



Babygro

Babygro Book

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Written and designed by Amanda Lucas.

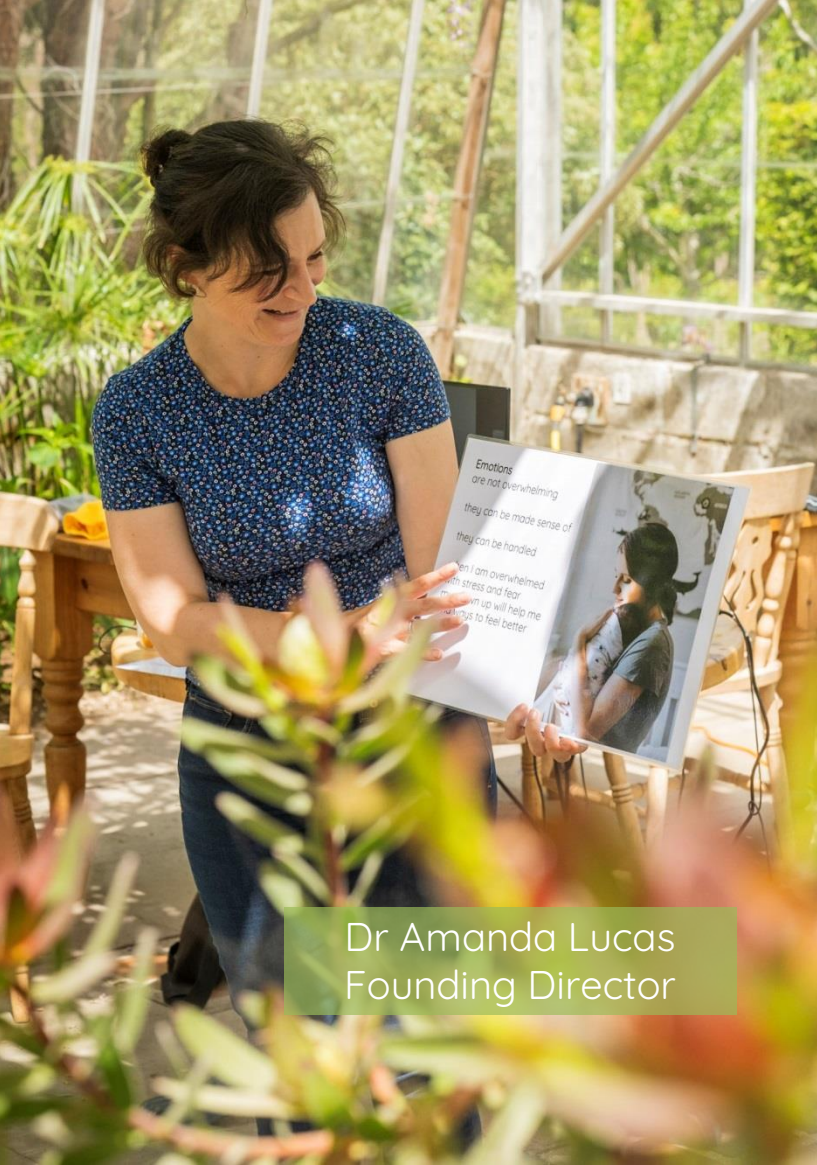
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Dr Amanda Lucas
Founding Director

While lecturing on infant development at the University of St Andrews, I became a mother myself.

I came to understand, first hand, how challenging and relentless - as well as extraordinary and life-affirming - it is to care for a new baby.

I was shocked at how much misinformation was circulating in guide books and on the internet, and confounded by cultural pressures to do things in certain ways.

Later, as a mother of two, I founded Babygro as a charity.

Our aim is to empower parents by bringing them trusted, evidence-based information that enables them to feel reassured and confident in their parenting choices.



Dr Pascal Vrticka
Social Neuroscientist and Lecturer
Babygro Associate Trustee

‘Together with a team of international collaborators, we work towards better understanding the biological and brain basis of human social relationships. In so doing, we are especially interested in caregiving and attachment.

Most recently, our efforts have led to the formulation of the first functional neuro-anatomical model of human attachment (NAMA).’

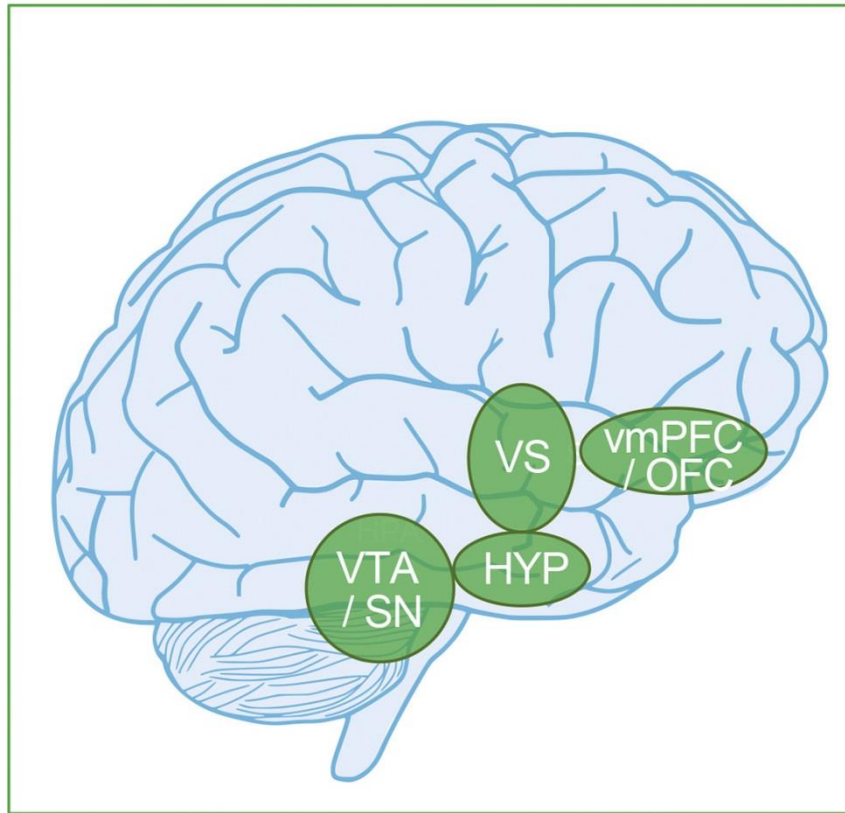
‘As we become more confident in our ability to explain how our bodies and brains orchestrate caregiving and attachment behaviours, it is important to translate our findings for the benefits of as many parents as possible.

*This Babygro Book does exactly that.
It was a great pleasure and honour to contribute to its realisation.’*

How to use this book

- The first section of this book illustrates, in images, four important networks of the brain, as they develop in a typical, healthy child, who has been enriched with CHATS:
 - Connection Network p6
 - Stress-Fear-Pain Network p15
 - Regulation Network p23
 - Self & Other Network p33
- The second section introduces CHATS:
 - Five elements of parent-and-baby communication that lead to healthy brain development and optimal later-life outcomes p46
 - **C**ues p50
 - **H**istory p64
 - **A**ttachment p68
 - **T**alk p93
 - **S**ynchrony p99

Connection Network



HYP = hypothalamus
vmMPF/OFC =
ventromedial
prefrontal/orbitofrontal
cortex
VS = ventral striatum
VTA/SN = ventral
tegmental area /
substantia nigra

Connection Network

- Also known as the ‘reward’ or the ‘approach’ network, this system provides feelings of intense pleasure and reward in response to holding, touch, eye contact, smiles and social interaction.
- It also provides:
 - feelings of safety
 - the instinct to reach out to others for help when needed
 - the drive to be curious and exploratory
 - feelings of wellbeing, delight and joy
- This network of the brain resides mostly in the ‘limbic system’, the emotional heart of the brain. It is functional from birth (although it develops throughout childhood), and is common to all mammals.
- This means that babies, from birth, are full of feelings!

Oxytocin

(The Love Hormone)

nurturing
trust
cosiness
safety



Dopamine (The Reward Hormone)

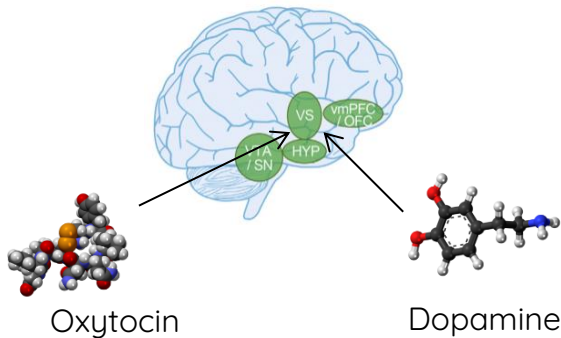


pleasure motivation feel-good effort

Oxytocin & Dopamine

receptors
coupled together
in the brain
make

Social Interaction Rewarding



Oxytocin

nurturing
calm
peaceful
safe

Dopamine

intensity
vigour
seeking social contact
interactive rhythms



Oxytocin



Serotonin

The Happy Hormones

Endorphins



Dopamine



While Oxytocin and Dopamine underpin the rewarding feelings that accompany social interaction, other feel-good hormones - including Serotonin and Endorphins - are also associated with the Connection Network

happiness
mood
calm
serenity

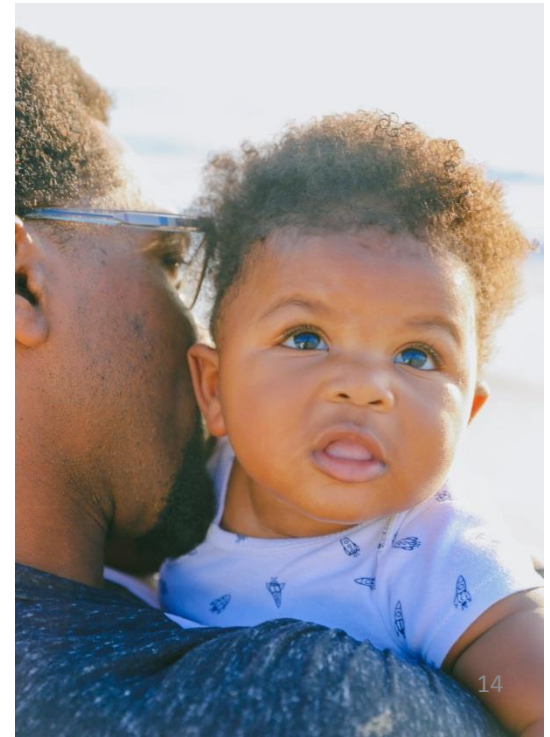


Serotonin
(The Wellbeing Hormone)

euphoria
joy
elation
delight



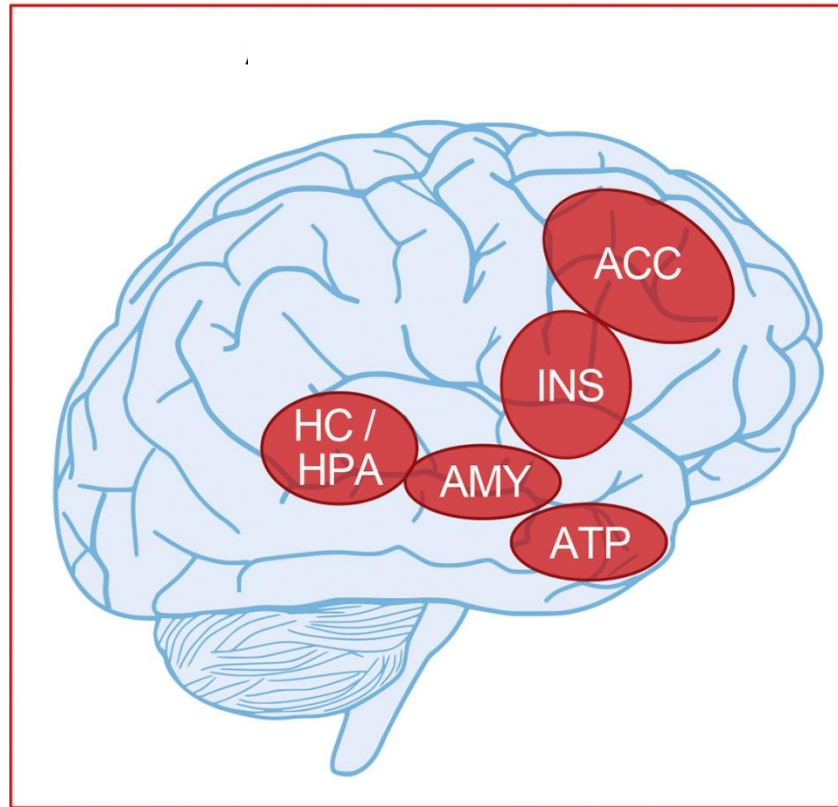
stress
reducing
pain
relieving



Endorphins

(Excitement & Pain Alleviating Hormones)

Stress-Fear-Pain Network



ACC = anterior cingulate cortex
AMY = amygdala
ATP = anterior temporal pole
HC/HPA = hippocampus/hypothalamic-pituitary-adrenal axis
INS = insula

Stress-Fear-Pain Network

- The Stress-Fear-Pain Network controls the release of hormones which prepare baby's body to respond to perceived threats. It is activated in response to separation, unfamiliar/unexpected events, boredom, discomfort or pain.
- Over time, the Stress-Fear-Pain Network can become:
 - **over-reactive**. Too frequent or prolonged activations may result in intensified feelings in times of distress, and background feelings of anxiety in times of calm.
 - **under-reactive**. Too intense or chronic activations may result in blunted feelings and a lack of responsiveness.
 - **optimally-reactive**. Activations in response to everyday stressors that are soothed by a responsive caregiver, result in background feelings of well-being (from the Connection Network) during times of calm.
- Activation of the Stress-Fear-Pain Network is a healthy response to distress that helps babies to communicate their needs. We cannot always prevent it, but we can respond to it.

tired? over-aroused? craving sensory change?
hungry? wet/dirty?
craving contact? lonely?



wind/digestion? uncomfortable?
too hot? too cold?

overflowing
intense
incomprehensible
feelings



spectrum of upset feelings



grimacing, grunting, jerky movements,
flushing, grizzles, frowns

Cortisol (The Stress Hormone)



Increases
Blood Sugar,
Heart Rate and
Breathing



Slows
Digestion and
Immune System

Cortisol mobilises bodily resources for a rapid response to threats. It also slows down systems that are non-essential in an emergency.

