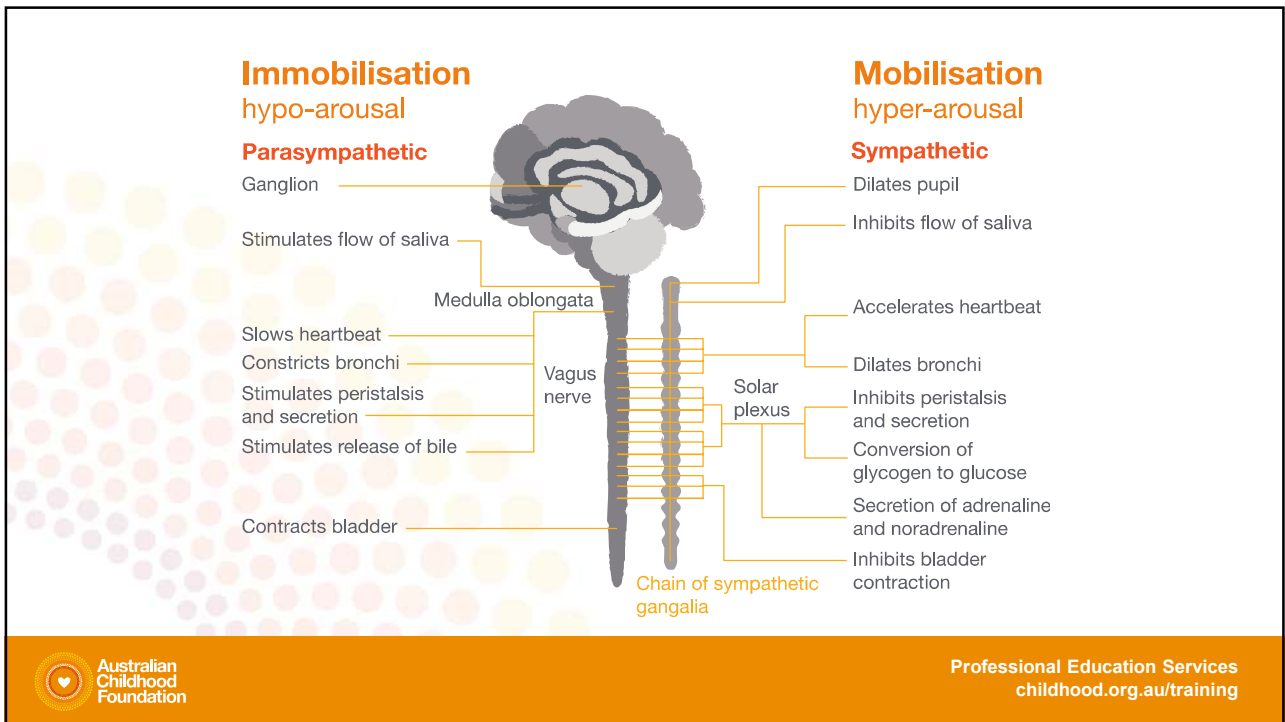
D= mobilised fear responses to threat

D= immobilised responses to threat



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Stephen Porges Polyvagal theory

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Polyvagal Theory and Protective Responses

by Stephen Porges

Behavioural Functions	Body Functions
Social Engagement Soothing and calming Indicates safety	<ul style="list-style-type: none"> • Lowers or raises vocalisation pitch • Regulates middle ear muscles to perceive human voice • Changes facial expressivity • Head turning • Tears and eyelids • Slows or speeds heart rate
Mobilisation Fight or Flight Active Freeze Moderate or extreme danger	Hyper arousal <ul style="list-style-type: none"> • Increases heart rate • Sweat increases • Inhibits gastrointestinal function • Narrowing blood vessels - to slow blood flow to extremities • Release of adrenaline
Immobilisation Collapse or submission Death feigning Increased pain threshold Conserves metabolic resources Life threatening situations	Hypo - arousal <ul style="list-style-type: none"> • Slows heart rate • Constricts bronchi • Stimulates gastrointestinal function



