



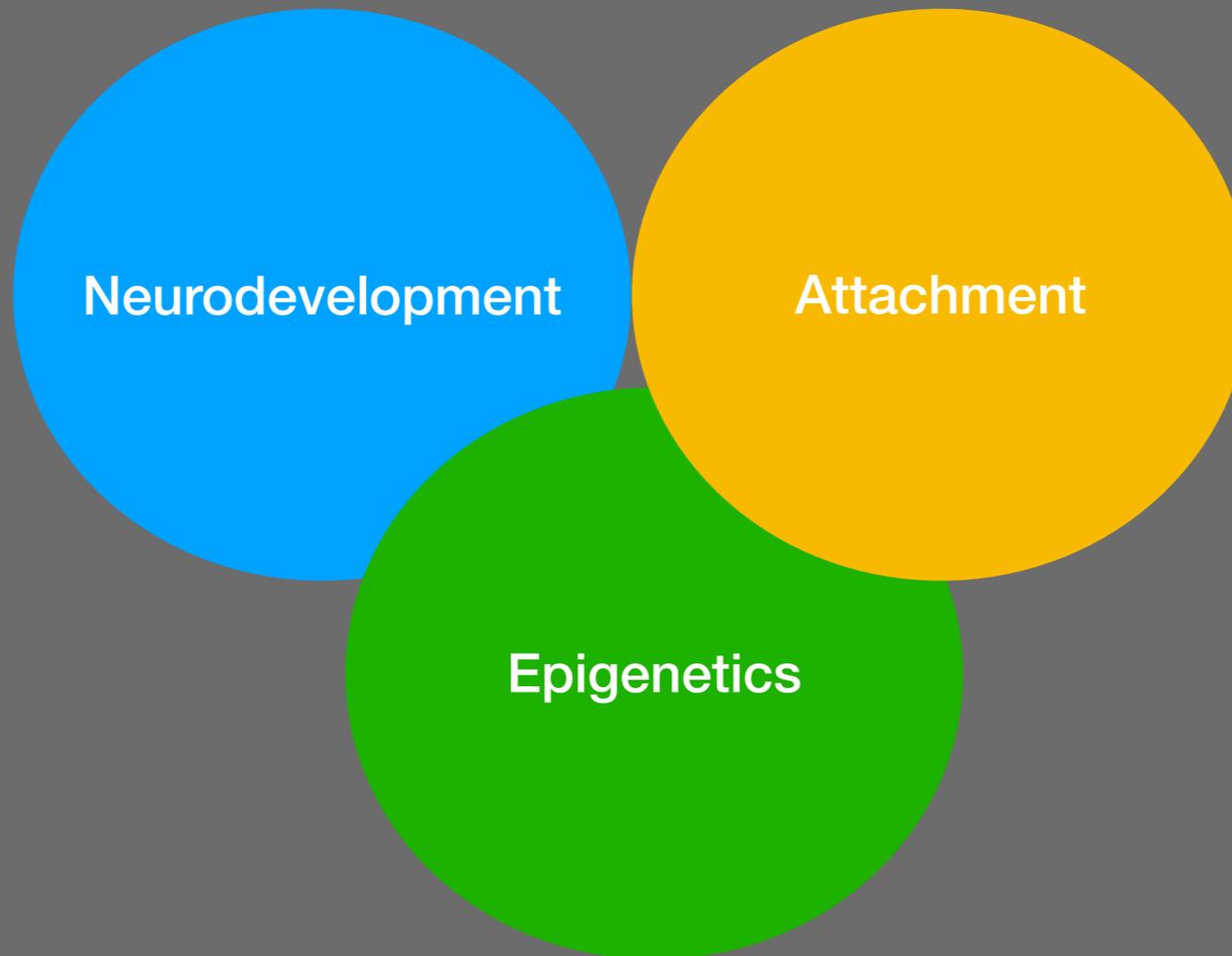
Epigenetics: Destiny's Child?

Understanding Ways to Work with Intergenerational Trauma.
What is epigenetics?



Overview

- What is Epigenetics?
- Impact & Implications
- Practice Application



Epigenetics related words

telomere

chromosome

epigenome

protein

nucleotides

genome

gene

DNA

RNA

histones

methyl

methylation



What is epigenetics?

Epigenetics is the science of all of the things above or around the gene that influences whether it turns on or off and at what degree



What is epigenetics?

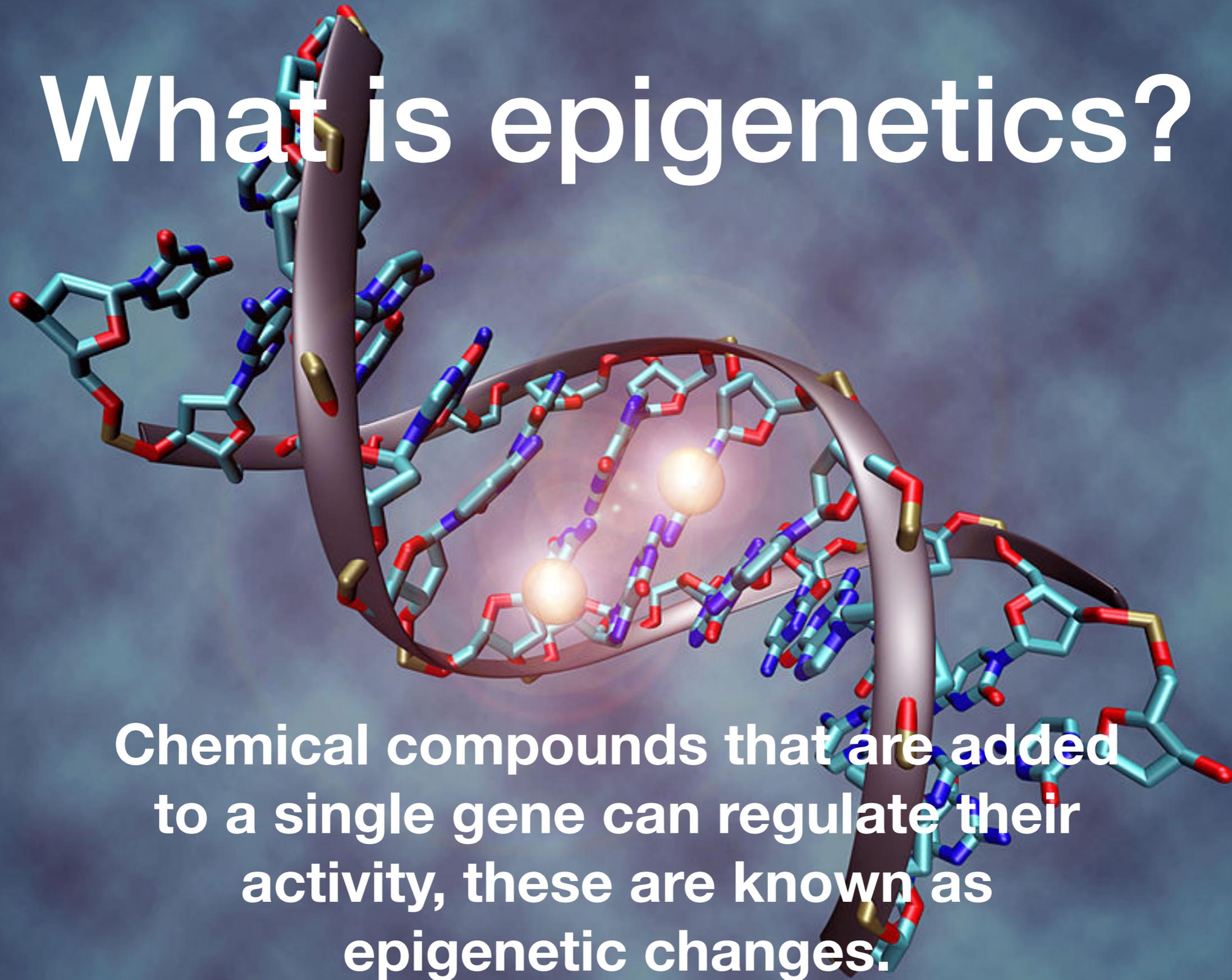
Changes to gene expression that are caused other than changes to the underlying DNA sequence.

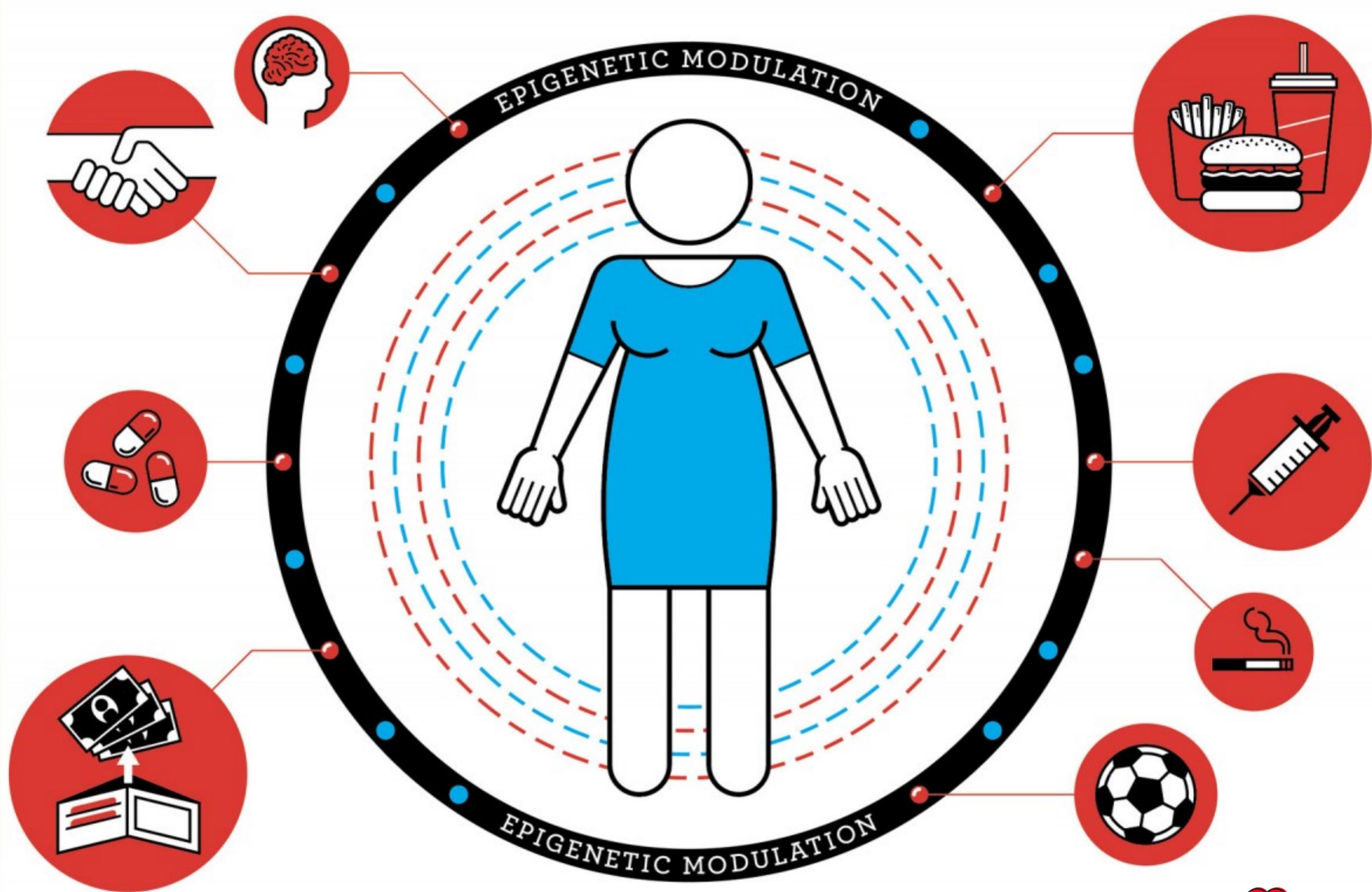
Enables a cell/organism to respond to its dynamic external environment during development and through out life!