It is important to remember that some cortisol is necessary and healthy. Optimal levels keep babies alert, and ensure they respond appropriately to distress when it does occur.

fight flight freeze

is a healthy, proportional response to an
EMERGENCY

Calming and reassuring babies/toddlers when there is no emergency will help them to *(eventually)* develop a healthy, proportional response to everyday stressors.



In healthy development, there is a 'Push-Pull'
between the Stress-Fear-Pain Network and the Connection Network...



...when one is activated, the other is de-activated

Regulation Network



DLPFC = dorsolateral
prefrontal cortex
LOFC = lateral
orbitofrontal cortex

Regulation Network

- Situated in the Frontal Cortex, this network is 'newer' than the more primitive limbic system (home of the Connection and Stress Networks)
- It is responsible for:
 - coping with emotions
 - choosing appropriate responses or behaviours
- This network is completely undeveloped at birth, meaning that babies are unable to control their feelings or plan their behaviour.
- The development of this network involves repeated instances of 'co-regulation,' whereby parents label their babies'/children's emotions, help them to understand and cope with their feelings, and support them in finding ways to feel better.
- Eventually, after many repeated instances of co-regulation, children begin to adopt conscious strategies for managing their feelings and behaviour.

*soothing baby
shows them
that...*



...emotions

are not overwhelming

they can be made
sense of

they can be handled

when I am overwhelmed
with stress and fear
my grown up will help me
find ways to feel better

Co-Regulation

The strategies on the following pages for helping toddlers, children (and adults) cope with feelings, are not learned by children on their own.

Rather, they are practised through many repetitions of ‘Co-Regulation’, whereby a responsive caregiver helps a child ***find ways to feel better.***

It is important to remember that the *stronger* the feelings of stress, the *less efficiently* the child’s Regulation Network operates, and the more ‘Co-regulation’ is needed.

Eventually, after years of practice with their caregivers, children will learn to use these strategies to manage daily stressors independently.

walk away



breathe





redirect



talk about
feelings



problem
solve



Tell kinder stories to
yourself...



...in which your
cup becomes...

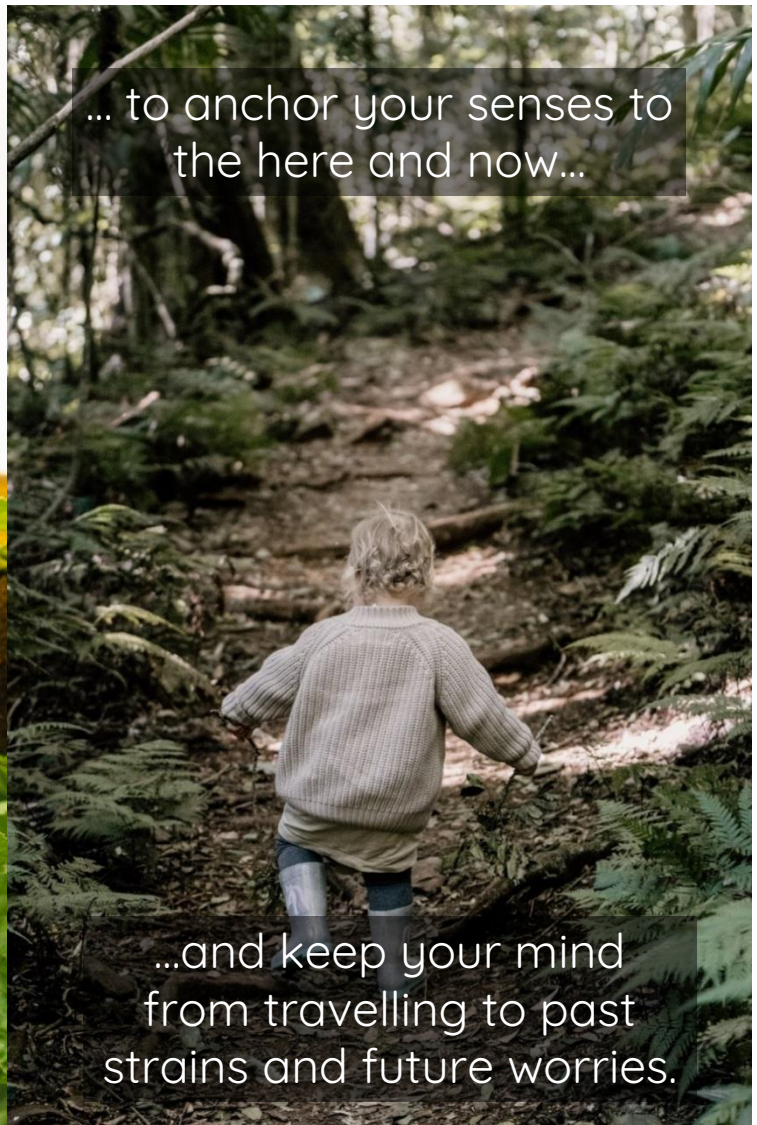
...half full



mindfulness



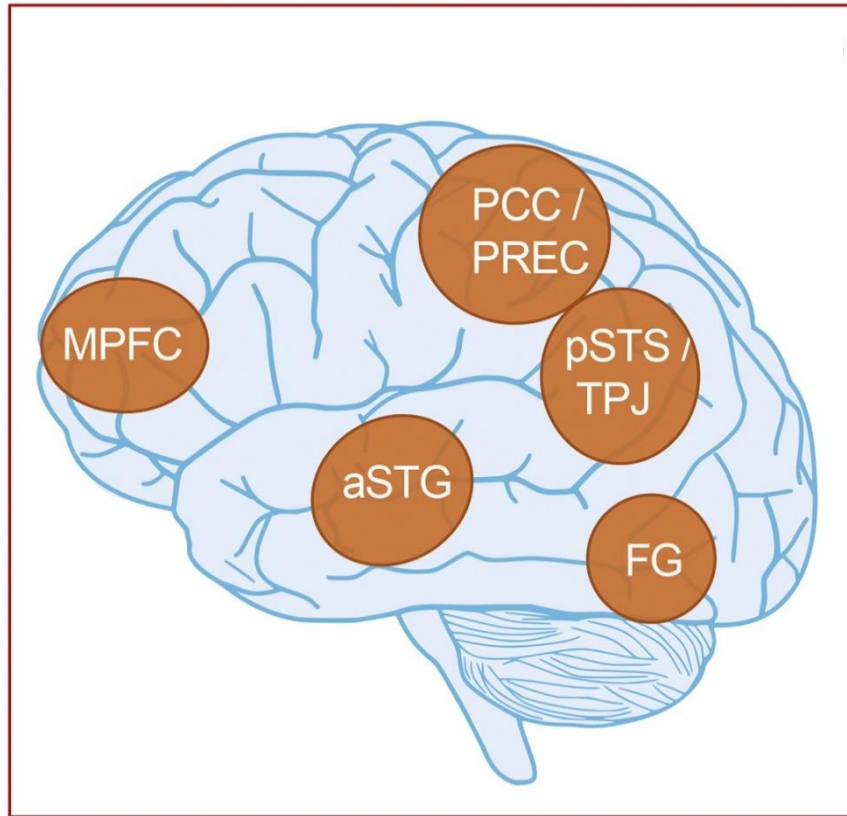
be present
in small moments...



... to anchor your senses to
the here and now...

...and keep your mind
from travelling to past
strains and future worries.

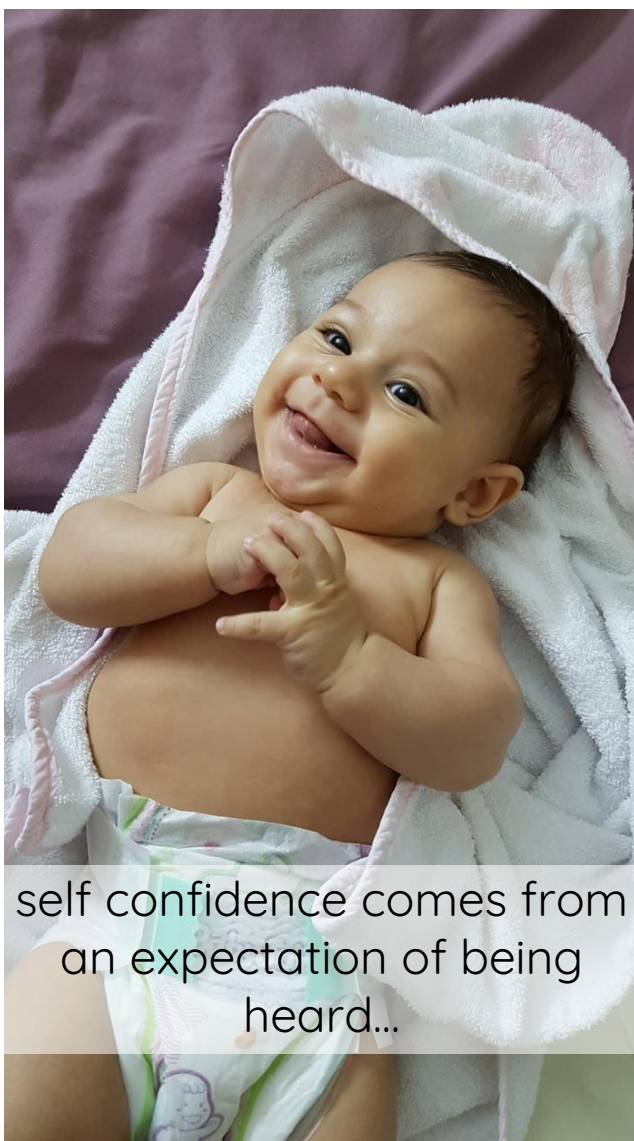
Self & Other Network



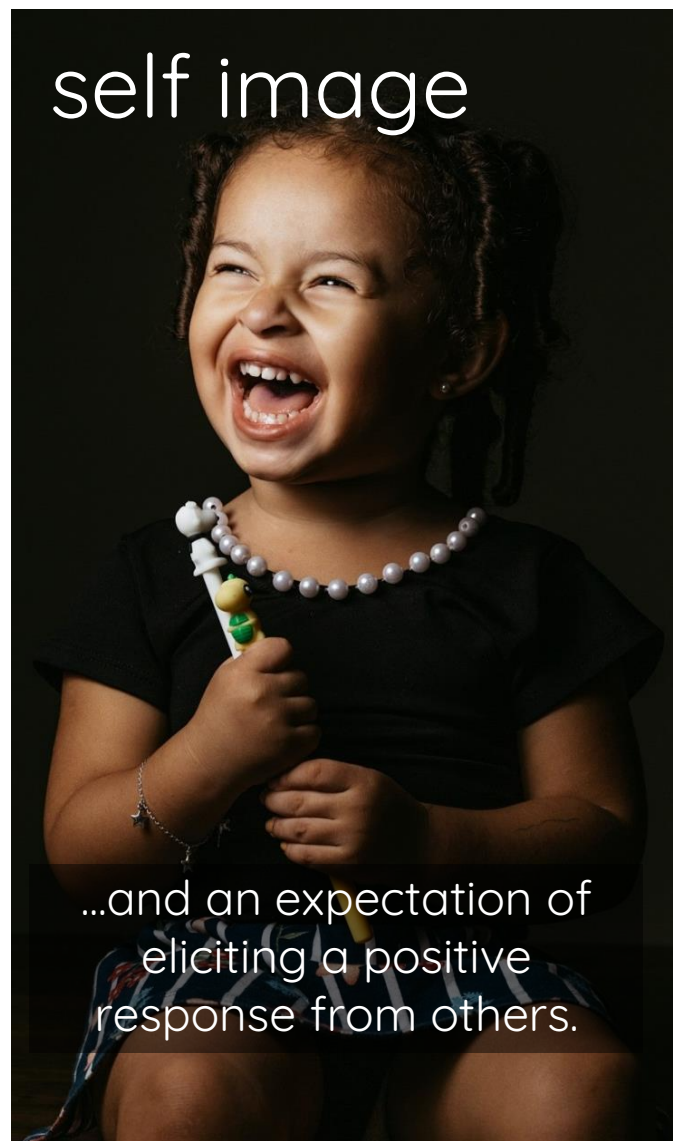
aSTG = anterior superior temporal gyrus
FG = fusiform gyrus
MPFC = medial prefrontal cortex
PCC/PREC = posterior cingulate cortex/precuneus
pSTS/TPJ = posterior superior temporal sulcus/temporo-parietal junction

Self & Other Network

- This network governs how babies/toddlers perceive themselves and what they expect from others.
- It's optimal development (through CHATS - see next section) enables babies and toddlers to see the world through the eyes of other people.
- This underpins their capacity for empathy, cooperation and taking the perspectives of others.
- The Self & Other Network also acts to promote group cohesion and a sense of belonging to one's 'tribe'.



self confidence comes from
an expectation of being
heard...



self image

...and an expectation of
eliciting a positive
response from others.

other image

A group of approximately ten children and one adult are standing in a grassy field, holding up a large rainbow flag. They are all smiling and looking towards the camera. The background shows a blue sky with scattered white clouds and a line of green trees in the distance. The overall atmosphere is bright and positive.

others are viewed as helpful and cooperative,
with good intentions.

How the Self & Other Network Develops

Through responding sensitively to babies' cues and communications (see 'Cues', in next section on CHATS) they develop a positive image of themselves and an expectation of cooperation from others.