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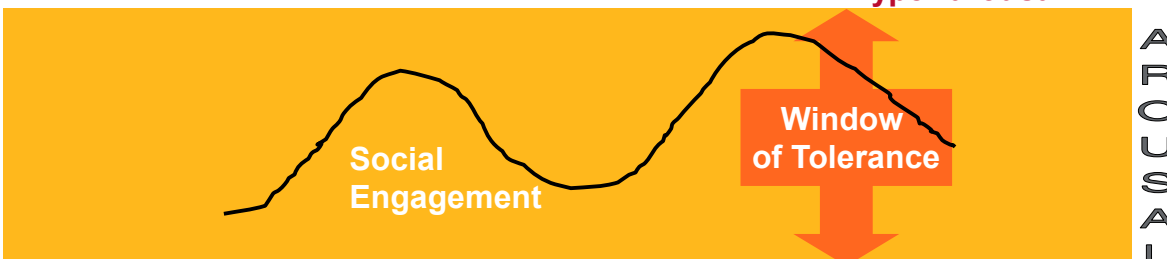
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Regulated Arousal

Fight or Flight hyper-vigilant, action-orientated, impulsive, emotionally flooded, reactive, defensive, self-destructive

Freeze Physically immobilized, frozen, tense musculature


Sympathetic Hyper-arousal



Parasympathetic Hypo-arousal

Submit Collapsed, weak, defeated, flat affect, numb, empty, helpless, hopeless

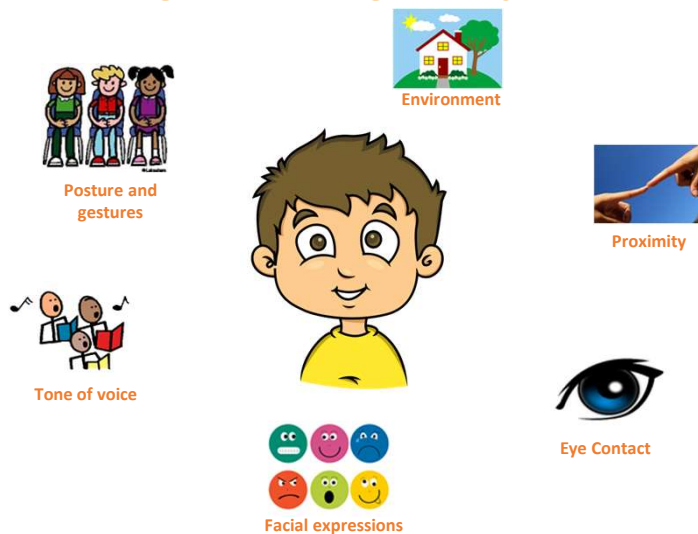
Ogden, Minton, Pain 2006



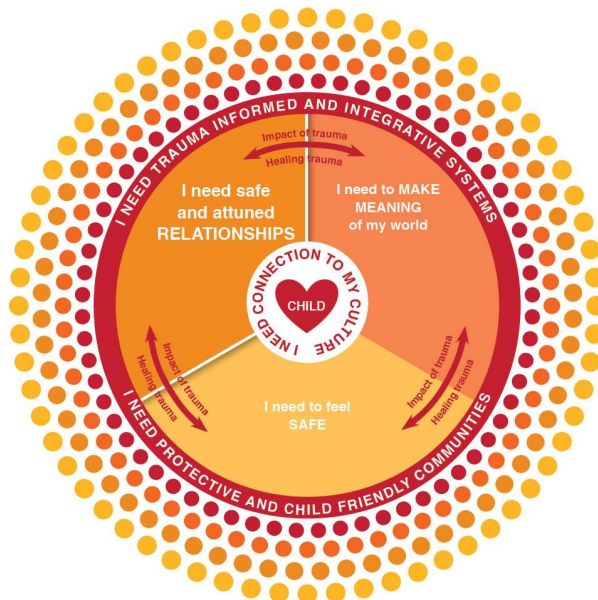
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Strategies for healing - Creating safety

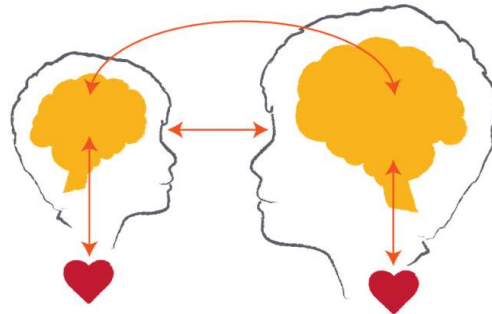


I need safe and attuned RELATIONSHIPS



The right hemisphere in relationship

- These primary relationships contribute to:
- stored internal working models of primary relationships recorded in the right hemisphere
- the perception of emotion in self and others, enabling empathy and humour.