Particularly important for the generation of different types of cells during embryonic development



What is epigenetics?



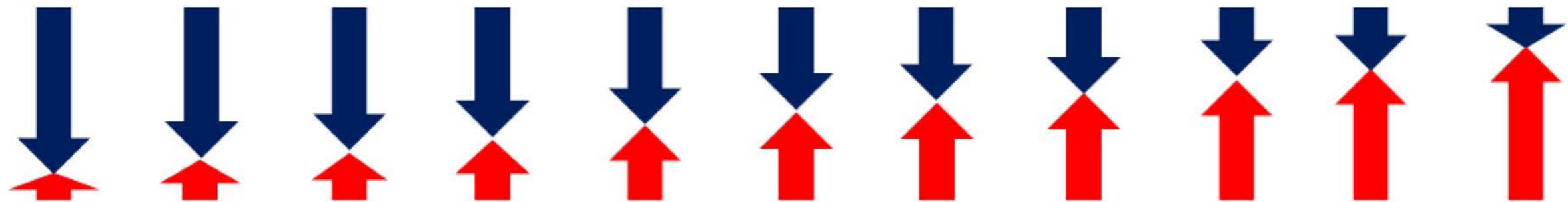


Environmental exposures, stresses, diet, and lifestyle can all induce epigenetic changes that determine whether genes are turned on or off.



External Influences

DNA intergenic methylation



CpG island methylation
Aberrant histone modifications
Aberrant methylation of miRNA promoters

Normal cells → differentiated cells → invasive differentiated cells.

Exposure to Toxins

Ethnicity

Alcohol Intake

Family History

Physical Activity

Increasing Age

Nutrition

Gender

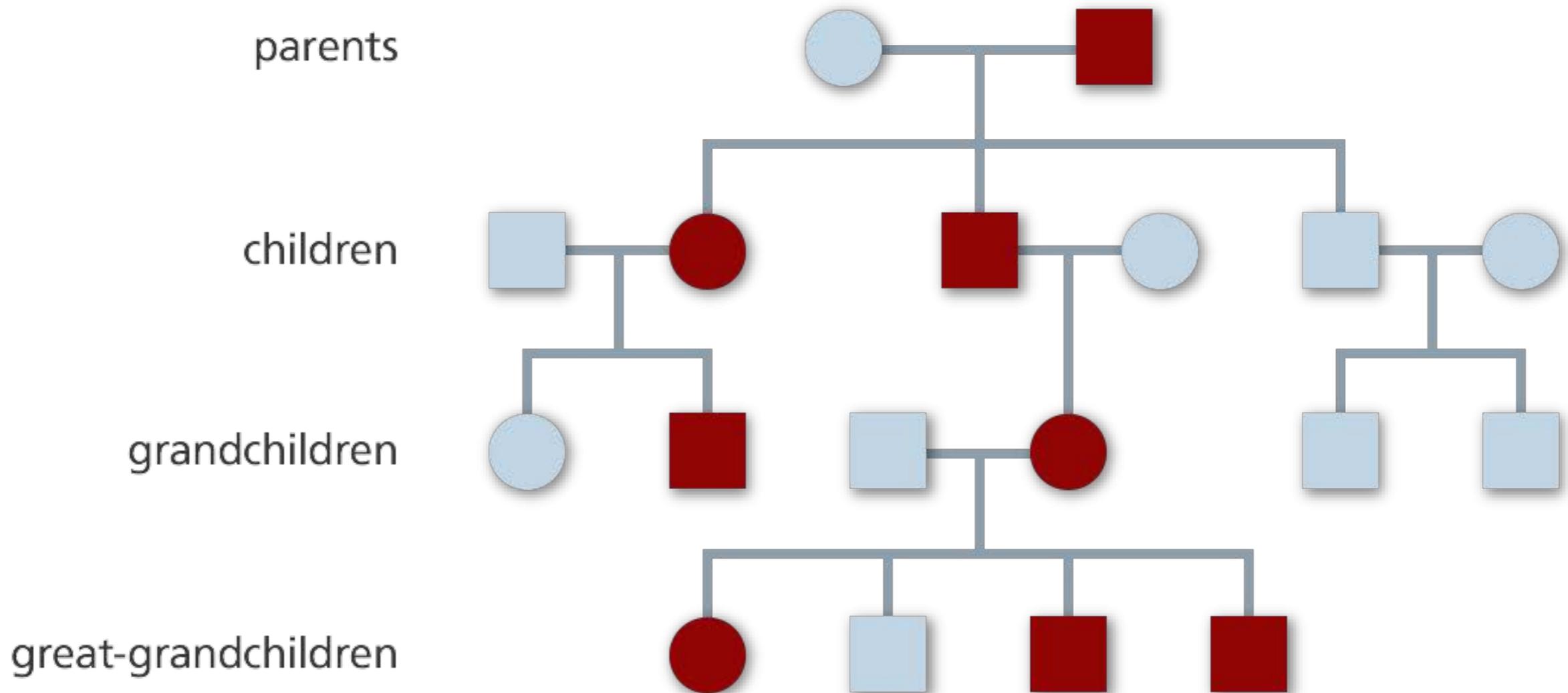
Smoking



Secure Base Solutions

Promoting Relational Resilience

Transmission Across Gender



♀

♂



unaffected



affected



Secure Base Solutions

Promoting Relational Resilience

The Agouti Mouse Model



<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2822875/>



Secure Base Solutions
Promoting Relational Resilience

Epigenetic inheritance

Certain environmental factors experienced by adult mice can be passed on to their offspring via epigenetic mechanisms.

The best example is a gene called agouti, which is methylated in normal brown mice.

Mice with an unmethylated agouti gene are yellow and obese

Altering the pregnant mother's diet can modify the ratio of brown to yellow offspring: folic acid results in more brown pups, while BPA results in more yellow pups.



Research

Recent studies in rats recently demonstrated that exposure to THC (the active compound in cannabis) during adolescence can prime future offspring to display signs of predisposition to heroin addiction.