Through partaking in turn-taking, non-verbal, exchanges (see 'Synchrony', in next section on CHATS) babies come to understand that they can emotionally affect, and be affected by, others.

Through talking to babies about what they may be thinking or feeling (see 'Talk', in next section on CHATS) they begin to make sense of their own and others' feelings.

Together, these three elements of CHATS tune babies and toddlers in to the feelings, needs, interests and goals of others.

This enables a capacity for empathy,
and motivates cooperation.

A photograph of two young children standing in the shallow ocean waves at sunset. The child on the left is a girl with long blonde hair, wearing a colorful, patterned one-piece swimsuit. The child on the right is a boy with short brown hair, wearing denim overalls. They are holding hands and looking at each other. The background shows the ocean and a hazy coastline under a warm, golden sky.

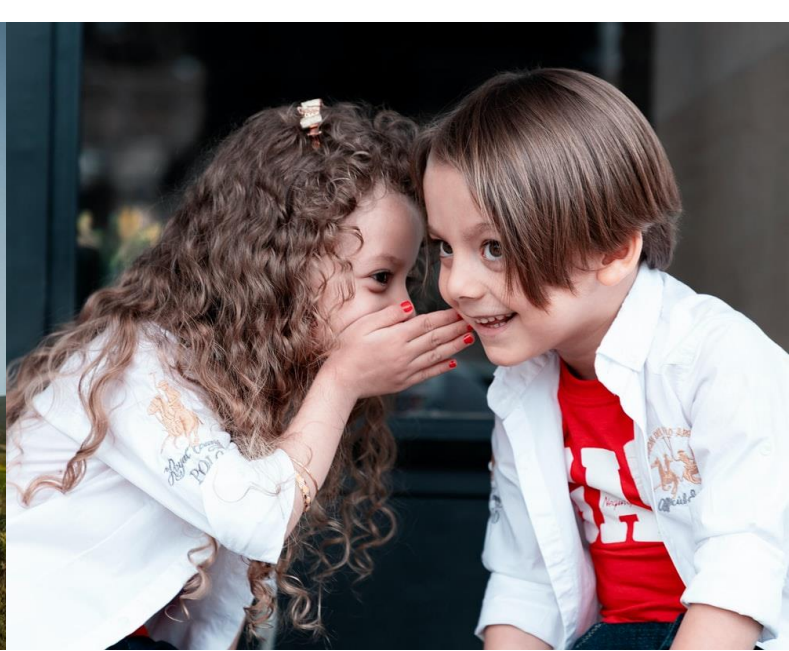
exchanging emotions

*being
affected by
and
affecting
another's feelings*

reading
body
language

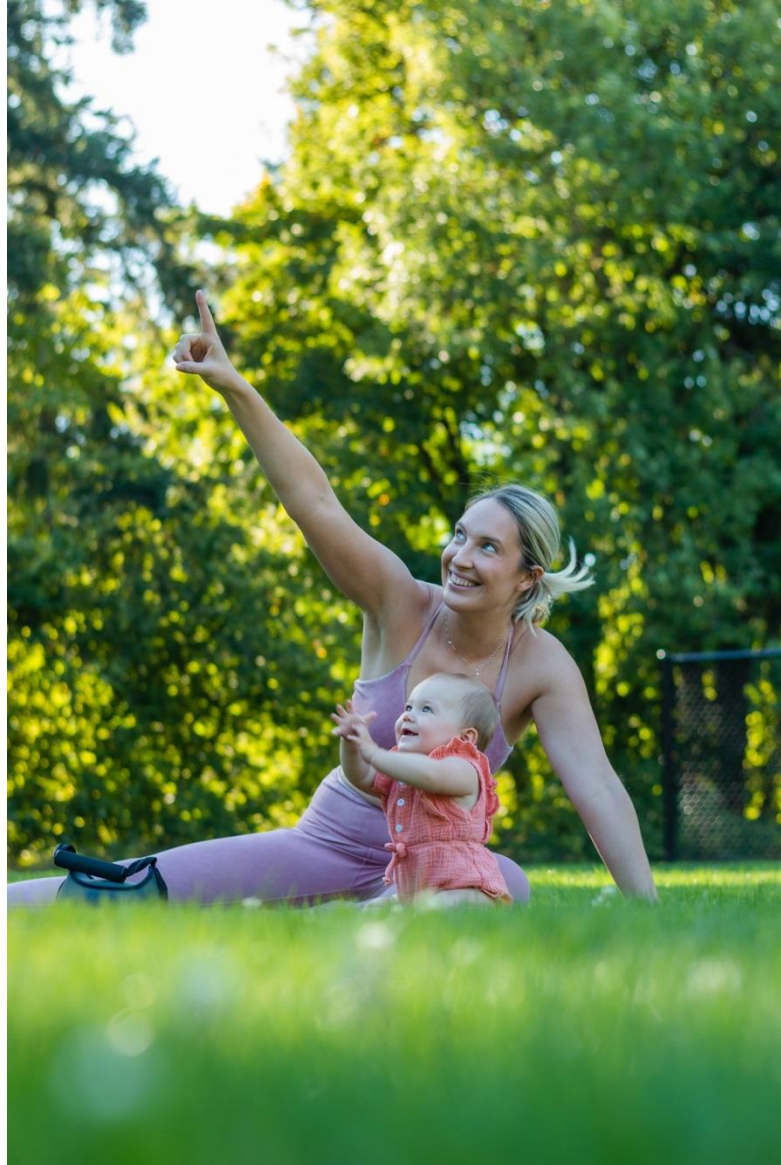


engaging
in non-verbal
communication



understanding others'
feelings
needs
desires
beliefs

sharing
attention
and
interest



aligning with
others'
goals



joint
purposes
and
shared
meaning



cooperation

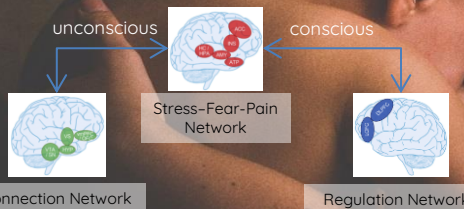


The brain networks working together

in a typical, healthy child, who has been enriched with CHATS

in response to
STRESS

in response to
OTHERS

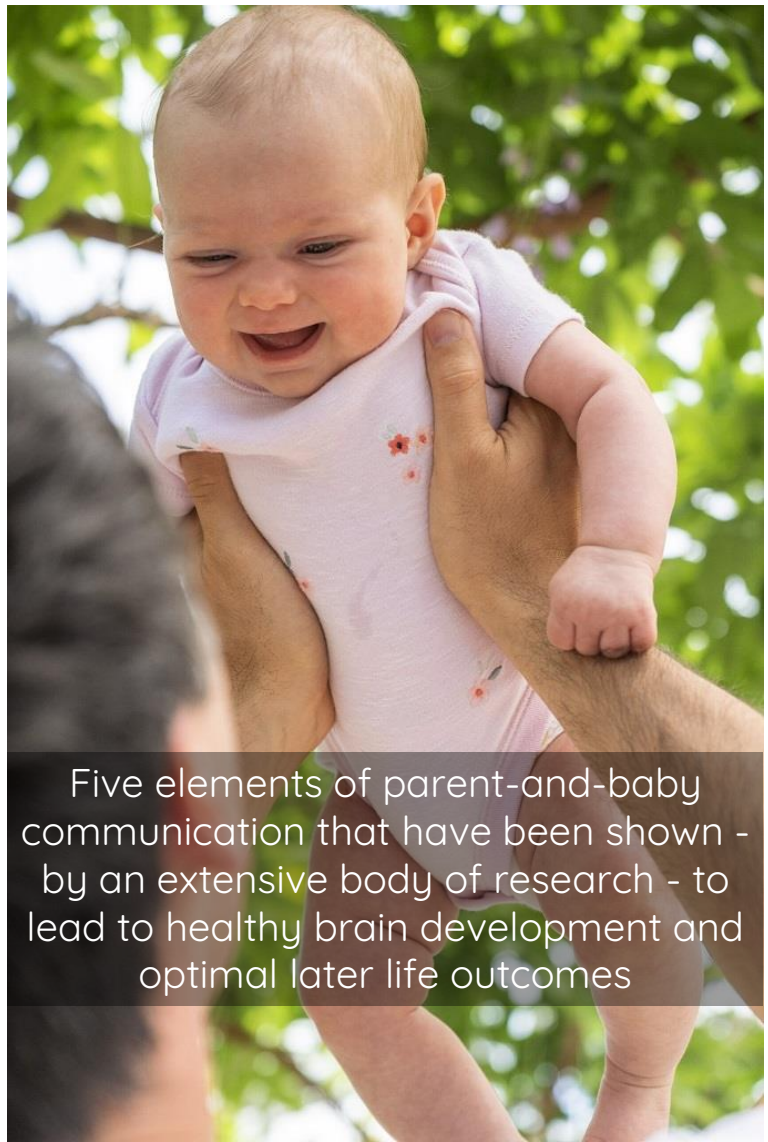


The *unconscious* response to stress is for the Connection Network to be activated and for the child to seek out comfort in others. The *conscious* response to stress is to attempt to regulate feelings and behaviour using strategies that have been previously practised (through co-regulation) with a sensitive caregiver. Both routes lead to deactivation of the Stress Network



Social interaction with caregivers activates the Connection Network and is experienced as intensely rewarding. Non-verbal communication, underpinned by the Self & Other Network, is effortless and flowing. The child naturally aligns with the feelings, needs and goals of others and feels motivated to cooperate. They have developed a confident image of self, and an expectation of validation and support from others

- Cues
- History
- Attachment
- Talk
- Synchrony



Five elements of parent-and-baby communication that have been shown - by an extensive body of research - to lead to healthy brain development and optimal later life outcomes

CHATS

These five elements of parent-and-baby communication have been shown, through a comprehensive body of work stretching back over 50 years, to link to optimal life outcomes.

Such outcomes relate to the ability to maintain deep and committed relationships and a sense of connection to others.

They also include a capacity for compassion, the ability to take the perspectives of others and the willingness to help and cooperate.

Further, these outcomes comprise measures of physical and mental health, including resilience to stress and wellbeing.

Indeed the biggest predictor of mental health conditions in children is the number of Adverse Childhood Events (ACEs) that a child has experienced.

Examples of ACEs are living in a family with financial difficulties, moving home or school, grief, family illness, parental separation or witnessing domestic abuse.

Research consistently shows that parent-and-baby relationships enriched with CHATS buffer and protect against the effects of ACEs, limiting their impact on mental health.

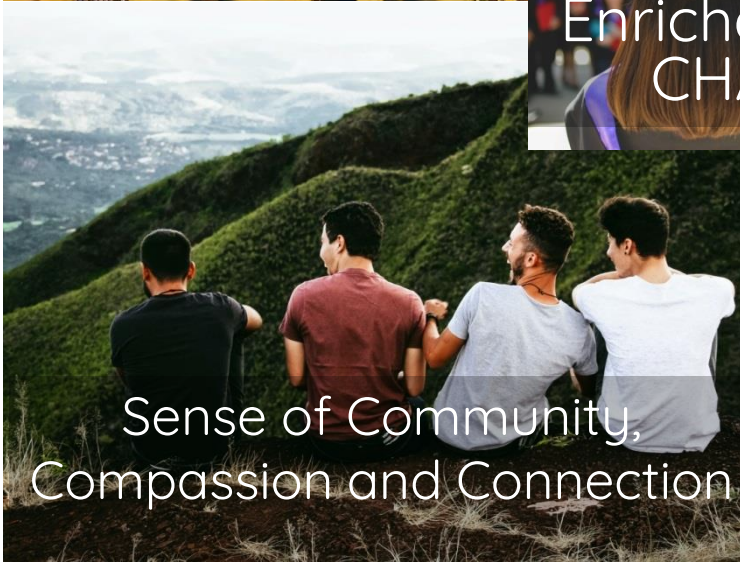
Deep and Lasting Relationships



Resilience



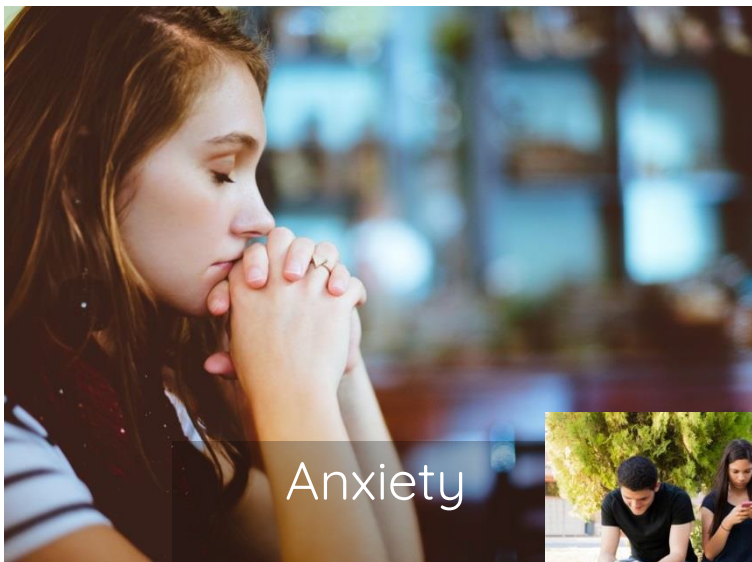
Enriched with CHATS



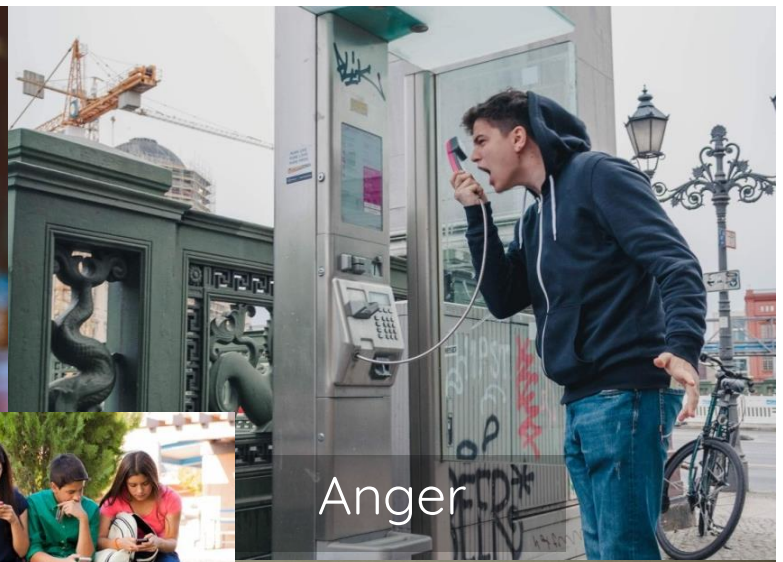
Sense of Community, Compassion and Connection