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<https://www.youtube.com/watch?v=YAHgBAjcBbg>

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Rupture and repair

What you did is not ok, but you're still a good person and our relationship is still strong.'



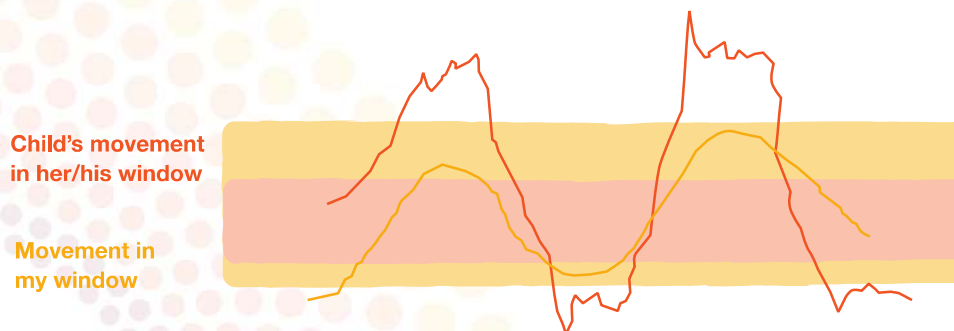
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Understanding our own Window of Tolerance

In relationships, one's ability to regulate one's window of tolerance will affect the other's ability to regulate their own window of tolerance



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The Autonomic nervous system...



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I need to MAKE MEANING of my world



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Meaning making

How children understand and make meaning of their world often occurs through what is reflected back to them through their interactions with significant adults.

If adults respond to the child's behaviour in a punitive way, it reinforces negative stories that the child has developed about themselves. These stories can be both conscious and sub-conscious (or cortical and sub-cortical).



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Self Concept: Internal templates

View of self	I am lovable I am worthy	I am unlovable I am unworthy
View of the world and relationships	Others are responsive Others are loving Others are interested in me Others are available to me The world is relatively safe	Others are unavailable Others are neglectful Others are rejecting Others are unresponsive The world is unsafe



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Trauma response patterns

To cope with trauma children use initial adaptive responses to survive

This is reasonable as a once off occurrence, but, if they continue they can become maladaptive patterns of behaviour

These responses will be different for an individual child at different developmental stages

Often a combination of appropriate developmental behaviours and maladaptive patterns of behaviour emerge



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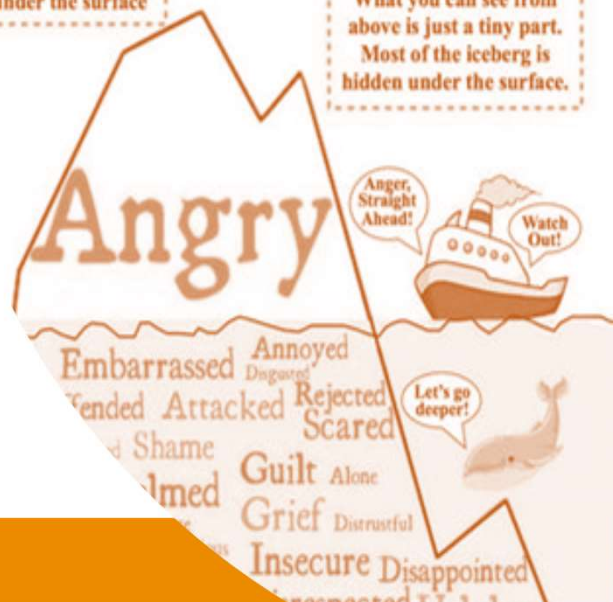
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Behaviour – narratives of trauma

- **Behaviour tells a story!**
- Traumatized children's behaviour can be difficult and complex for parents, teachers and carers to understand, manage and shape
- However, it is functional and almost always makes sense given their specific experiences of trauma
- Children's behaviour is the manifestation of the impacts of trauma outlined in the previous sections