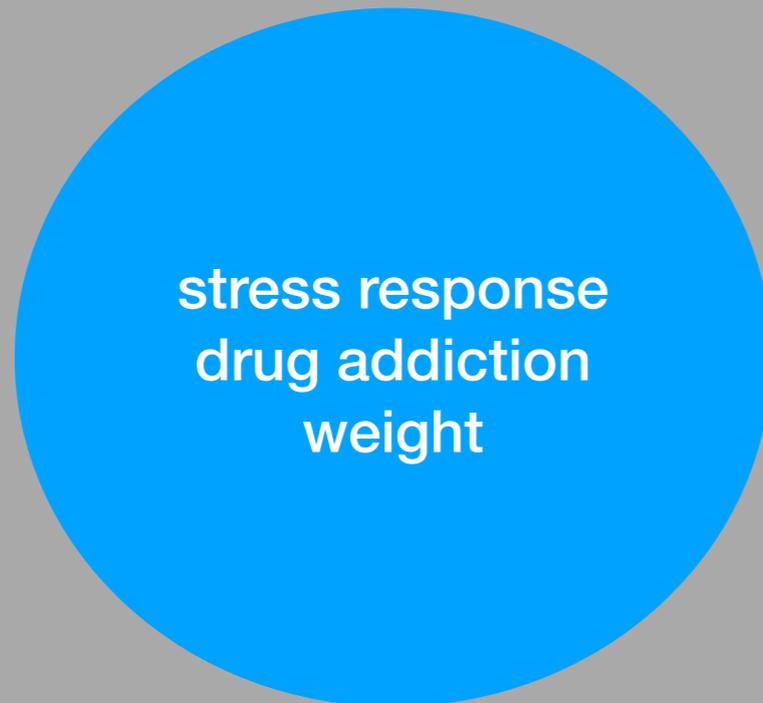




**All experiences can
influence gene expression**



Impact on genes

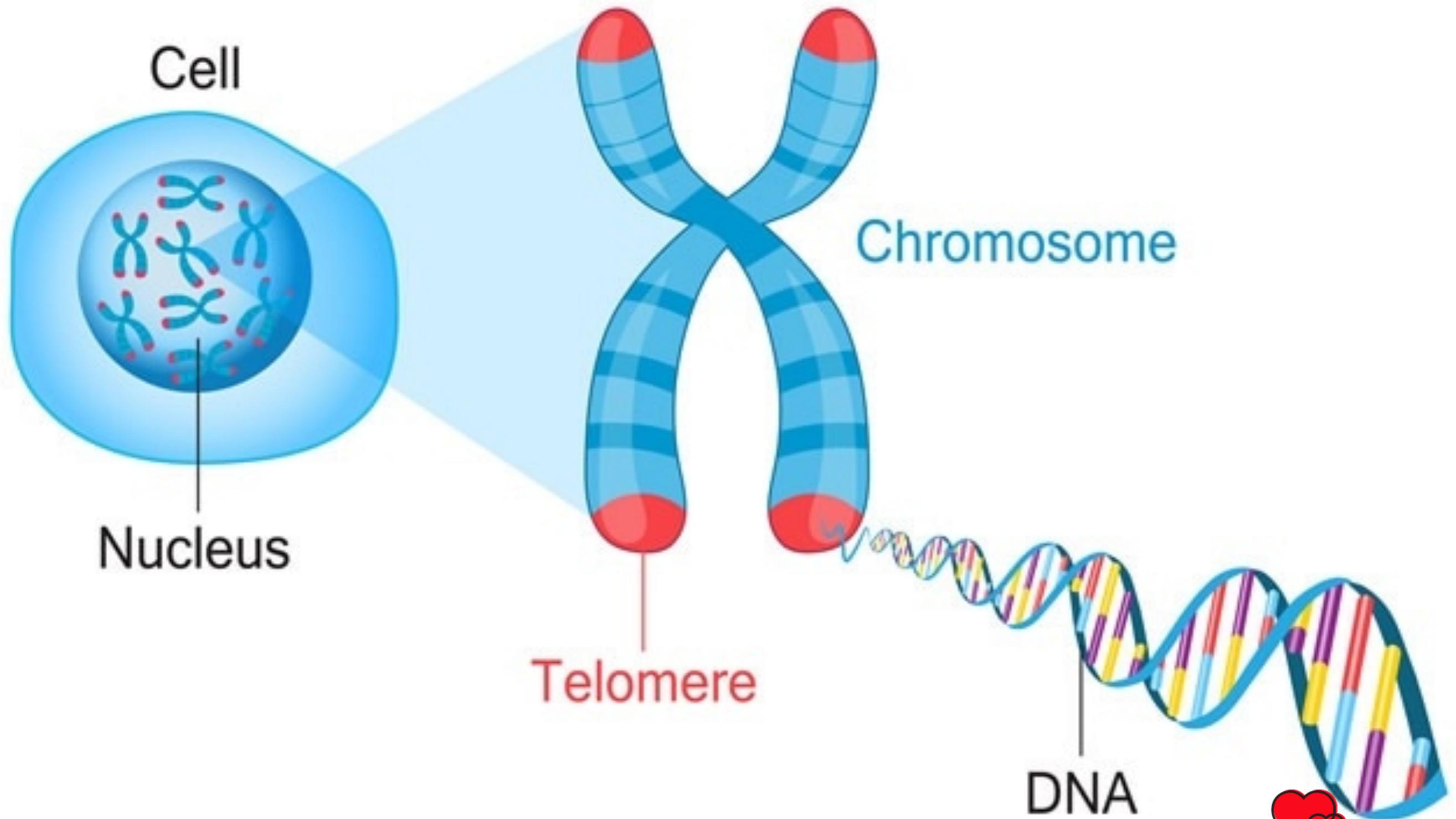


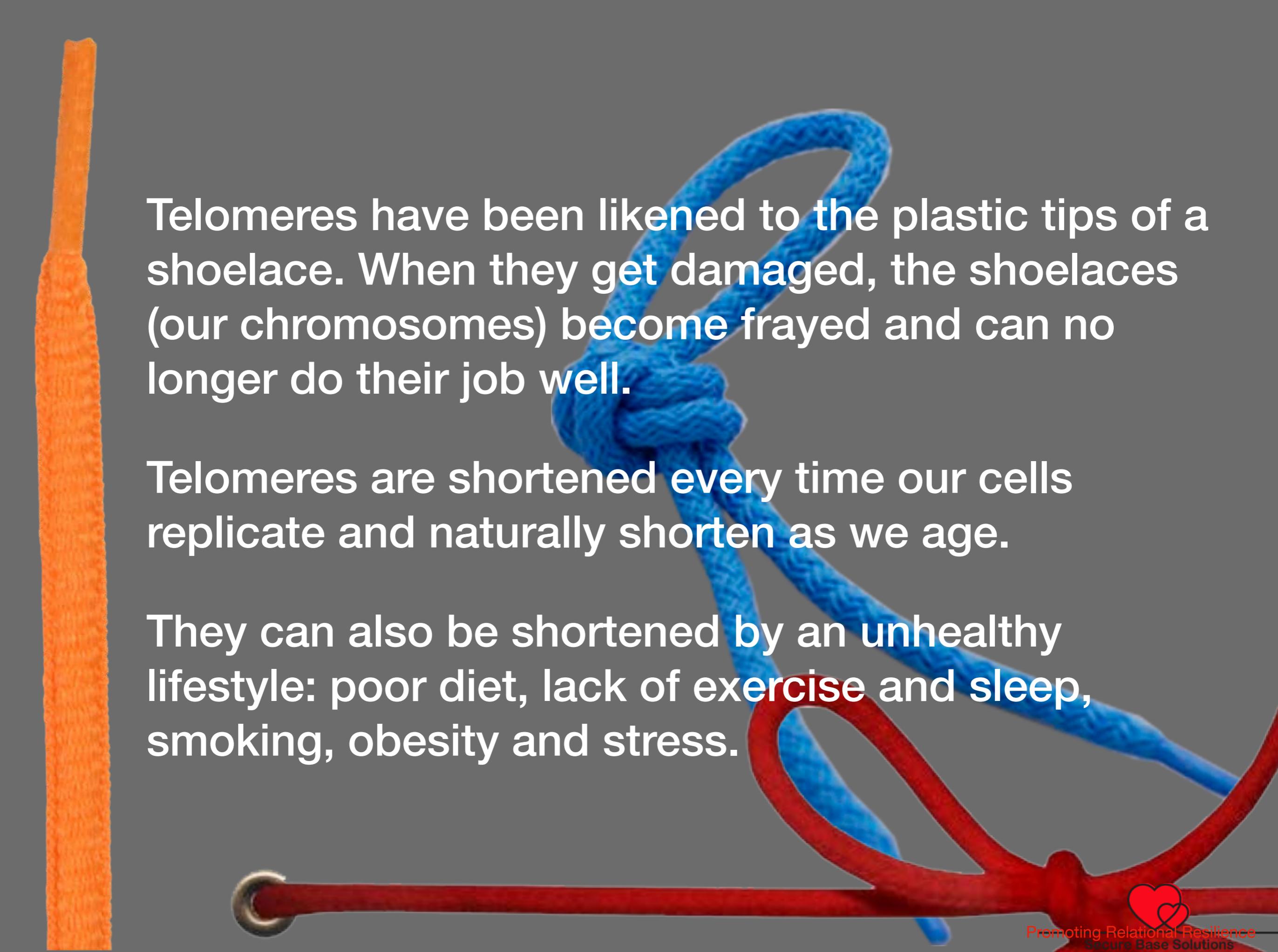


When experiences during development rearrange the epigenetic marks that govern gene expression, they can change whether and how genes release the information they carry.



Telomere





Telomeres have been likened to the plastic tips of a shoelace. When they get damaged, the shoelaces (our chromosomes) become frayed and can no longer do their job well.

Telomeres are shortened every time our cells replicate and naturally shorten as we age.

They can also be shortened by an unhealthy lifestyle: poor diet, lack of exercise and sleep, smoking, obesity and stress.

the epigenome can be affected by positive experiences, such as supportive relationships and opportunities for learning...

... or negative influences, such as environmental toxins or stressful life circumstances ...



Telomeres

Telomeres are crucial parts of the chromosome that act to protect them and ensure DNA replication is performed effectively.

Telomere function can be linked to ACES



Facts

- epigenetic transmission can happen at birth
- parents who have very short telomeres from their life experiences can be transmitted to the babies





So what we start off with on day one of life is a very important factor that shapes our telomeres for life.



Epigenetics: Destiny's Child?