Flexibility & Positivity in the Face of Stress



Anxiety



Anger



Lacking in CHATS



Difficult Relationships



Depression

Cues

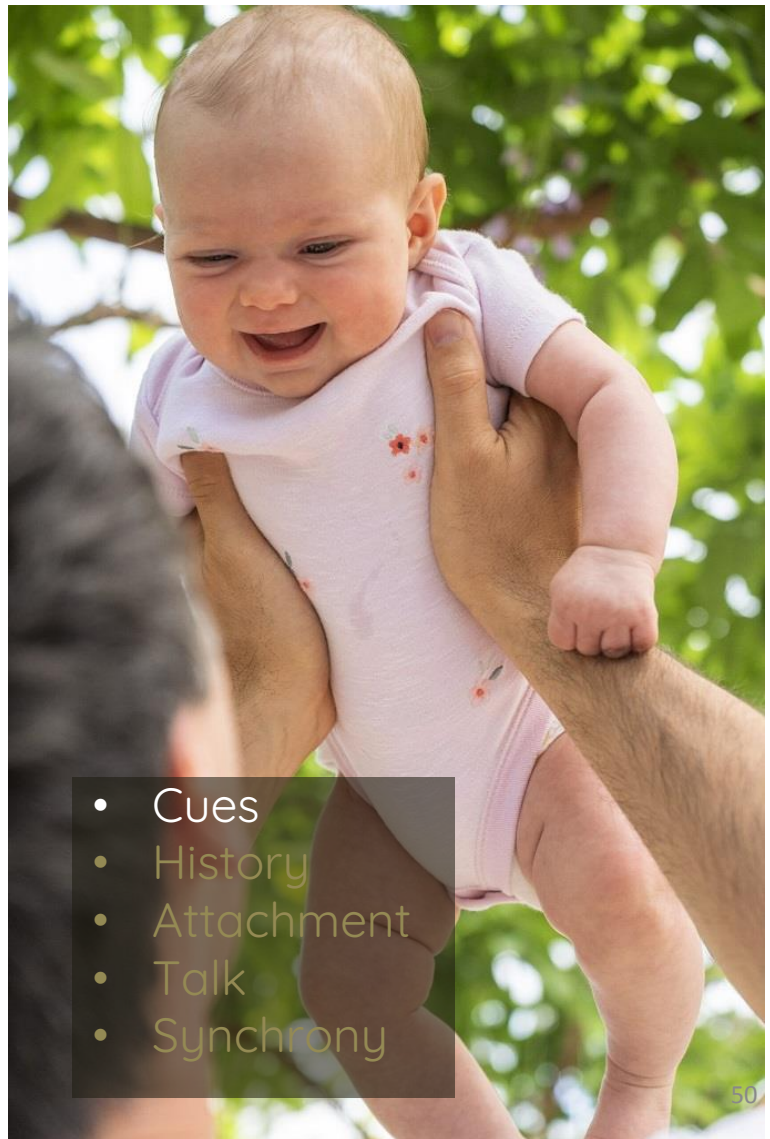
Reading and responding to baby's cues and communications

Look through the following pictures and think about:

What is baby is trying to communicate?

What would your response be?

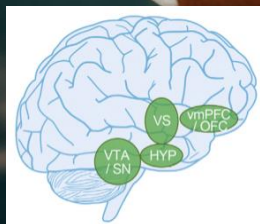
How satisfied is baby with the response they received?



- Cues
- History
- Attachment
- Talk
- Synchrony

Comforting baby
when distressed...

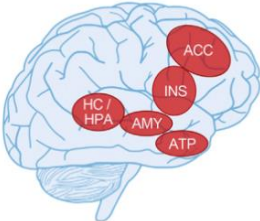
...and encouraging curiosity
and exploration when they
show interest...



Connection
Network

...rewards the brain with hormones
that help baby to feel safe on one
hand, and a capacity for learning and
joy on the other.

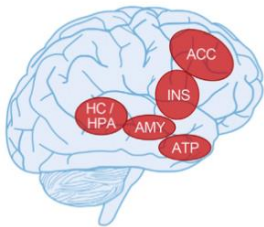
Responding to babies' smallest cues and communications...



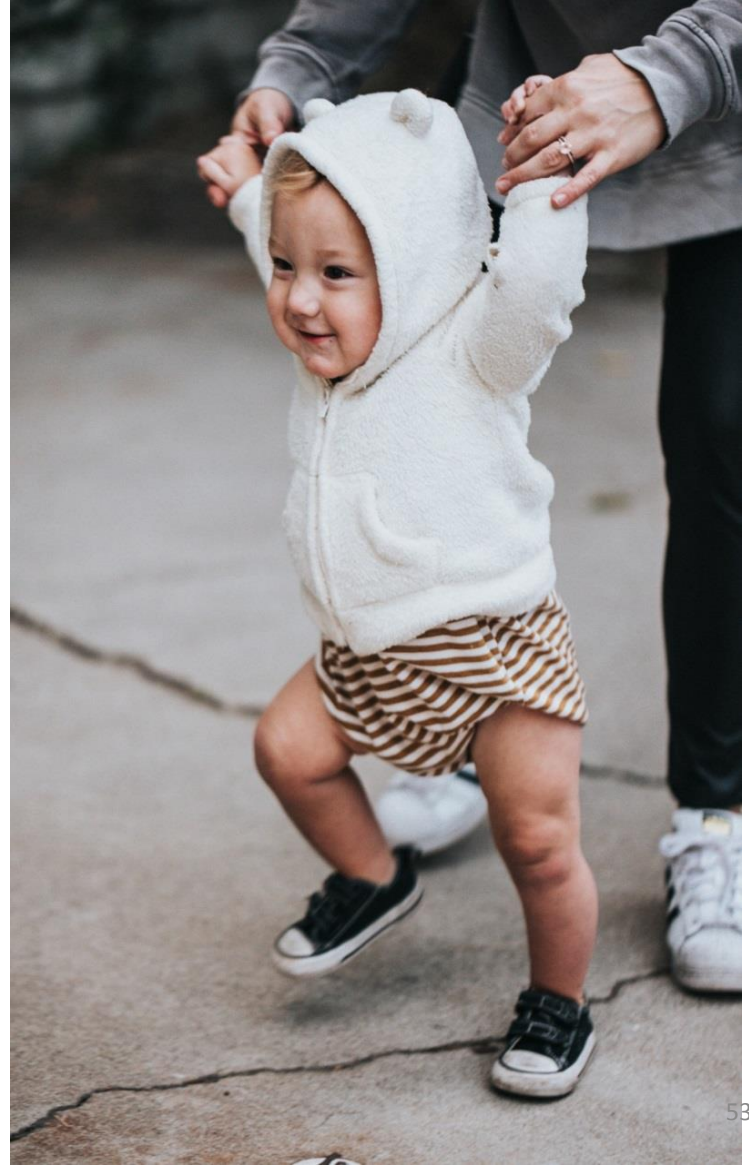
Stress-Fear-Pain Network



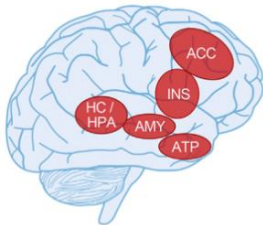
...moderates development of the Stress Network, as they learn they have the power to elicit help.



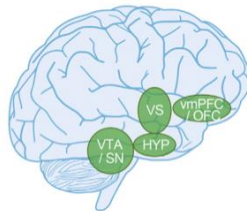
Stress-Fear-Pain Network



Over repeated instances, set points for daily cortisol are reduced and set points for ‘Happy Hormones’ (from the Connection Network) are increased, leading to background feelings of happiness and wellbeing.

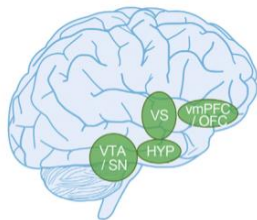


Stress-Fear-Pain
Network

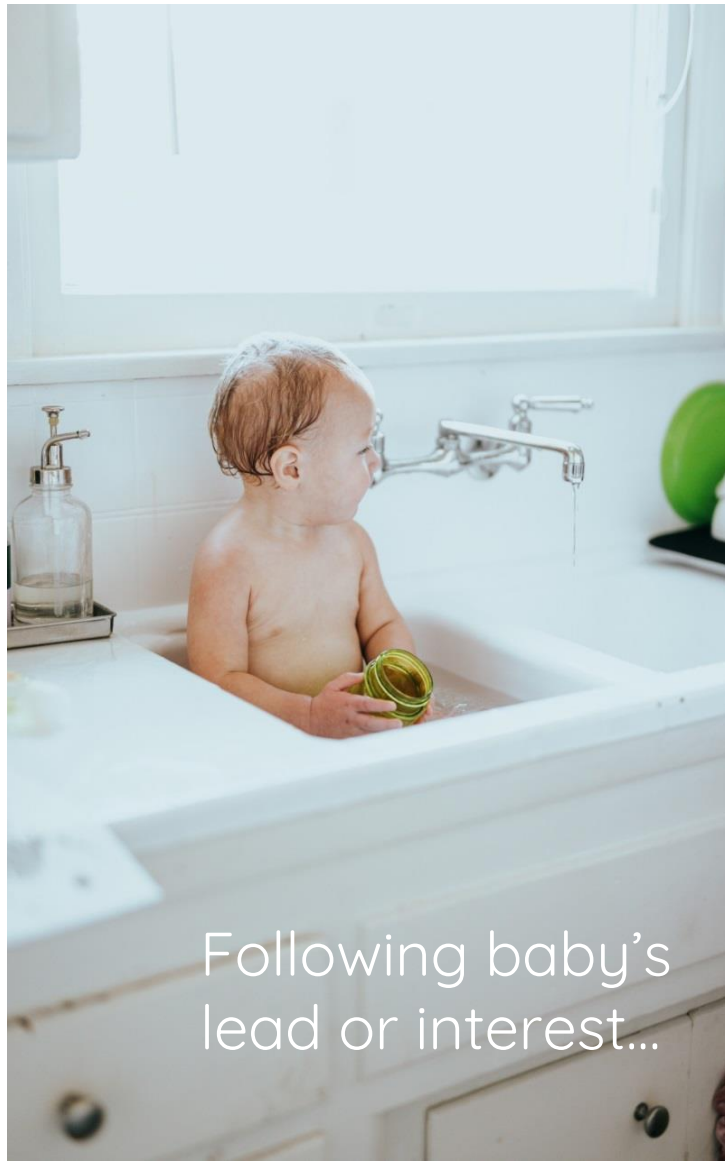


Connection
Network

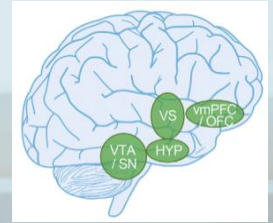




Connection
Network

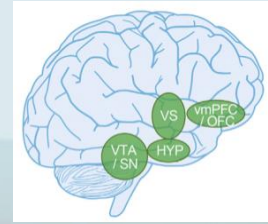


Following baby's
lead or interest...



Connection
Network

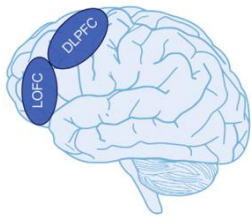
...and encouraging
curiosity...



Connection
Network

...activates
hormones
involved in
autonomy,
learning, and
pleasure.

Showing babies that their emotions can be expressed and understood...