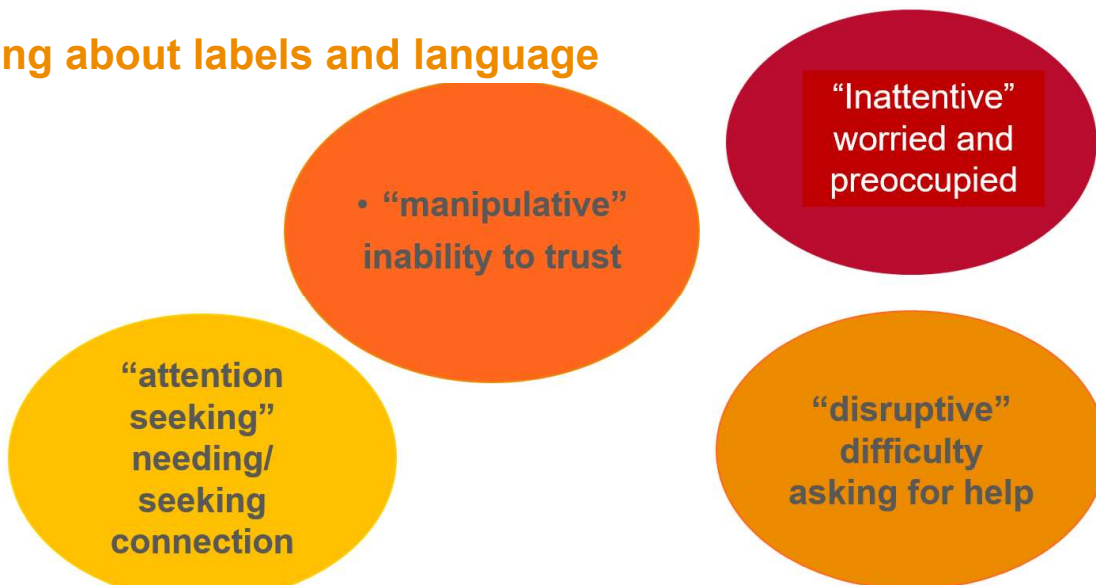
Sometimes when we are angry, there are other emotions under the surface

Icebergs are giant floating pieces of ice found in the coldest parts of the ocean. What you can see from above is just a tiny part. Most of the iceberg is hidden under the surface.




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Thinking about labels and language



- “attention seeking”
needing/
seeking
connection
- “manipulative”
inability to trust
- “Inattentive”
worried and
preoccupied
- “disruptive”
difficulty
asking for help

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Meaning making

In making meaning we want the child to understand who they are in a way that includes, but doesn't only incorporate, their experiences of trauma

And for them to know they are ok, they are loved, they are accepted no matter what trauma impacts are manifesting

We also want children to start to connect with their strengths and resources despite their struggle to engage with those positive qualities within them

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Holding the child at the centre...



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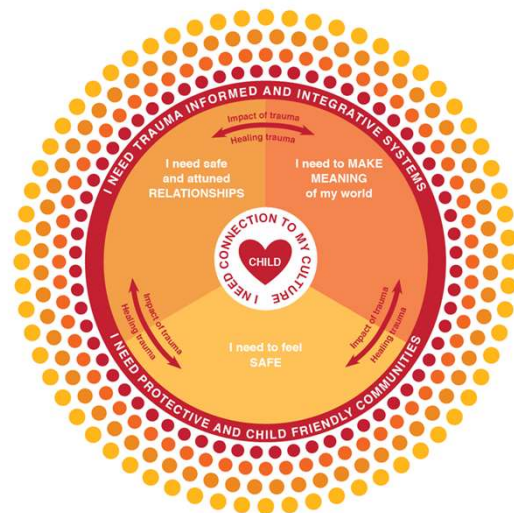
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**I need TRAUMA INFORMED
and INTEGRATIVE
SYSTEMS
and
I need PROTECTIVE and
CHILD FRIENDLY
COMMUNITIES**



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Trauma informed and integrative systems