Understanding Ways to Work with Intergenerational Trauma
Impact & Implications

Lisa Gardiner



Secure Base Solutions
Promoting Relational Resilience

Impact

Health & Wellbeing

Diseases & Disorders

Diet & Exercise

Connection & Emotional Regulation

Drugs & Addiction

Ageing & Memory

Parenting

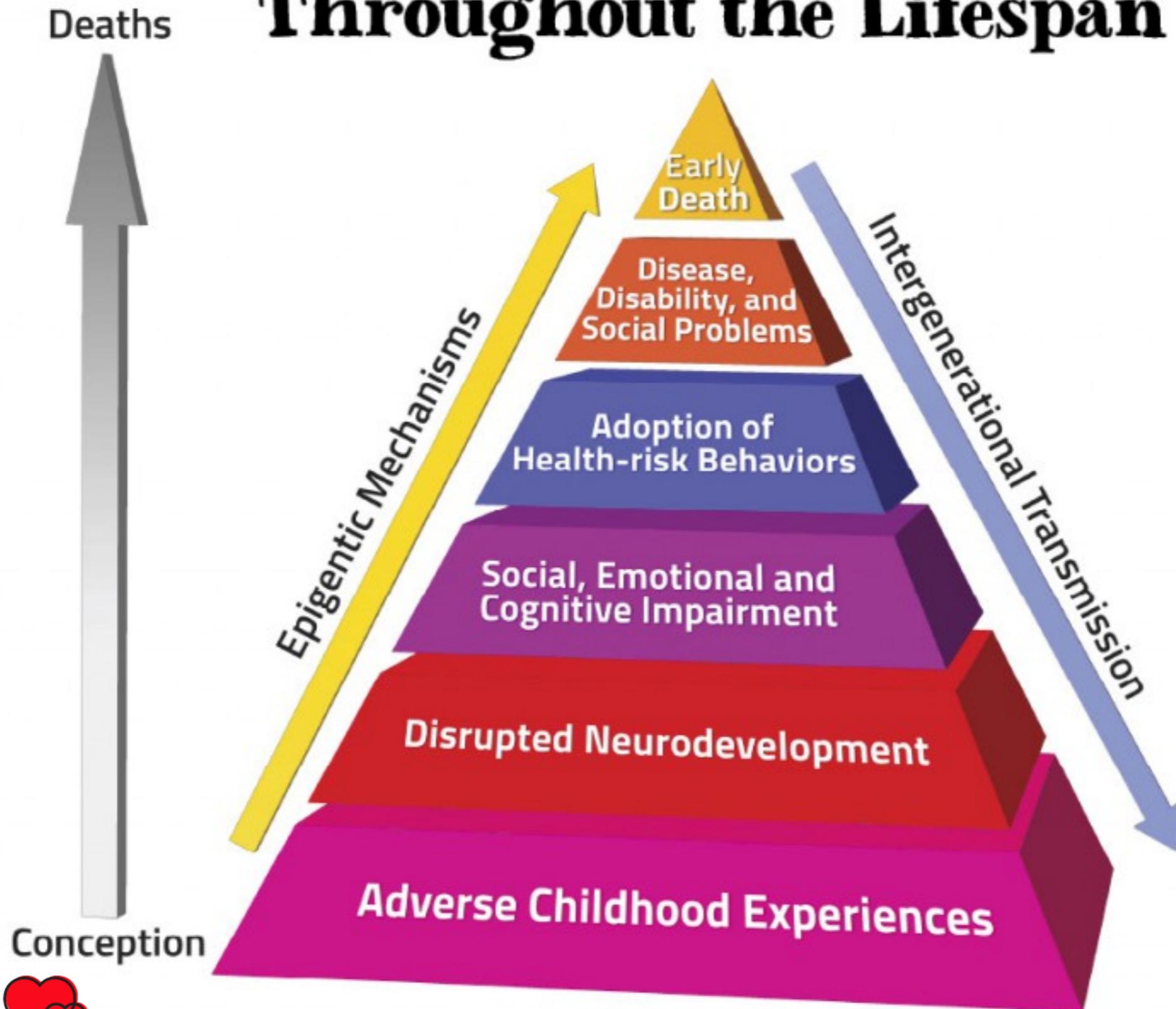
Resilience



Secure Base Solutions

Promoting Relational Resilience

Mechanisms by which Adverse Childhood Experiences Influence Health and Well-being Throughout the Lifespan

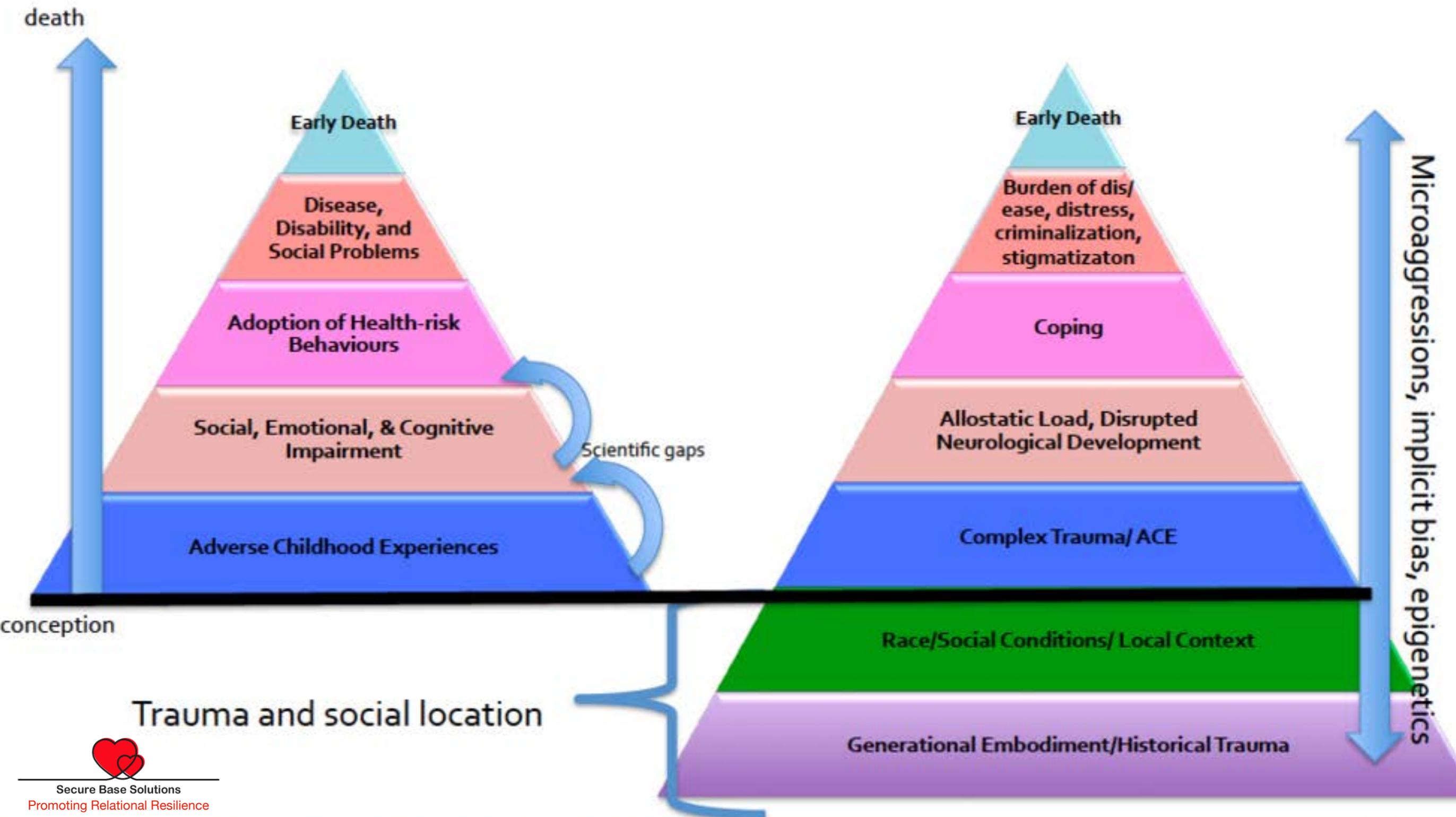




Trauma and Social Location

Adverse Childhood Experiences*

Historical Trauma/Embodiment



Secure Base Solutions
Promoting Relational Resilience

*<http://www.cdc.gov/violenceprevention/acestudy/pyramid.html>

Adverse Childhood Experiences

ABUSE

- Physical abuse
- Sexual abuse
- Emotional abuse

NEGLECT

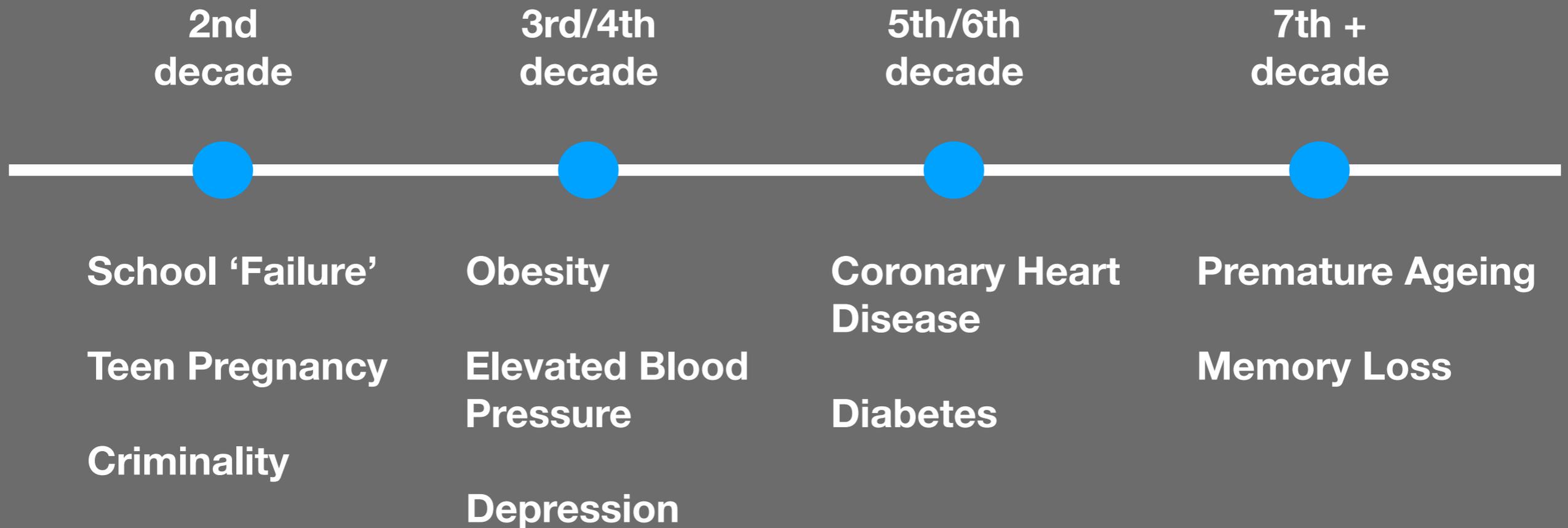
- Physical neglect
- Emotional neglect

HOUSEHOLD DYSFUNCTION

- Mother treated violently
- Household substance abuse
- Household mental illness
- Parental separation or divorce
- Incarcerated household member



Life Course Problems Related to Early Life



Epigenetics & Refugees

Extremely high exposure to seven or more on average different types of traumatic events:

- imprisonment
- torture
- starvation
- being extremely ill without healthcare
- being in combat
- kidnapped
- family, friends, community members murdered.

This can happen before and during forced migration.



Research

Individual studies have demonstrated the capacity to reverse negative alterations in certain important brain structures.

White matter: the connective bundles that relay and communication between different brain regions

Hippocampus: an important part of the limbic system involved in consolidation of memories.