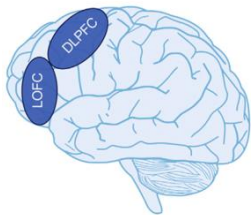


Regulation
Network

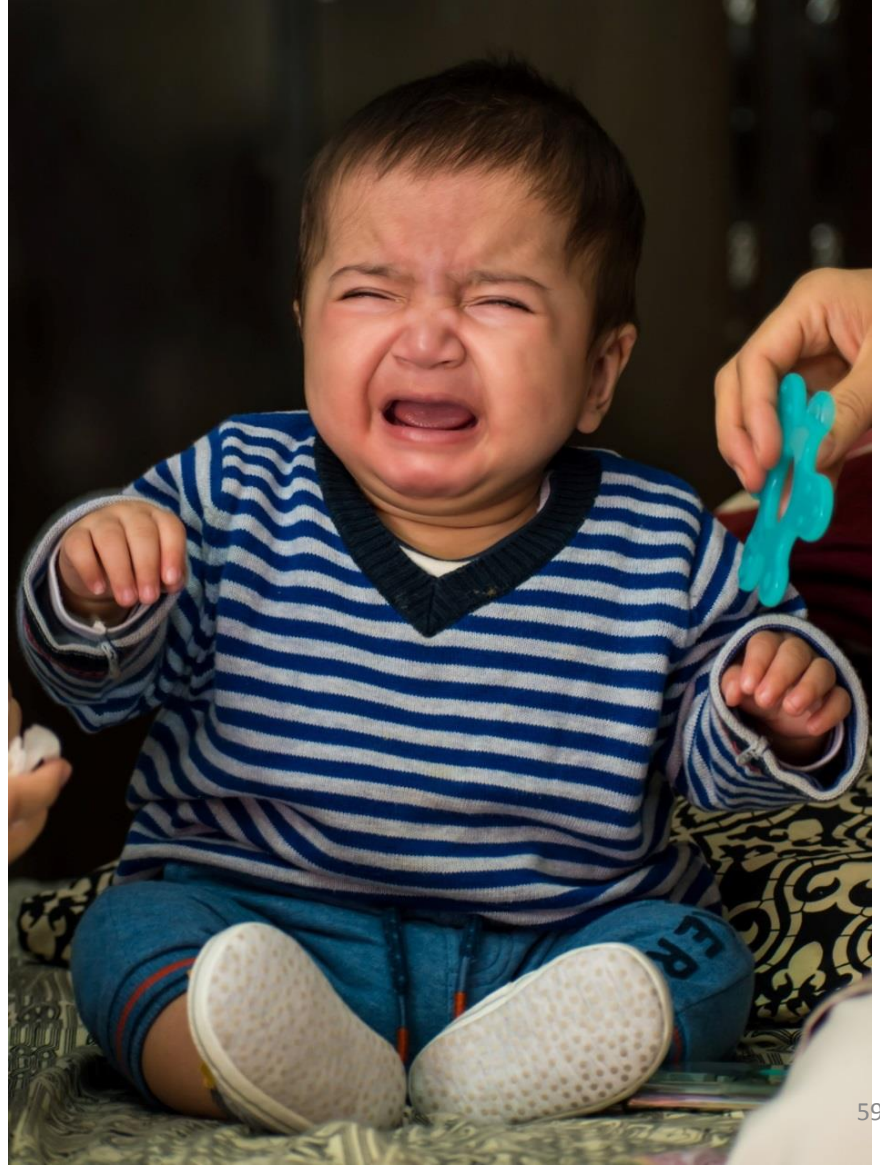


...that their feelings
need not be
overwhelming

that even when
things go wrong,
there are ways to
feel better
together...

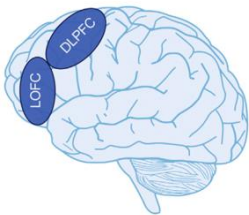


Regulation
Network



...helps them to develop resilience

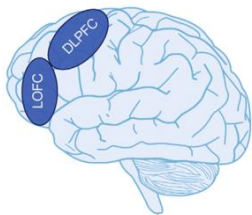
an assurance that they can cope with and have some control over their emotions and their circumstances throughout life.



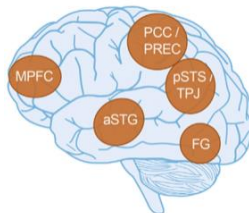
Regulation Network



Healthy communication is not about being perfectly attuned...



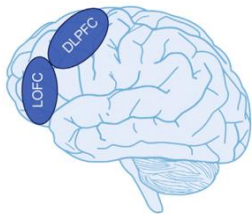
Regulation Network



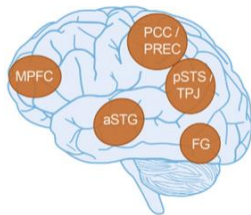
Self & Other Network



...there are often ruptures...



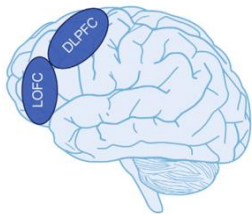
Regulation Network



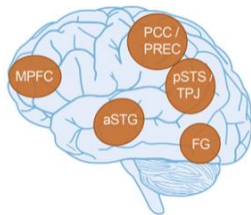
Self & Other Network



...and repairs.



Regulation
Network



Self & Other
Network



These build trust and
confidence that things can
always be made right

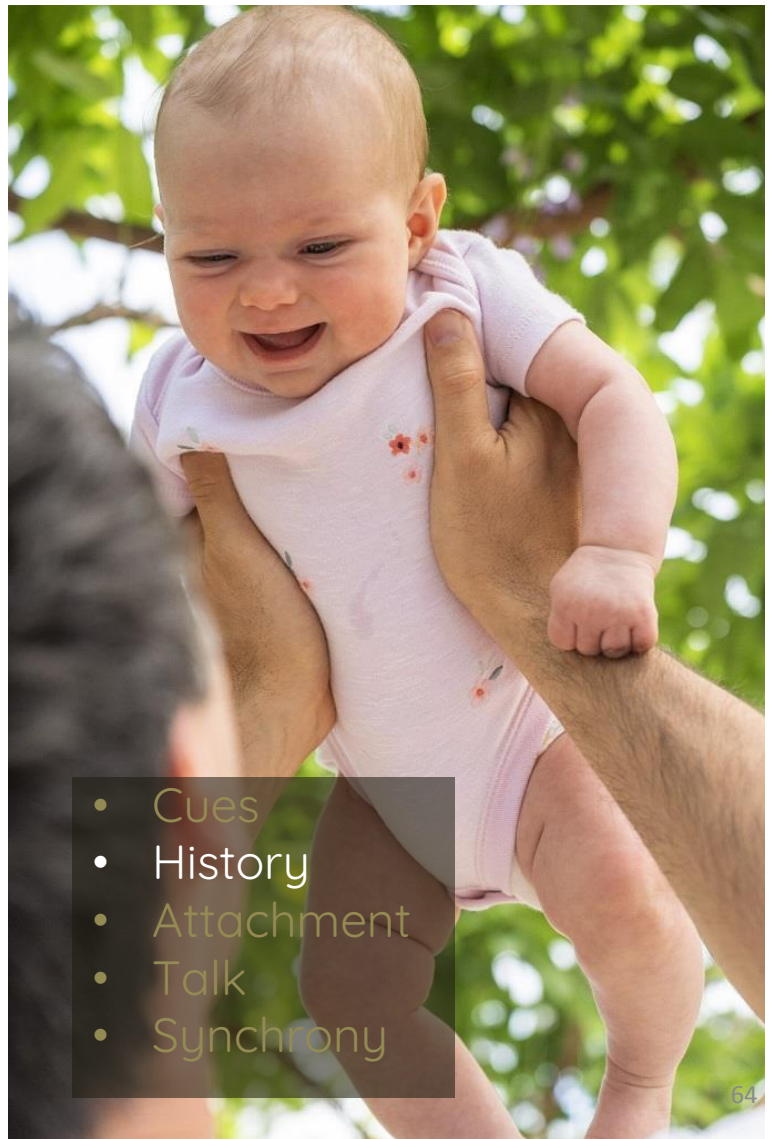
History

Making sense of your early relationship with your own parents

Look through the following questions and think about what your responses would be.

Perhaps talk through your answers with a close friend or loved one.

- Cues
- History
- Attachment
- Talk
- Synchrony



Adult Attachment Interview



- I'd like to ask you to choose five words that reflect your relationship with your mother (father) starting from as far back as you can remember in early childhood.
- The first word you used was... Can you think of a memory or an incident that would illustrate why you chose that word to describe the relationship?
- In general, how do you think your overall experiences with your parents have affected your adult personality?

George, C., Kaplan, N., & Main, M. (1996).
Adult attachment interview.

Secure (Coherent)



Insecure (Incoherent)



Our relationships with our parents need not, necessarily, directly impact our relationships with our children. Rather, it is how we make sense of those early relationships that matters.



Even if we ourselves did not receive an optimal dose of CHATS, reflecting on how this has made us into the people we are today, helps us to take positives forward into our relationships with our own children

Attachment

Attachment is a measure, in developmental research, of the relationship between parent and baby

Babies who are enriched with CHATS are those who are most likely to be **Securely Attached** and their brain development will proceed as in the first section of this book.

Babies who are – to greater or lesser degrees - not enriched with CHATS are those who are most likely to be **Insecurely Attached.**

In what follows, we can see how the brains of these babies may develop differently.



- Cues
- History
- Attachment
- Talk
- Synchrony

Attachment Styles

Secure



55-60%
of the population

Avoidant



30%
of the population

Anxious



10-15%
of the population

← Insecure →

Avoidant Attachment

Pushes away feelings

Pushes away other people



Dismissive or Detached

An Avoidant Attachment style arises from 'Dismissive' or 'Detached' parenting whereby the baby/toddler - to varying degrees - is left to deal with their own feelings or has their feelings denied.

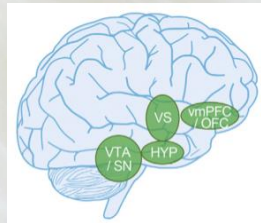
This is often well-intentioned and comes about through misinformation about how to best promote independence.

There is often a misconception that babies/toddlers use their big feelings or 'tantrums' to manipulate adults.

baby or toddler discouraged from expressing 'big feelings' and when they do, these feelings are not validated



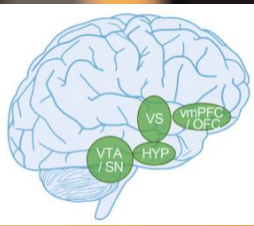
stop seeking comfort



Connection Network



When baby's subtle communications are not responded to they learn - to greater or lesser degrees - that they must deal with stress alone. They become *under-reliant* on the Connection Network.



Connection
Network

self contained

Connection with others is
experienced as
less rewarding

Rather than seek out help,
they are inclined to deal with
problems alone

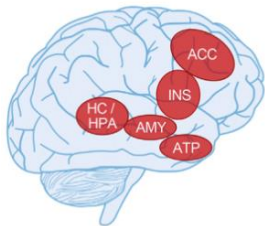
During times of distress, those with an Avoidant Attachment Style work very hard to de-activate the Stress Network

(using 'Self-Regulation' Strategies, illustrated on the following pages).

These strategies are often only partially successful, and when stress is felt, it may be felt more keenly than those who are Securely Attached.

Conversely, some social stressors that are known to be painful to the majority of people – rejection and exclusion – are felt less keenly by Avoidants.

Indeed, one aim of de-activating the Stress Network for Avoidants, is to reduce the chances of approach or help from others - which in itself, may be experienced as stressful.

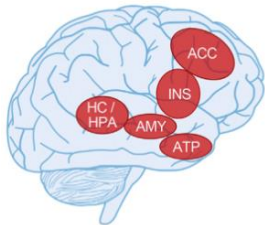


Stress-Fear-Pain
Network



de-activate

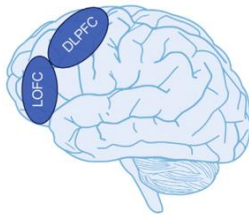
During times of calm, those with an Avoidant Attachment Style may experience background feelings of vigilance and anxiety, rather than wellbeing.



Stress-Fear-Pain
Network

Since baby has dealt, and must deal, with small or not-so-small stressors and feelings on their own, the Stress Network becomes heightened for early detection.

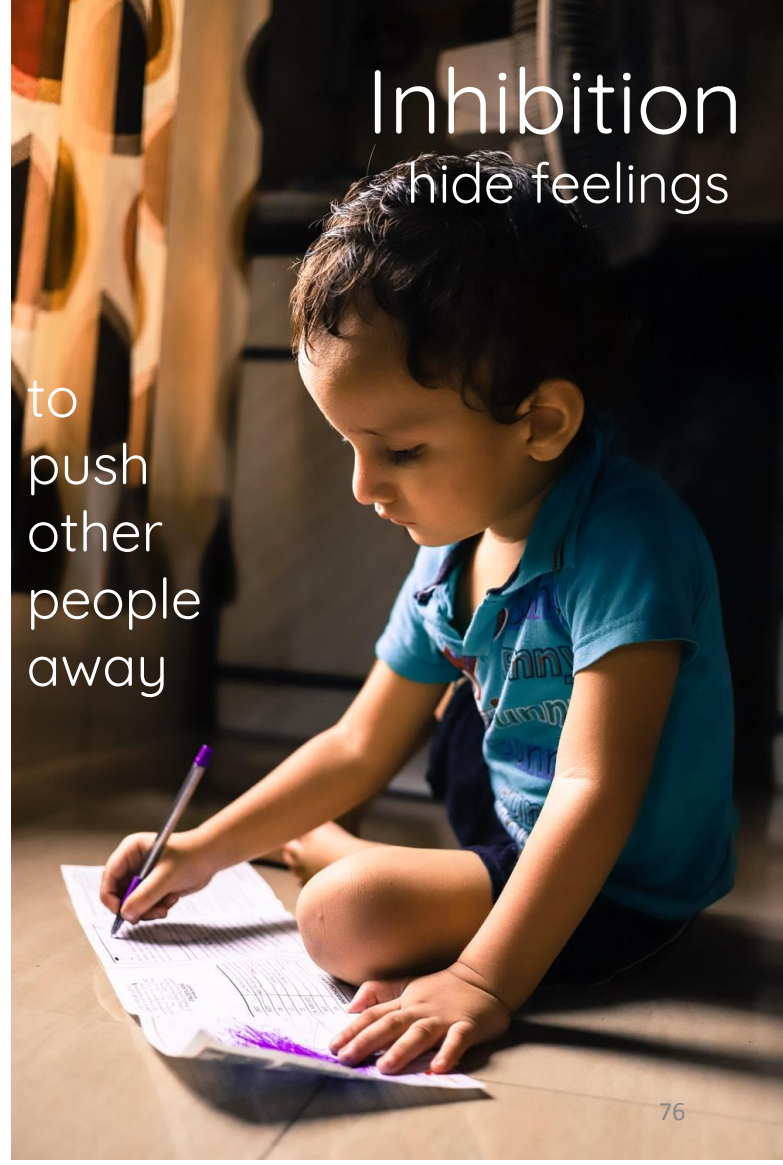
Without co-regulation
from a responsive
caregiver,
less-than-optimal
'self-regulation'
strategies are
developed
in an attempt
to reduce stress



Regulation Network

Inhibition hide feelings

to
push
other
people
away



Avoidance



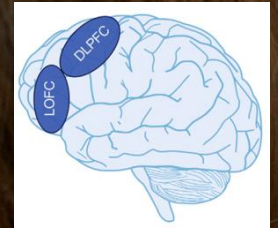
Regulation Network

less exploration
less curiosity
less discovery

When others cannot be relied on to help manage stress, situations that may pose a threat are avoided

Suppression

push away feelings



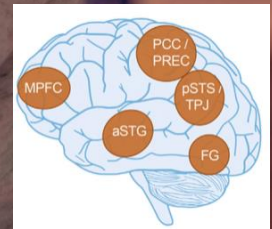
Regulation Network

In order to reduce stress, feelings are pushed away, rather than talked through and worked through

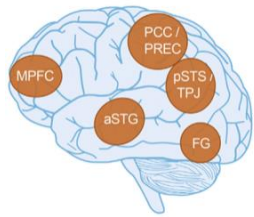
Self image

don't expect to be heard

less confidence
in ability to elicit
positive or
empathic
responses
from others



Self & Other Network



Self & Other Network



Other image

untrusting

If self-regulation strategies (suppression, inhibition, avoidance) are somewhat successful in managing stress, then self-image may be fairly positive. There is a sense, however, that one must look out for oneself. Others are viewed as unhelpful, with negative intentions.