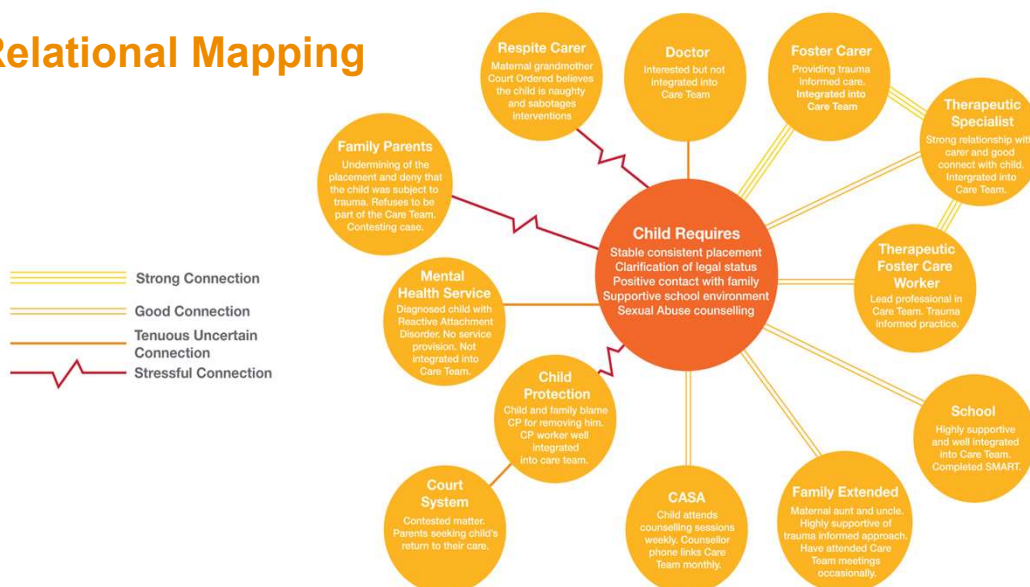
- Systems are designed and function, at all levels, with the child and young person in mind and an understanding of the core needs of children who experience trauma
- Trauma informed organisations - policies and procedures that reflect understanding and are responsive to children, young people and the impacts of trauma from intake and assessment through to closure
- Underpinned by neurobiological and environmental safety
- All relationships are therapeutic
- Child is central to all decisions and has a prominent voice in the process
- Collaborative practice is a key component of the work
- Worker wellbeing is supported – wellbeing, workloads, training, supervision and reflective practice are key components of practice



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Relational Mapping



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Supporting parents and carers

- A core aspect of the systems supporting the child are those who care for them
- They often need support and understanding to effectively respond to the child's needs
- This can be complicated by their own experiences of trauma
- Think about the principles of practice for children and young people that can also be applied to parents and carers



Care teams

- A Care Team approach provides a systems framework to drive a whole-of-practice approach to understanding, supporting and working through the needs of children and young people in a way that is child-centred, holistic and connected.
- It is much more than 'just a meeting' – it is an active working group
- The core function of the Care Team is the establishment of holistic arrangements that are explicitly geared to the needs of young people, inclusive of the wishes and goals of the young person and their family, are culturally strong, draw on theory, evidence of what works, practice wisdom and focus on making a real and sustainable difference (Macnamara, 2020).

Protective and child friendly communities

- Cultural and societal views of children as valued and in need of protection
- Safe spaces for children and young people
- Legislative processes that protect children
- Policies and procedures that ensure the safety and protection of children from organisations through to churches, sporting clubs and playgroups, for example.
- Environmental safety – clean air, access to natural spaces, play areas



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Caring for ourselves

- Working with traumatised children and families is hard work and can lead to us experiencing vicarious trauma
- This work can challenge our sense of self, beliefs about the world and our core values
- Neurobiologically, we cannot co-regulate others if we cannot regulate ourselves
- **Caring for ourselves is an essential part of our work**



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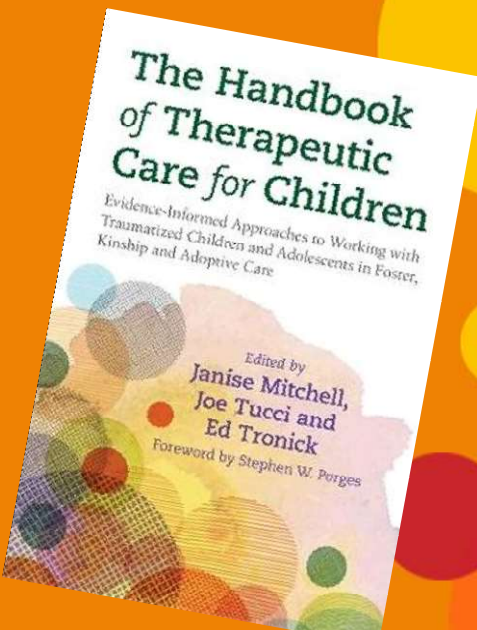
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A valuable resource

Includes chapters from:

- Martin Teicher
- Ed Tronick
- Allan Schore
- Bruce Perry
- Dan Hughes & Jon Baylin
- Kim Golding
- Cathy Malchiodi
- Joe Tucci
- Janise Mitchell
- Glenda Kickett
- Noel Macnamara




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Find additional resources at:
<https://professionals.childhood.org.au/resources/>
<https://professionals.childhood.org.au/covid-19/>



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