Holocaust offspring

Feelings of over-identification and fused identity with parents

impaired self-esteem stemming from minimization of offspring's own life experiences in comparison to the parental trauma

Tendency towards catastrophizing, worry that parental traumas would be repeated

Behavioral disturbances - anxiety, traumatic nightmares, dysphoria, guilt, hypervigilance and difficulties in interpersonal functioning



Research - transference of trauma

Born with less of a capacity to metabolise stress

Transmitted change - the cell divides, there's reproduction, and the change sticks, and it's present in the next generation.

Feeling traumatised by witnessing the symptoms of their parents

Holocaust offspring also showed a lot of resilience-related qualities also more vulnerable to depression or anxiety





‘It is not that fear is being passed down the generations – it is, that fear in one generation leads to sensitivity in the next ...’



Researchers examined how trauma early in life could be passed on by taking mouse pups away from their mothers right after birth.

The symptoms these pups showed as they grew up also mimicked the symptoms seen in children who have experienced early trauma.

The mice showed signs of increased risk-taking and higher calorie intake, both seen in child trauma survivors.

When the males grew up, they had pups that showed similar traits – overeating, risk taking and higher levels of antisocial behaviour.



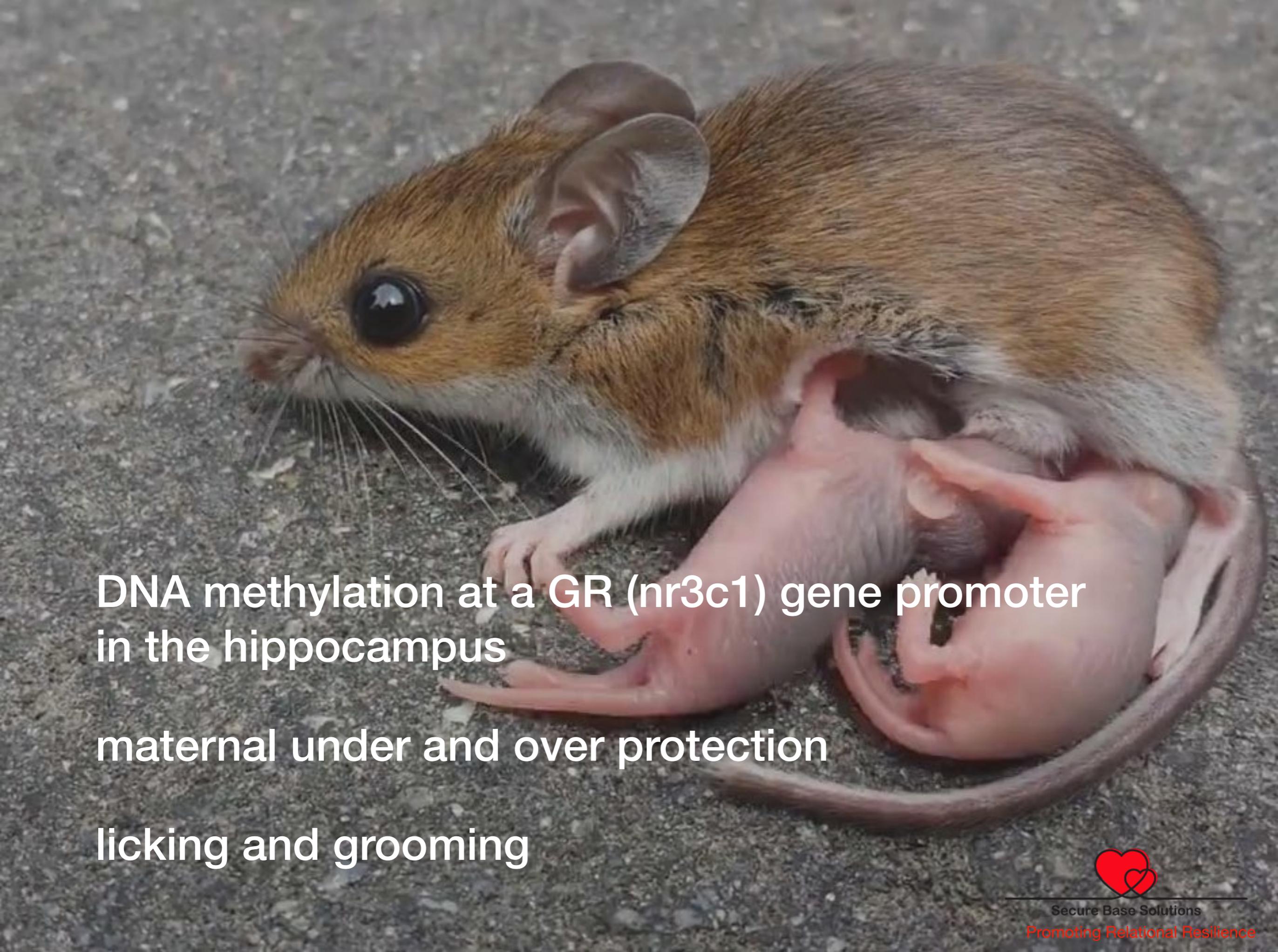
A photograph of a person sleeping in a bed, viewed from above. The person is lying on their side, with their head resting on a light-colored pillow. Their hands are clasped together near their head. They are covered by a grey blanket. In the background, there are several pillows in shades of pink and red. The overall scene is peaceful and suggests a focus on sleep and health.

Telomerase enzyme expression is a circadian process.

Impaired circadian rhythm accompanies senescence of the cell, of which TL is a marker.

Shortened telomeres also correlate with sleep disorders and shortened sleep duration.





DNA methylation at a GR (nr3c1) gene promoter
in the hippocampus

maternal under and over protection

licking and grooming



Holocaust survivors

HPA axis alterations associated with PTSD, such as lower cortisol levels and enhanced GR responsiveness.

lower cortisol levels were observed in the adult offspring of combat veterans with PTSD compared to offspring of combat veterans without PTSD.



Secure Base Solutions

Promoting Relational Resilience

Vietnam veterans

Similar types of symptoms were later described in the children of Vietnam Veterans

Intergenerational transmission vs “secondary traumatisatisation”





Societal Impacts

Impact of **colonisation**, and

Slavery and **displacement trauma** of First Nation Peoples Aboriginals, Maoris, Canadian Aboriginals, Native Americans and African Americans and others

Exposed to **genocide**, **ethnic cleansing** or **war** - Cambodians, Armenians, Rwandans, Palestinians, and communities in the former Yugoslavia and others



Secure Base Solutions

Promoting Relational Resilience

maternal trauma during gestation

Offspring effects through *fetoplacental interactions

At 22 weeks of gestation, the fetal HPA axis is developed and functioning, although it continues to be sensitive to environmental influence.

- foetus, placenta & mother are interconnected



Maternal Trauma Exposure

Study: infants born to mothers who had been pregnant and had to evacuate the World Trade Center - terrorist attacks 11/9/2001

Infant offspring demonstrated:

- lower cortisol levels in association with maternal PTSD, particularly if the mother had been exposed to trauma in the third trimester.
- 9 months, maternal morning cortisol levels were inversely related to maternal ratings of infant distress and response to novelty.
- mothers who had PTSD rated their infants as having greater distress to novelty than did mothers without PTSD
- the offspring of mothers with PTSD showed evidence of anxiety and behavioural disturbances.



Maternal trauma during gestation

newborns of mothers in the Democratic Republic of Congo exposed to severe prenatal stress (war zone stress experiences)

children of women exposed to the Tutsi genocide during pregnancy compared with non-genocide exposed women of the same ethnicity and pregnant at the same time

offspring of women pregnant during the 1998 Quebec ice storm, those whose mothers experienced objective hardship, but not subjective distress.

all had **methylation alterations** in genes related to **immune function**



Secure Base Solutions

Promoting Relational Resilience

Changes in foetal biology through mother

- anxiety
- depression
- hyperarousal





Women with early childhood trauma or prenatal trauma exposure might experience pregnancy with ambivalence or distress.

Any alteration in offspring may be mediated by mental health symptoms during gestation, and certainly extend to the postnatal environment.



Parents

parent's mental health
and physical health
and stress exposure is
shaping telomere
length at birth

prenatal stress and
depression

birth complications
and offspring health



Secure Base Solutions

Promoting Relational Resilience

We need to focus on:

- maternal health**
- protecting women during pregnancy**
- especially early pregnancy**
- father's health**