Anxious Attachment

Expresses big feelings
intensely

Appears clingy or needy

Becomes easily upset
or angry with other people



Intrusive or Inconsistent

An Anxious Attachment style arises from 'Intrusive' parenting, whereby the caregivers interactions with the baby/toddler are - to varying degrees - led 'by the clock' or solely directed by the caregiver.

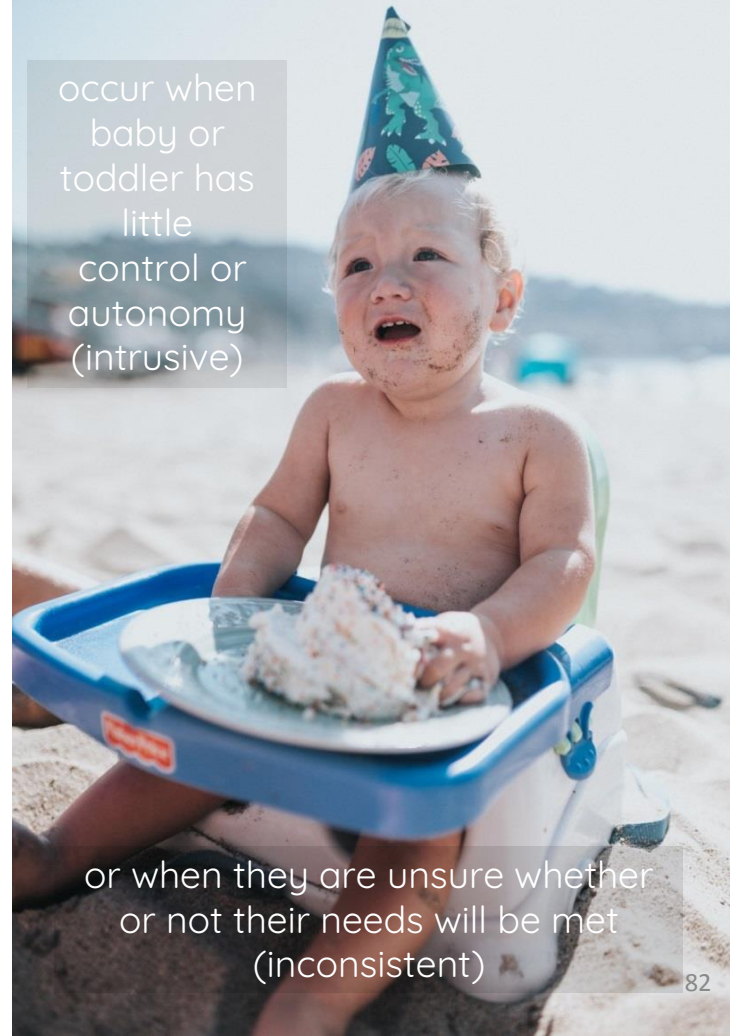
At the same time, the baby's own 'cues' or communications are often missed or misread.

This is often well-intentioned and comes about through a belief in the need for strict routines.

Anxious Attachment also comes about through 'Inconsistent' responses to baby's/toddler's communications - sometimes their needs are met, often they are not.

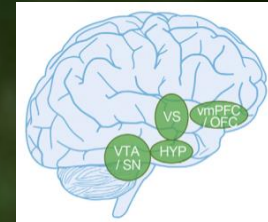
feelings of helplessness

occur when baby or toddler has little control or autonomy (intrusive)



or when they are unsure whether or not their needs will be met (inconsistent)

vigilant
to caregiver presence

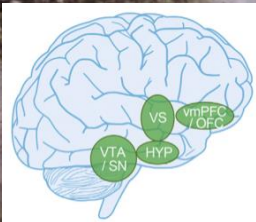


Connection
Network

Lack of autonomy and feelings of helplessness lead to
over-reliance on caregiver presence,
even though needs are often not met

'attention seeking'?

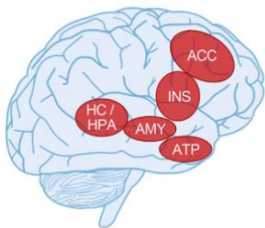
or attachment seeking



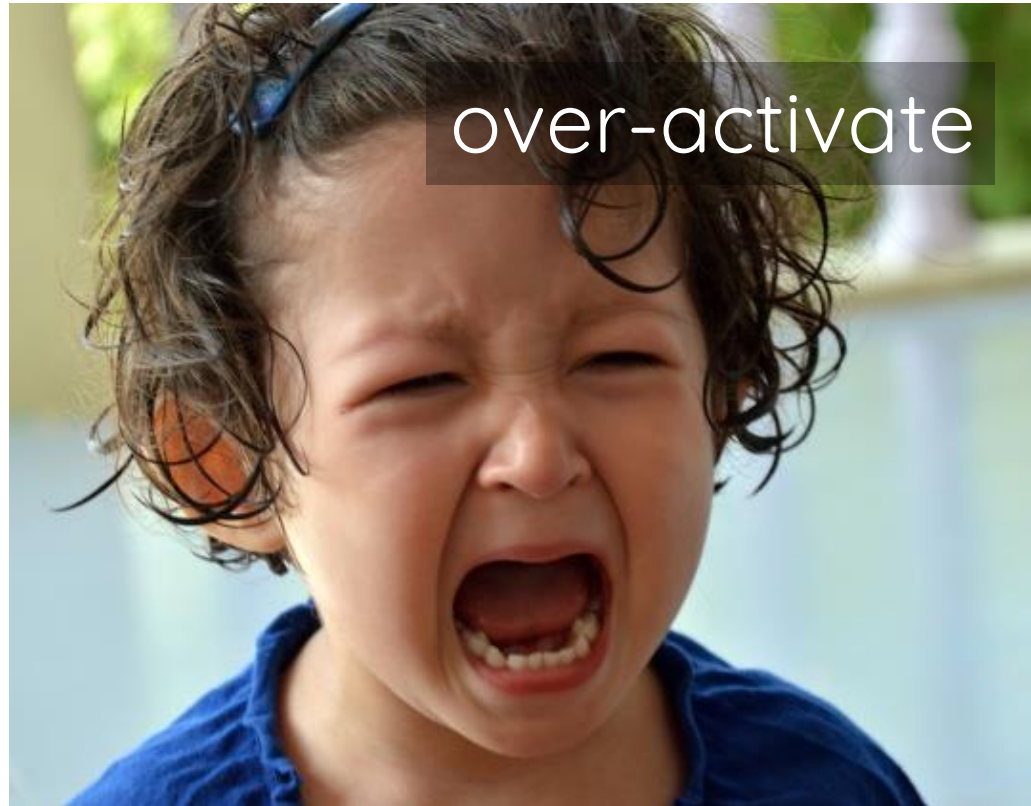
Connection
Network

During times of distress, those with an Anxious Attachment Style use 'Self-Regulation' to over-activate the Stress Network.

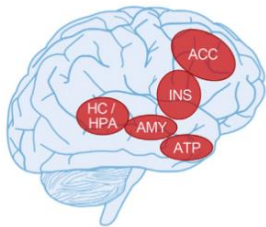
Stressful events are experienced as more painful, and are expressed more intensely, than for those who are Securely Attached.



Stress-Fear-Pain
Network



During times of calm,
those with an Anxious
Attachment Style may
be fretful, due to
accelerated
development of the
Stress Network



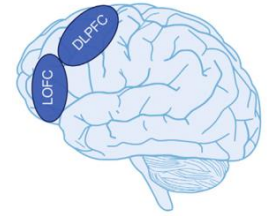
Stress-Fear-Pain
Network



fearful

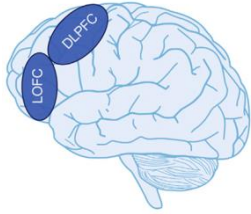
Since baby has experienced little autonomy or control over their environment, they may become fearful of any situation in which their caregiver is not present

Intensify emotions and behaviour



Regulation Network

In contrast to Avoidants, who downplay emotions to avoid connection with others, those who are Anxiously Attached intensify emotions in order to gain connection with others.



Regulation Network

Few tools

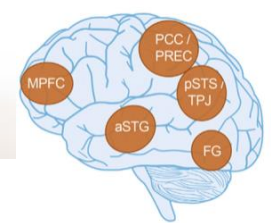


Over-reliance on caregivers who provide fewer experiences of co-regulation, may result in the Anxious child failing to develop any helpful strategies for managing feelings and behaviour.

Avoidants, by contrast, at least develop some self-regulation strategies for managing stress. However, these are often only partially successful.

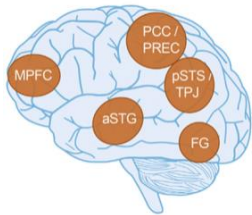
Self image

dependent
upon
others'
approval



Self & Other Network

lack of confidence in own abilities
fragile sense-of-self



Self & Other Network

Other image ambivalent



needs others to feel secure
yet doesn't expect needs to be met

A little more on Insecure Attachment

It is important to emphasise that Insecure Attachment is not intrinsically 'bad', but an adaptive response to the parenting style that a baby or toddler receives.

For Avoidant Attachment, a child who does not have their big feelings soothed (through activation of the Connection Network) and co-regulated (by having an adult help them cope with their emotions and find ways to feel better), can best manage stress by avoiding connection with others and developing strategies for downplaying their feelings through self-regulation - even if these strategies are less than optimal.

For Anxious Attachment, a child who lacks autonomy and is unsure whether or not their needs will be met is best served by exaggerating and amplifying their feelings, in order to increase the chance of eliciting help and activating the Connection Network.

These strategies often persist as our children grow and become a blueprint for how they deal with stress and how they make relationships with others. Comprehending this allows us to gain understanding of those who may relate differently to ourselves, and helps us to reflect on our own patterns of responding to life's events, and relating to others.

Disorganised Attachment

Beyond Secure and Insecure Attachment, babies may also be classified as 'Disorganised' in their Attachment Style.

This means that the child is unable to form a coherent strategy for relating to their caregiver, in order to manage stress.

It may come about when -

- the caregiver is themselves a source of threat (abuse),
- when intense or chronic early stress in life is not alleviated by a caregiver (neglect)

Around 15% of the general population is classified as Disorganised, but this rises to more than 30% for at-risk groups (e.g., adopted children, or parents affected by poverty, diagnosed with mental health conditions, or who have themselves been neglected or abused).

Disorganised Attachment has even stronger links than Insecure Attachment to later-life (mental) health conditions and difficulties maintaining relationships. It is also linked with adverse outcomes such as drug or alcohol abuse, domestic abuse, and criminality.

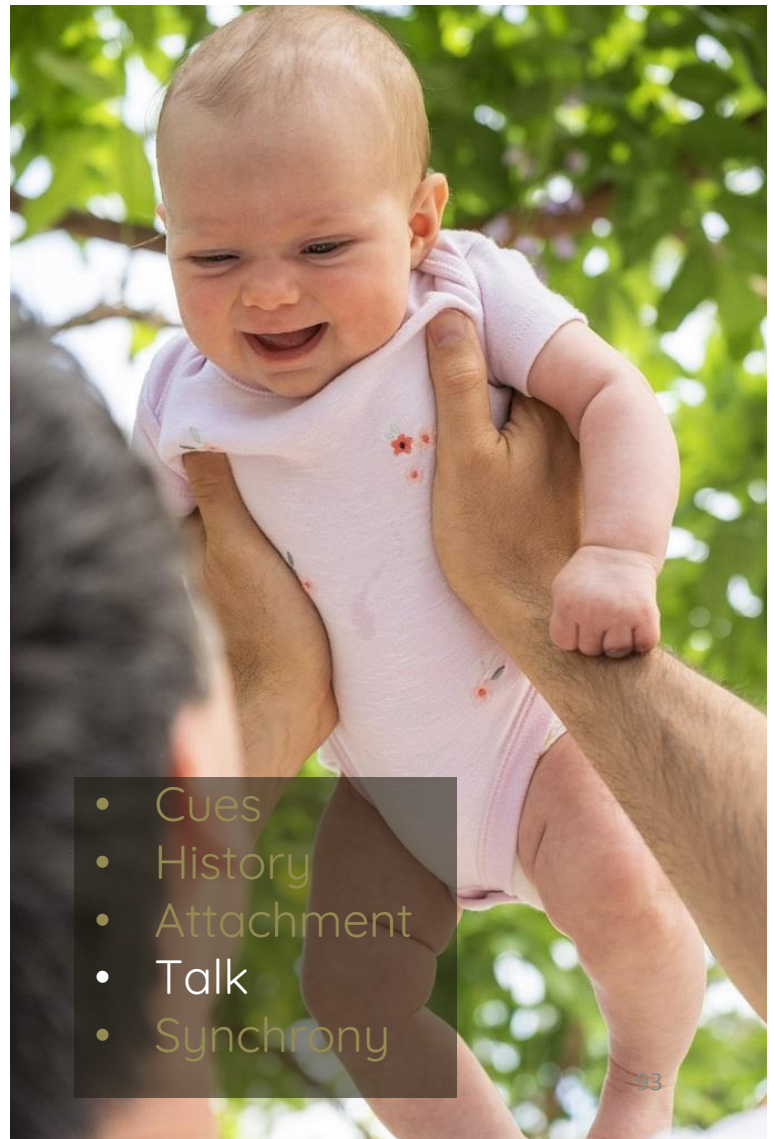
Talk

Talking to baby about what they may be *feeling* or *thinking*

Research shows that when we respond to babies' cues, if we also say out loud what we imagine they are thinking or feeling, then this becomes an even stronger prediction of Secure Attachment and optimal later-life outcomes.