maternal exposure

the nature of the exposure

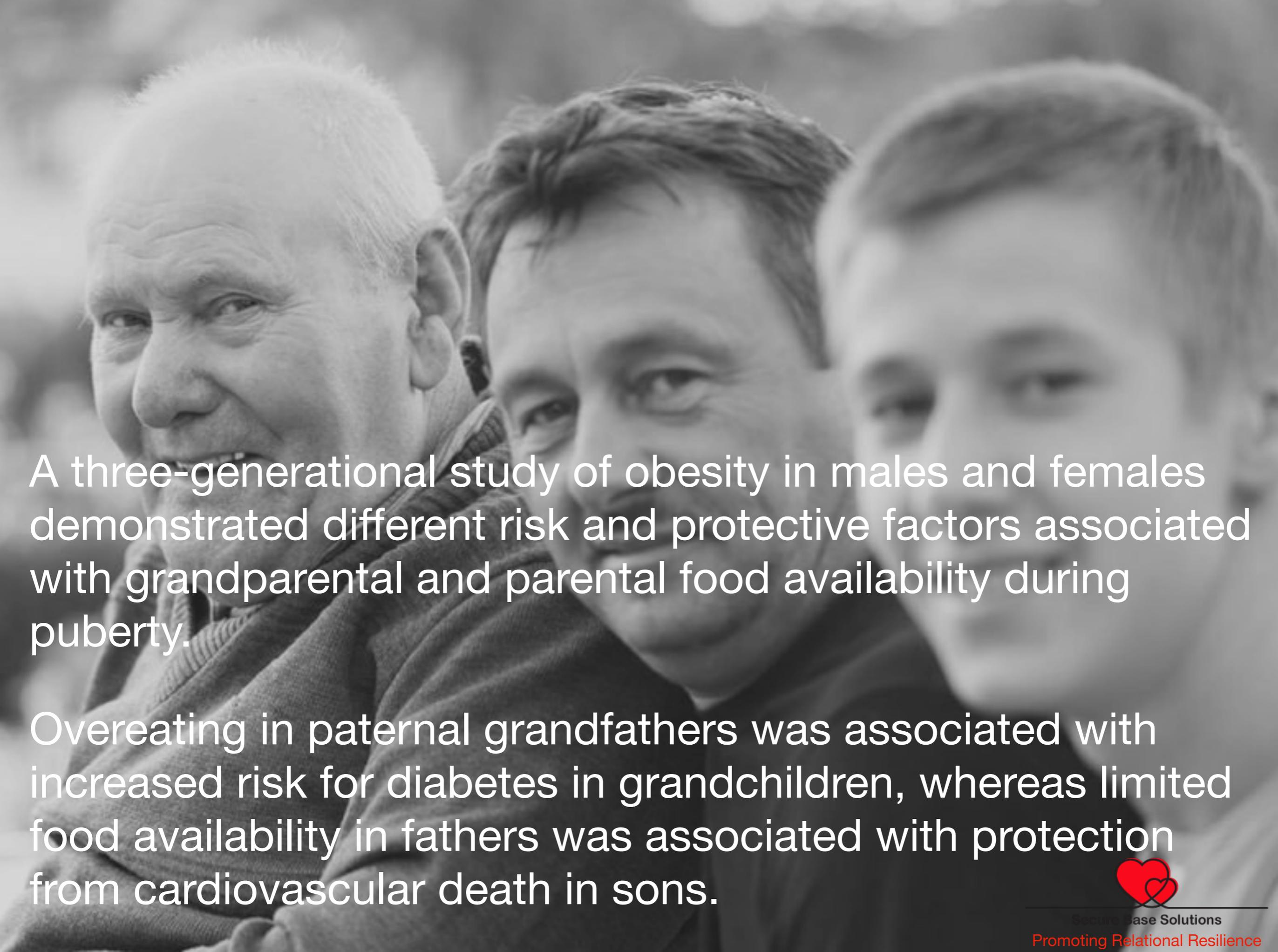
the timing of exposure in pregnancy

the sex of the foetus

the nature of maternal symptoms

significant contributions - nutrition, exposure to toxins, delivery factors, medication effects, socio-demographic variables





A three-generational study of obesity in males and females demonstrated different risk and protective factors associated with grandparental and parental food availability during puberty.

Overeating in paternal grandfathers was associated with increased risk for diabetes in grandchildren, whereas limited food availability in fathers was associated with protection from cardiovascular death in sons.



Paternal alcoholism has also been associated with neurological and behavioural deficits in offspring

Changes in DNA methylation were observed in sperm from men with alcohol or opioid dependence

Smoking was reported to increase risk of childhood cancer in the offspring of male smokers, reduced sperm count, motility and morphology (number and movement), altered sperm microRNA, mitochondria and protein in the smoker parent.



NCMH

National Centre for Mental Health

Possible Positive Impact of AD in pregnancy

DOI: 10.1111/1471-0528.13611

www.bjog.org

Prenatal antidepressant exposure and child behavioural outcomes at 7 years of age: a study within the Danish National Birth Cohort

LE Grzeskowiak,^{a,b} JL Morrison,^c TB Henriksen,^d BH Bech,^e C Obel,^{d,f} J Olsen,^g LH Pedersen^g

^a The Robinson Research Institute, School of Paediatrics and Reproductive Health, The University of Adelaide, Adelaide, SA, Australia ^b SA Pharmacy, Pharmacy Department, Flinders Medical Centre, Bedford Park, SA, Australia ^c School of Pharmacy and Medical Sciences, Sansom Institute for Health Research, University of South Australia, Adelaide, SA, Australia ^d Perinatal Epidemiology Research Unit, Department of Paediatrics, Aarhus University Hospital, Skejby, Denmark ^e Section for Epidemiology, Department of Public Health, Aarhus University, Aarhus, Denmark ^f Department of Public Health, Institute of General Medical Practice, Aarhus University, Aarhus, Denmark ^g Department of Obstetrics and Gynaecology, Institute of Clinical Medicine, Aarhus University, Aarhus, Denmark

Correspondence: Dr LE Grzeskowiak, c/o Pharmacy Department, Flinders Medical Centre, Bedford Park, SA 5042 Australia.
Email Luke.Grzeskowiak@adelaide.edu.au

Accepted 7 July 2015. Published online 16 September 2015.



The Western Australian Pregnancy Cohort (Raine) Study

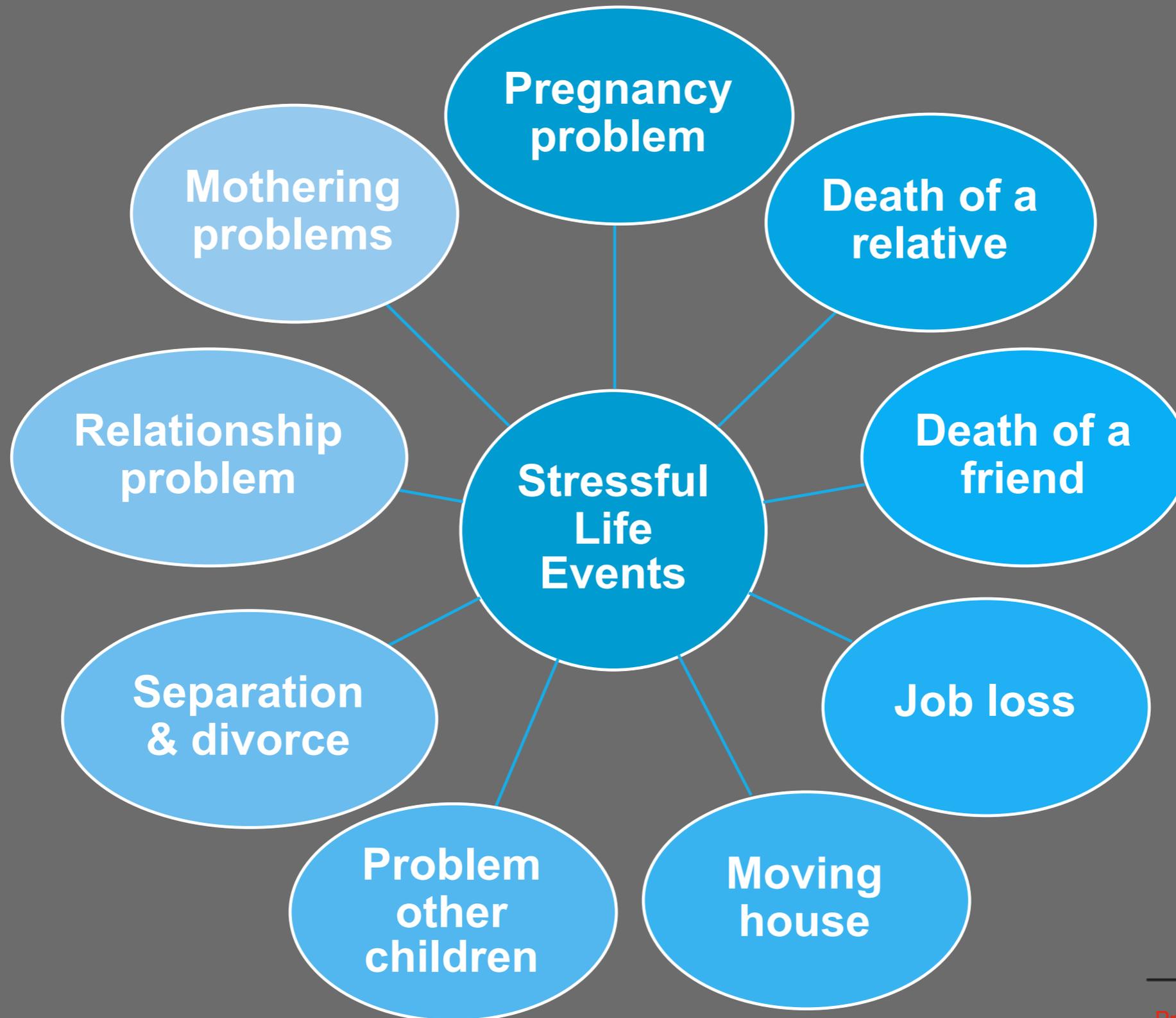
Stressful life events study

To determine the impact of maternal stressful life events during pregnancy on offspring behavioural outcomes with differentiation between:

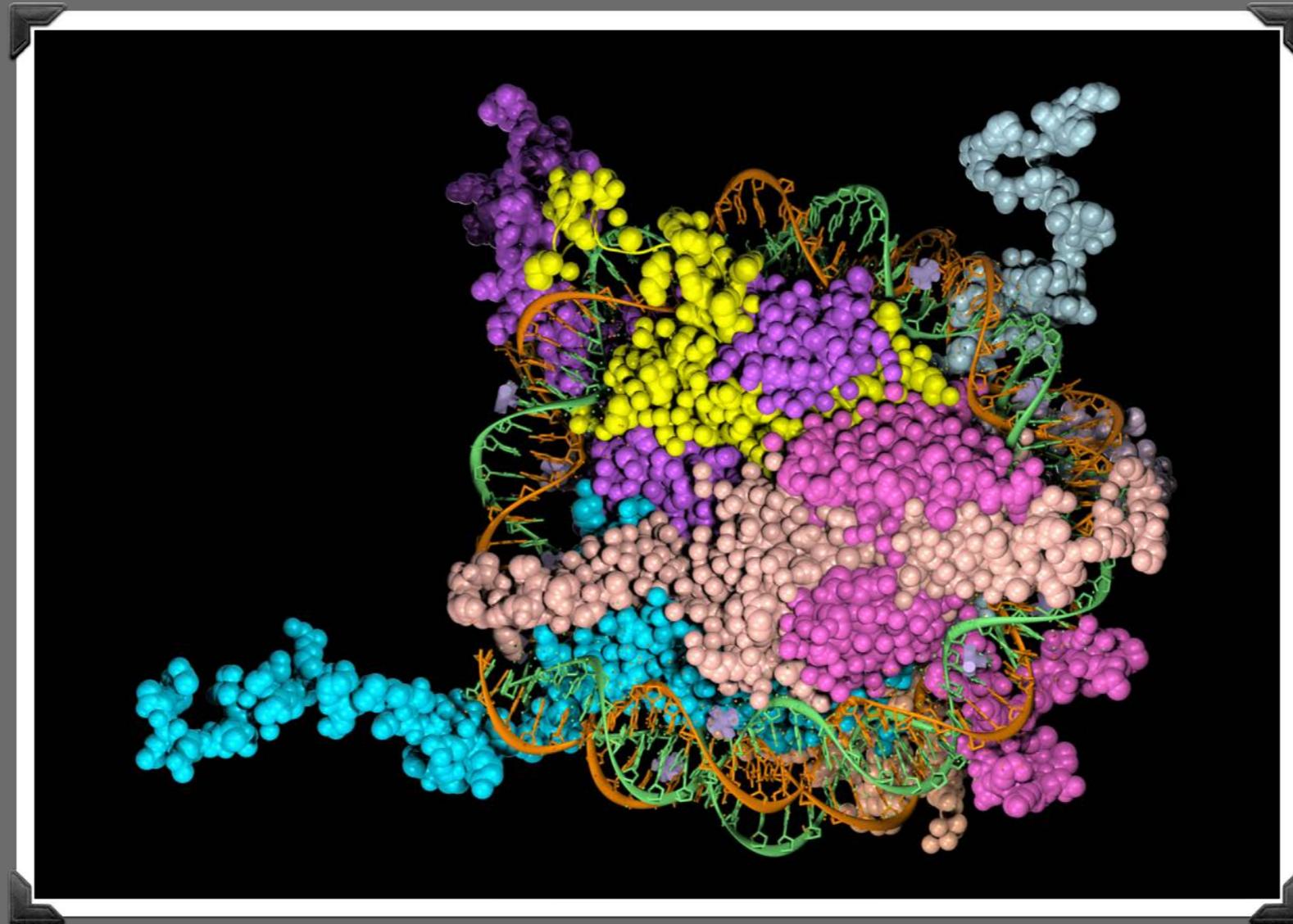
- The number of stressful events
- The type of stressful events
- The timing of stressful events



Raine Study



Implications



Secure Base Solutions

Promoting Relational Resilience



Epigenetics: Destiny's Child?

Understanding Ways to Work with Intergenerational Trauma
Practice

Lisa Gardiner



Secure Base Solutions

Promoting Relational Resilience

**‘Biology is our reality but it
doesn’t have to be our destiny’**



What do we know so far?

Through epigenetic research on mice we can go back 3 - 4 generations and find out information that may explain our experience

Mice are used because their genetic make up and number are most similar to humans



Secure Base Solutions

Promoting Relational Resilience

What do we know so far?

- Epigenetics is the science of all of the things around the gene that influences whether it turns on or off and at what degree



Epigenetics

TRAUMA

&

RESILIENCE



How epigenetic present

eyesight impaired

chronic backpain

cancer

breathing

sleeping

compromised organs

addiction

poor diet

lethargy





What do we need?

- Movement
- Touch
- Human connection
- Exposure to nature
- Deep listening
- Being seen



Ancient Wisdom

- ✦ Retell the story.
- ✦ Hold each other.
- ✦ Massage, dance, sing.
- ✦ Create images of the battle, hunt, and death.
- ✦ Fill literature, sculpture, and drama with retellings.
- ✦ Reconnect to loved ones and to community.
- ✦ Celebrate, eat, and share.



aboriginal healing practices & neurobiology

Relational (safe)

Relevant (developmentally matched)

Repetitive (patterned)

Rewarding (pleasurable)

Rhythmic (resonate with neural patterns)

Respectful (child, family, culture)

Dr Bruce Perry - Child Trauma Academy



Secure Base Solutions

Promoting Relational Resilience

A close-up, slightly blurred photograph of a person's face, focusing on their eyes and mouth. The person has light-colored eyes and is looking slightly to the right. Their hand is near their chin, suggesting a thoughtful or contemplative state. The lighting is soft, and the overall tone is muted.

Traumatized people need to have physical & sensory experiences to

- Unlock their bodies
- Activate effective fight/flight
- Tolerate their sensations
- Modulate dissociative responses / reactions
- Befriend their inner experiences
- Cultivate new action patterns

(van der Kolk)



Authentic & Meaningful Connection



Secure Base Solutions

Promoting Relational Resilience

initiates

contributes

participates

engages

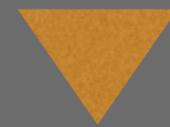
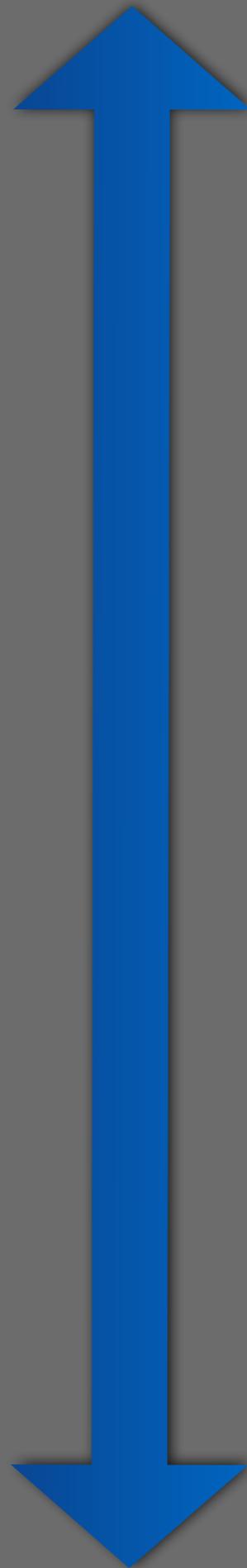
disengages

tolerates

reluctant

resistant

absent



safest

safe

getting there

unsafe



Giving Trauma a Voice



questioning process

What is your worst fear?

If everything went wrong?

Who else could share this sentence?

Mark Wolynn 2016

Mark Wolynn - It Didn't Start With You



Secure Base Solutions

Promoting Relational Resilience

Completion of Healing



Secure Base Solutions

Promoting Relational Resilience

Metaphor for creating safety:

The experience of emotional overwhelm is similar to that of a shaken bottle of soda. Inside the bottle is a tremendous amount of pressure. The safest way to release the pressure is to open and close the cap in a slow, cautious and intentional manner so as to prevent an explosion.

(Rothschild, 2010)

3 Phases of Healing

1. Safety & Stabilisation
2. Remembrance and Mourning
3. Reconnection & Integration

"Everyone has a right to have a present and future that are not completely dominated and dictated by the past"

- Karen Saakvitne



Secure Base Solutions

Promoting Relational Resilience



LISTEN

29m 7s

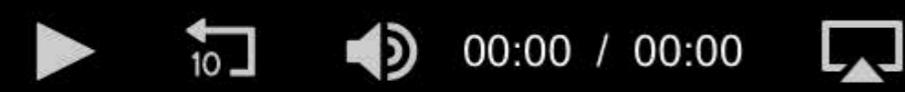


Image: With thanks to Aunty Lorraine, and her daughter Shaan

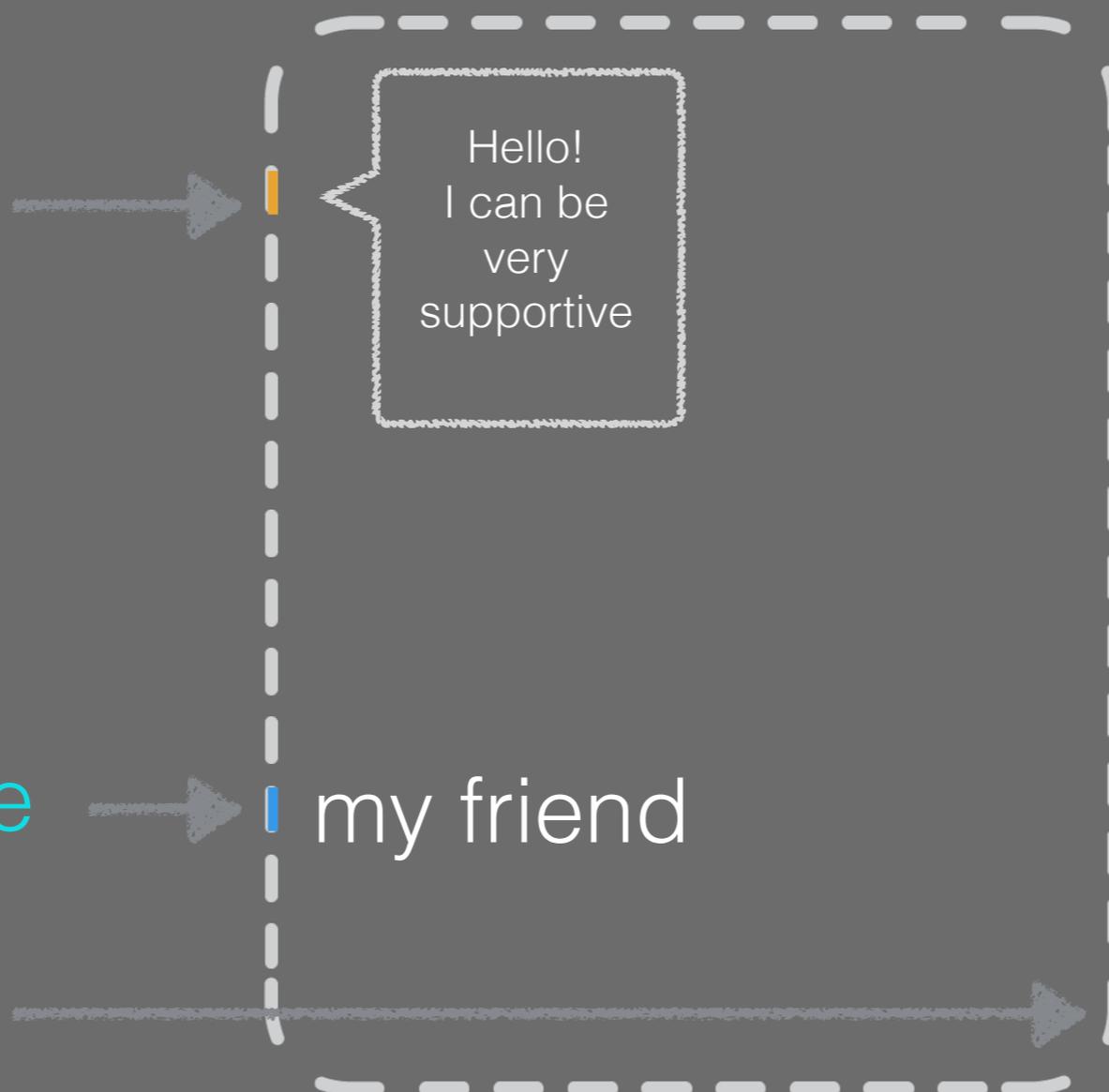


Secure Base Solutions
Promoting Relational Resilience

Healing the trauma of the Stolen Generations

Let's look at the Ecology

Each dash represents an ecological support



The ecology is both people and the environment

We need enough of the 'right' supports to feel 'good'