After looking at this section, go back to the section on 'Cues' and imagine what you would say to the babies featured there, about what they are thinking and feeling.

- Cues
- History
- Attachment
- Talk
- Synchrony

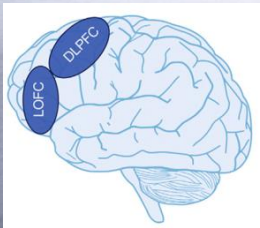


Talking about what our babies may be thinking or feeling

even before they recognise the words

helps them learn that emotions have names

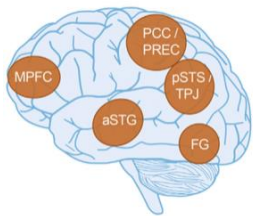
and that their feelings can be understood and made sense of.



Regulation Network

Narrating baby's thoughts and feelings helps them understand the thoughts and feelings of others.

This leads to empathy and the ability to take another person's perspective.

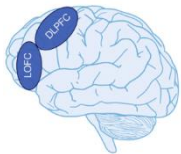


Self & Other Network

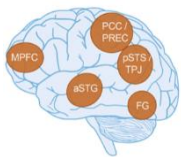


talk

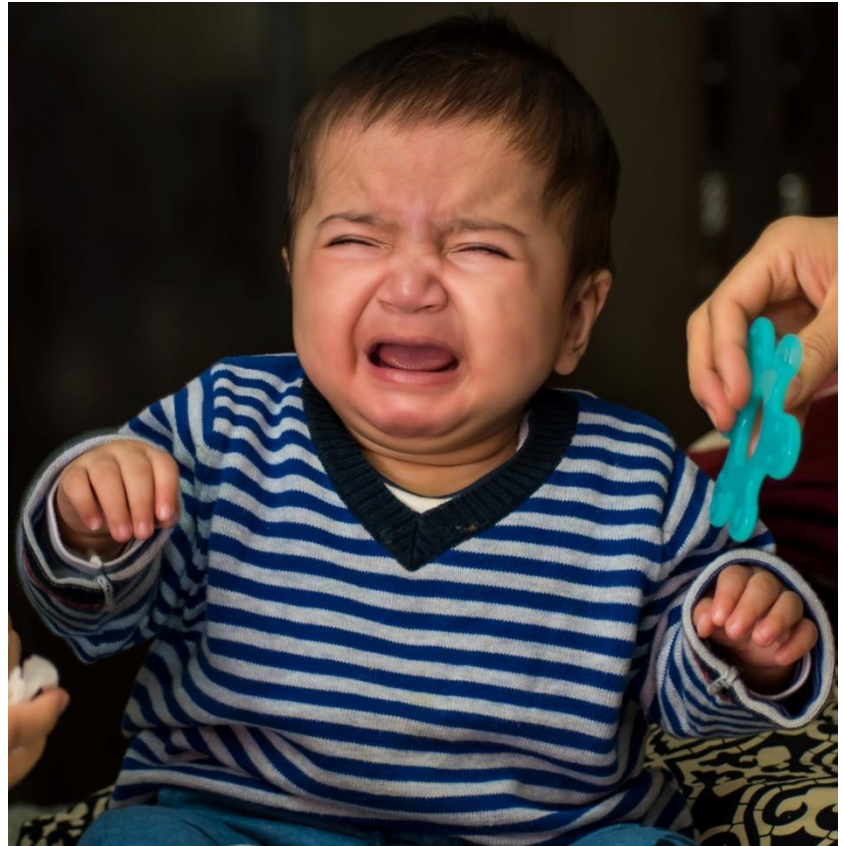
about what
baby is
thinking or
feeling...



Regulation Network



Self & Other Network



'Oh you didn't want me to take the toy'
'Oh you wished I would give the toy back'
'Oh you are so sad because you really like this toy'

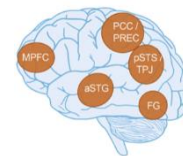
...then toddlers
will
talk
about
thoughts
and
feelings...



‘Daddy happy’
‘Maisy want lolly’
‘Me sad’



Regulation Network



Self & Other Network

...and teenagers will

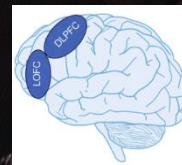
talk

to express empathy

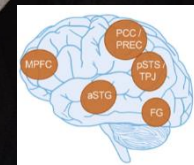
see others' perspective

change their mind

and find solutions



Regulation Network



Self & Other Network

Synchrony

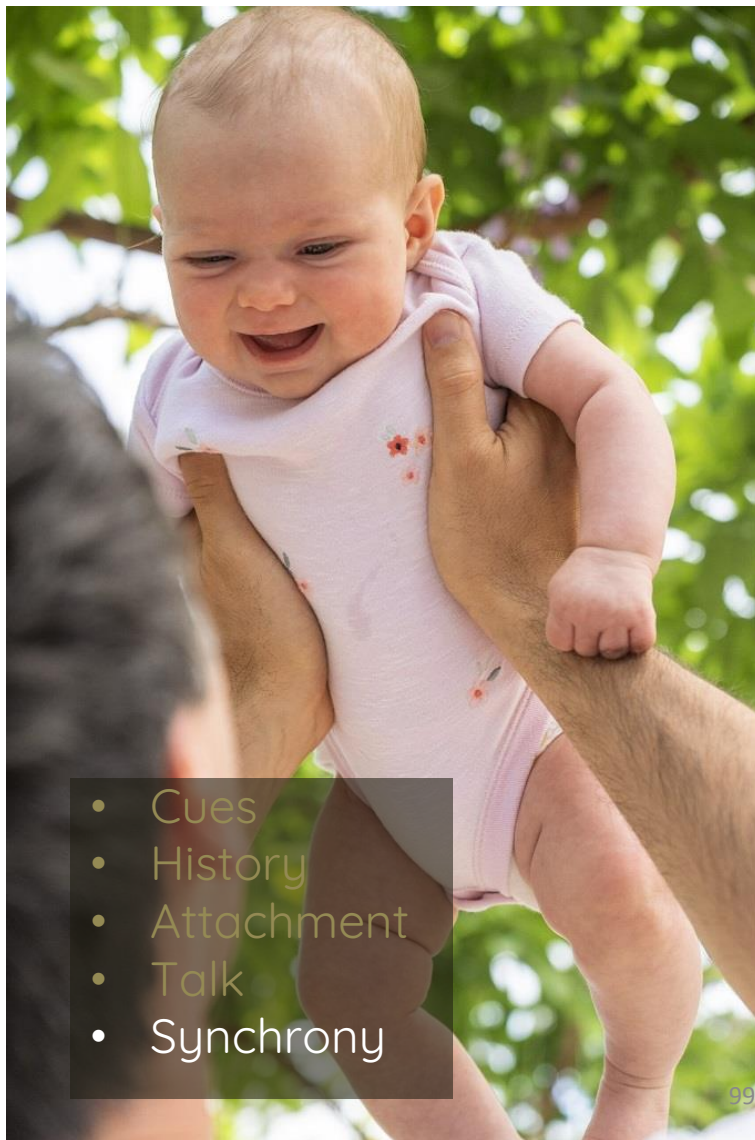
‘Turn-taking’ exchanges, involving eye contact, facial expressions, gestures and vocalisations

Initially parents structure and scaffold these ‘conversations’, leaving space for baby to respond.

By around 4-months-of-age, however, babies are increasingly able take the lead and become equal conversational partners.

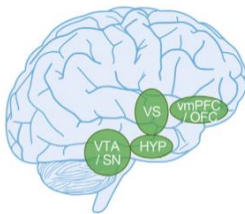
There are three hallmarks of Synchrony that are linked to Secure Attachment and healthy brain development:

- becoming more positive together
- allowing baby to look away then reconnect
- mirroring baby’s distress



- Cues
- History
- Attachment
- Talk
- Synchrony

The capacity for synchrony rests upon biological rhythms which are matured through close contact



Connection Network

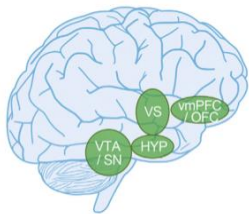


Many parents notice their babies beginning to communicate at around 4-6 weeks of age.

Amazingly however, the capacity to hold gaze and mirror parents' expressions is present, in small moments of quiet alertness, from birth.



Baby and caregiver's brains are flooded with feel-good hormones, during mutual eye gaze and synchronous exchanges.



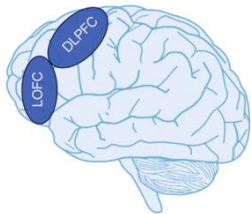
Connection Network



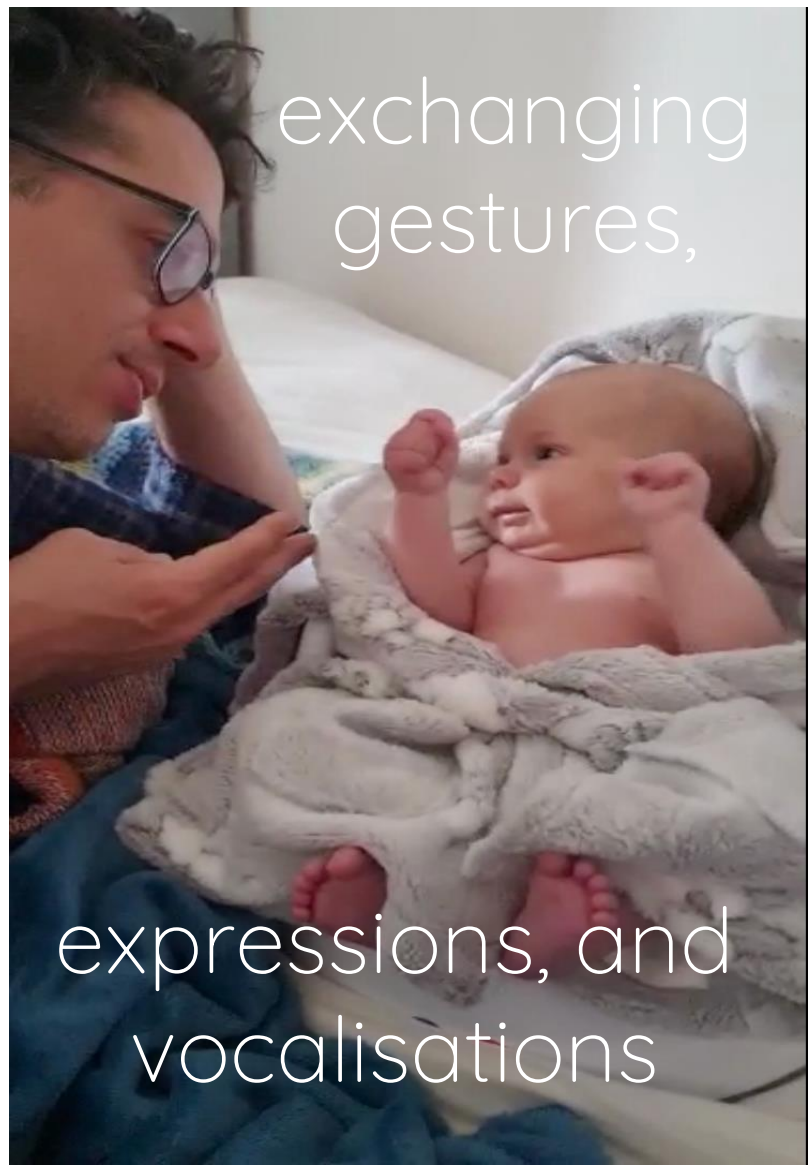
mutual
gaze

Baby learns to organise their actions - when to wait and when to respond.

These are important skills for gaining voluntary control over their arousal and behaviour.

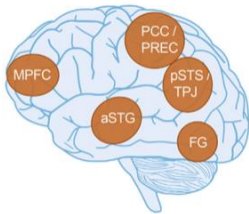


Regulation Network

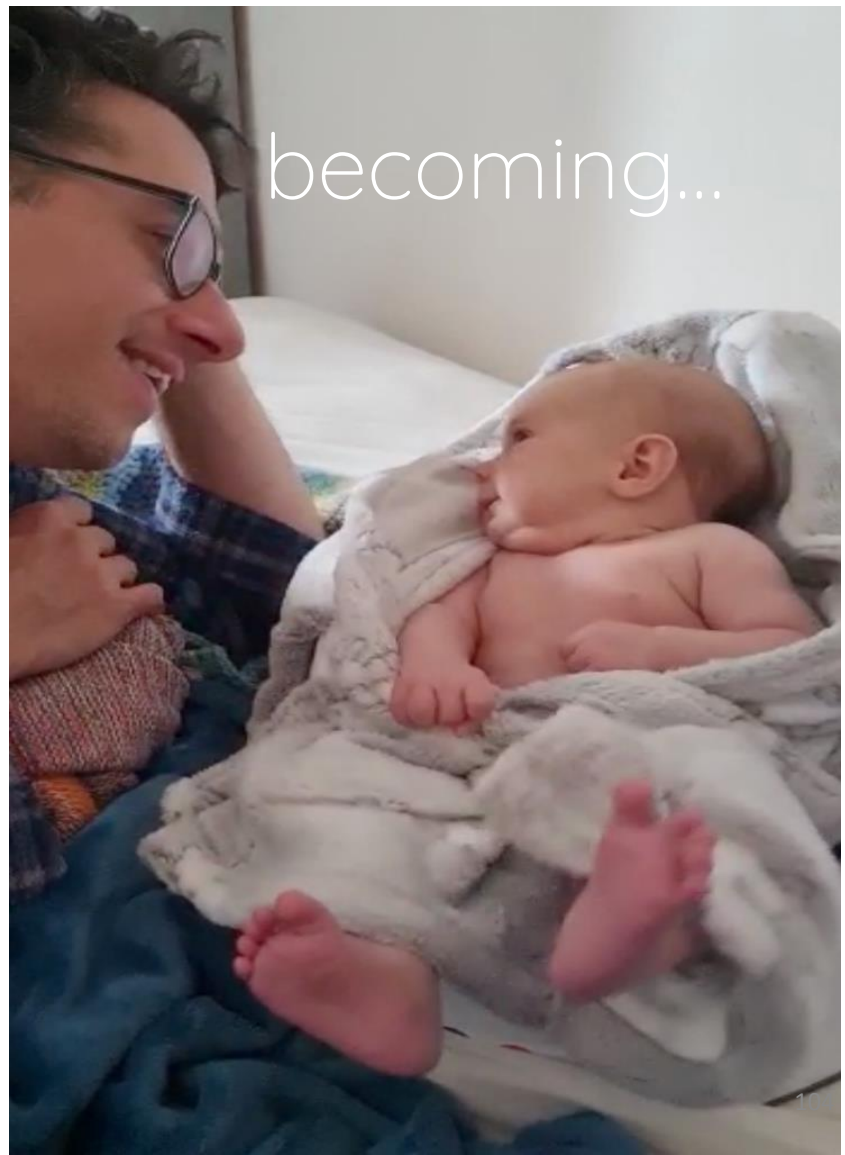


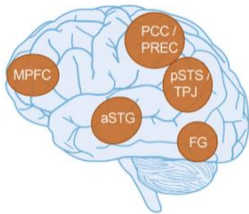
exchanging gestures,

expressions, and vocalisations

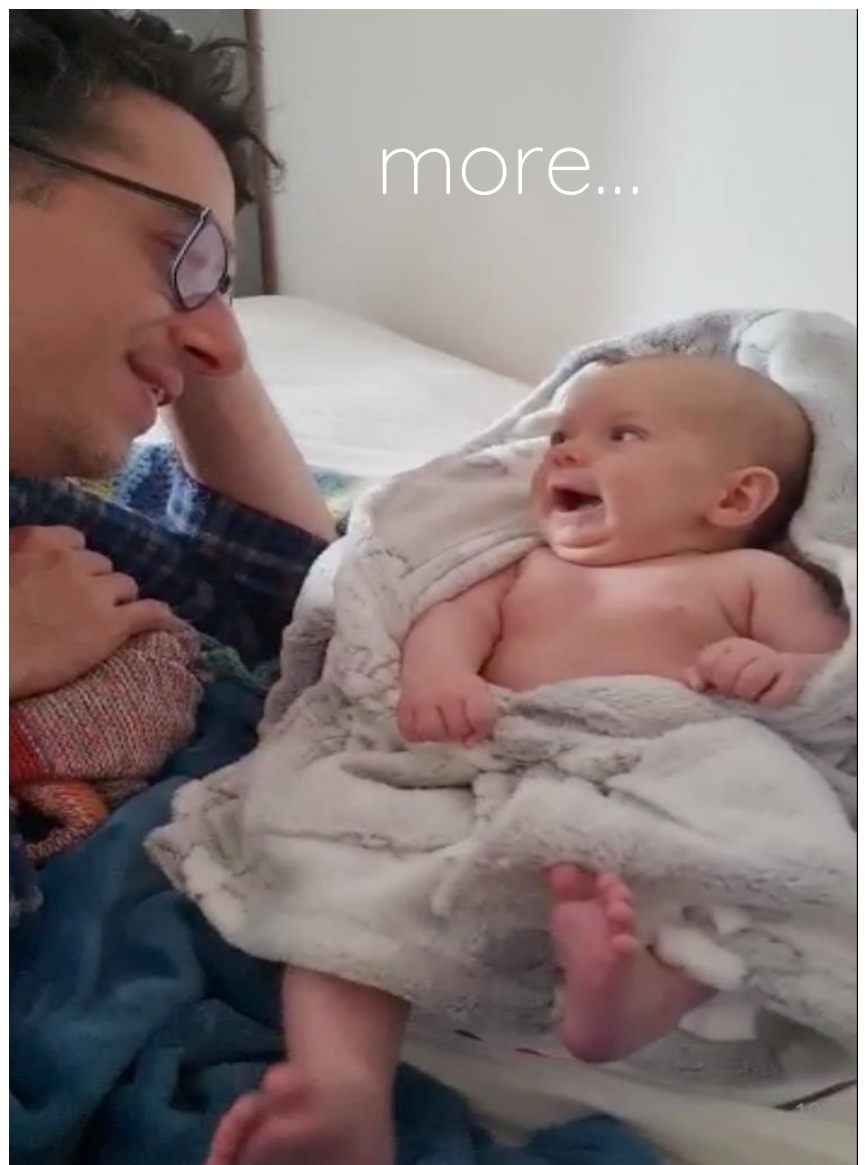


Self & Other Network



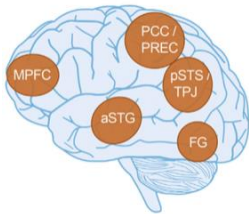


Self & Other Network

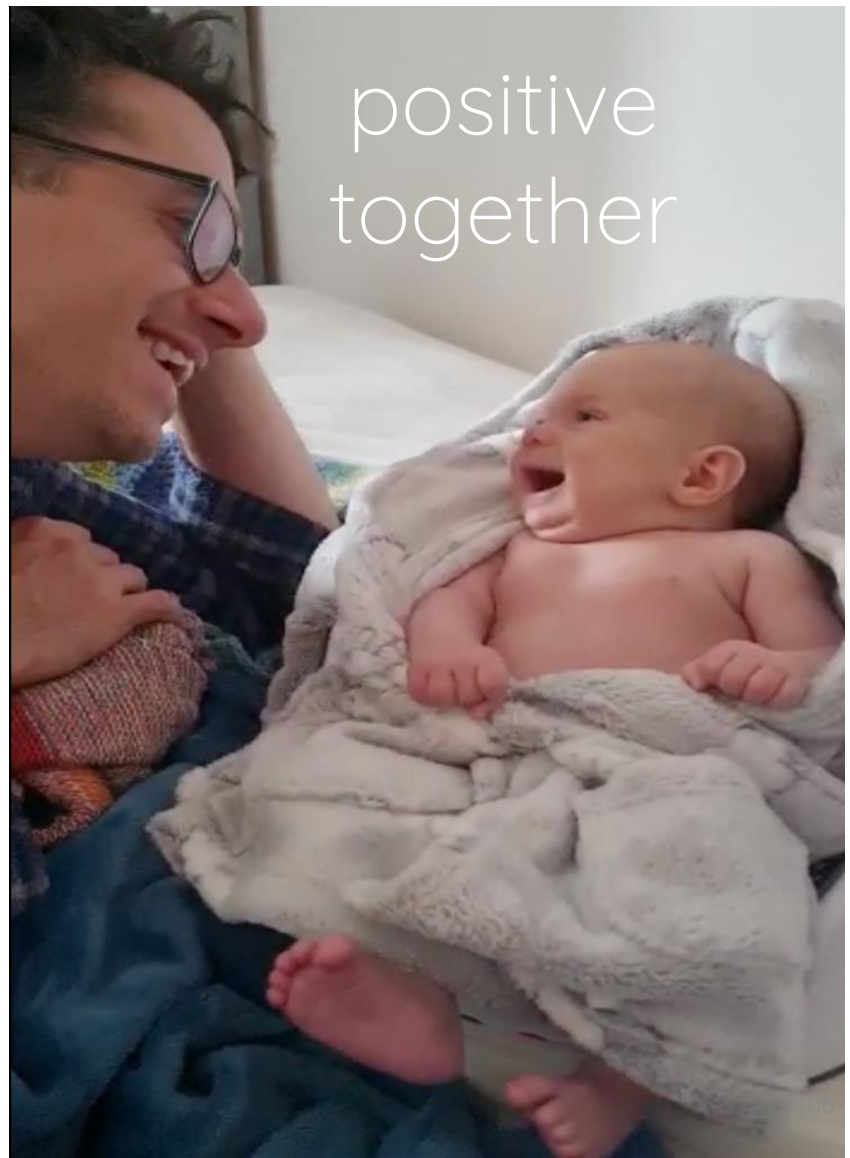


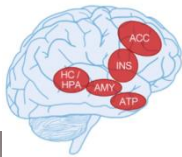
more...

Through repeated exchanges of tactile, facial and vocal emotions, baby comes to resonate with others' feelings



Self & Other Network



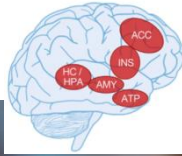


Stress-Fear-Pain
Network

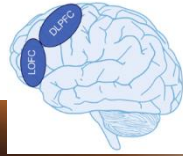


Regulation
Network

allowing

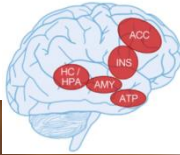


Stress-Fear-Pain
Network



Regulation
Network

time and space

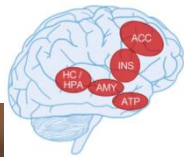


Stress-Fear-Pain
Network



Regulation
Network

for baby to
look away

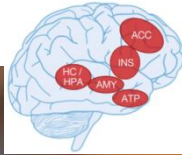


Stress-Fear-Pain
Network



Regulation
Network

calm down



Stress-Fear-Pain
Network



Regulation
Network

and reconnect

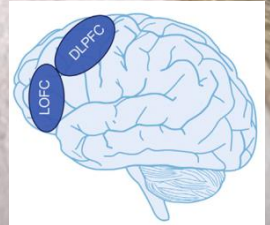
Enables baby to gain control over their arousal levels
and their ability to calm themselves down

mirroring



Regulation
Network

baby's distress



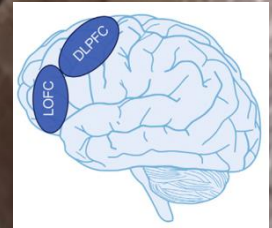
Regulation
Network

then gently



Regulation Network

coming back to
smiles together



Regulation
Network

Shows baby that they can express their negative feelings,
have them recognised, and then choose,
together with their grown up, to feel better

Further Reading and Viewing

Scientific Articles

Below are 5 key scientific articles from science journals. They can be found online, are open access and free to read:

- Long, M., Verbeke, W., Ein-Dor, T., & Vrtička, P. (2020). A functional neuro-anatomical model of human attachment (NAMA): Insights from first-and second-person social neuroscience. *Cortex*, 126, 281-321. <https://doi.org/10.1016/j.cortex.2020.01.010>
- Lee, A., Poh, J. S., Wen, D. J., Tan, H. M., Chong, Y. S., Tan, K. H., ... Rifkin-Graboi, A & Qiu, A. (2019). Maternal care in infancy and the course of limbic development. *Developmental cognitive neuroscience*, 40, 100714. <https://doi.org/10.1016/j.dcn.2019.100714>
- Müller, M., Zietlow, A. L., Klausner, N., Woll, C., Nonnenmacher, N., Tronick, E., & Reck, C. (2021). From Early Micro-Temporal Interaction Patterns to Child Cortisol Levels: Towards the Role of Interactive Reparation and Infant Attachment in a Longitudinal Study. *Frontiers in Psychology*, 6463. <https://doi.org/10.3389/fpsyg.2021.807157>
- Rifkin-Graboi, A., Kong, L., Sim, L. W., Sanmugam, S., Broekman, B. F. P., Chen, H., ... & Qiu, A. (2015). Maternal sensitivity, infant limbic structure volume and functional connectivity: a preliminary study. *Translational Psychiatry*, 5(10). <https://doi.org/10.1038/tp.2015.133>
- Yaniv, A. U., Salomon, R., Waidergoren, S., Shimon-Raz, O., Djalovski, A., & Feldman, R. (2021). Synchronous caregiving from birth to adulthood tunes humans' social brain. *Proceedings of the National Academy of Sciences*, 118(14). <https://doi.org/10.1073/pnas.2012900118>

Docuseries

Scientific studies by Ruth Feldman, Ed Tronick and Anne Rifkin-Graboi on Synchrony and Responding to Babies' Cues are featured in **'Babies – Episode 1 - Love'**.

This docuseries can be viewed free-of-charge on the Netflix YouTube Channel:

<https://www.youtube.com/watch?v=YOV5jDFtvsI>



Babygro is steered by trustees who work in adoption, are experts in attachment theory and who are academics in the field of psychology, behaviour and evolution. Our focus is less on prescribing parenting advice and more on providing a direct line to the latest research findings.

In this way parents can feel empowered about the parenting choices they make.



This book illustrates - in pictures and with minimal words - how our babies' brains develop, and how responsive communication between parent and baby leads to later life (mental) health and wellbeing.

Babygro is a registered charity and our mission is to empower parents by bringing-to-life the latest research.

Scan the QR code to visit our Babygro Community and take part in our free-of-charge online workshops.

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