Building the Reparative Ecology

Relationship
& Belonging

Quality
of Life
Elements



Scaffolding
& Support

Safe & Secure

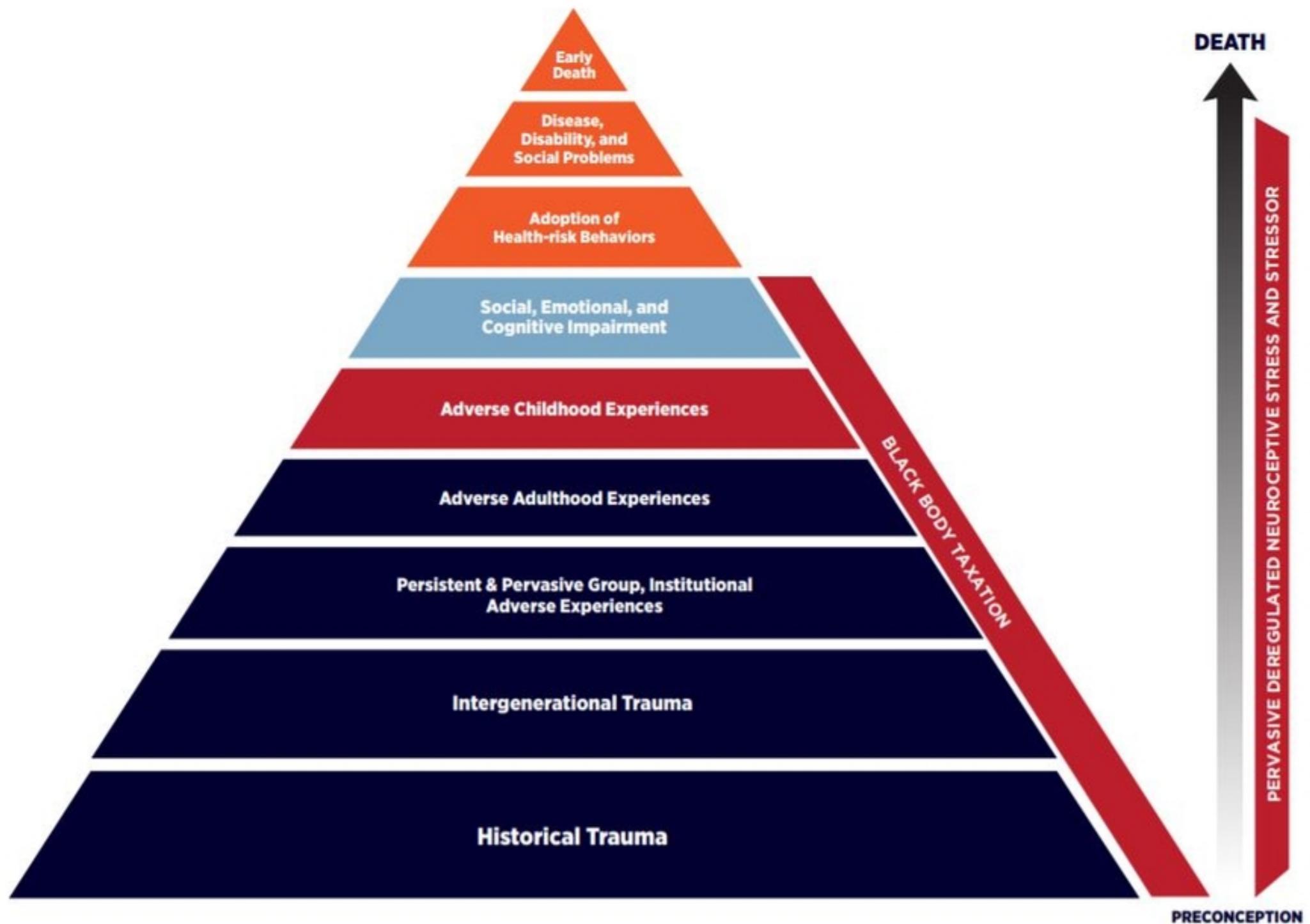


Touch

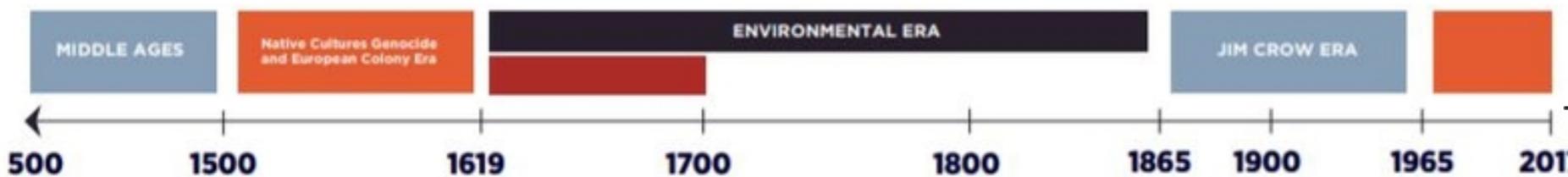


Secure Base Solutions

Promoting Relational Resilience



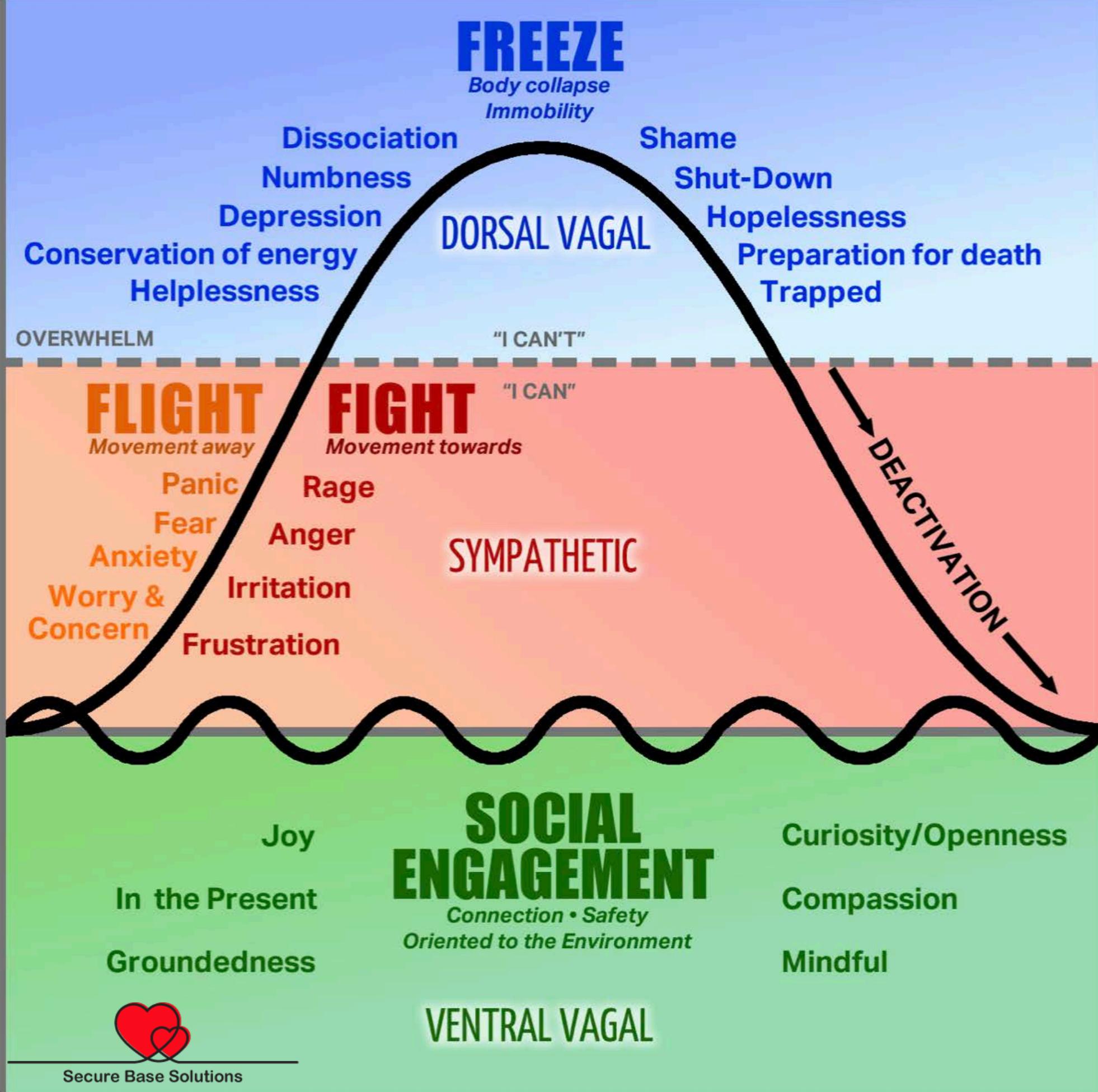
SOMATIC HISTORY ERAS



Secure Base Solutions

Promoting Relational Resilience

↑
AROUSAL INCREASES



PARASYMPATHETIC NERVOUS SYSTEM
DORSAL VAGAL - EMERGENCY STATE

Increases
Fuel storage & insulin activity
Endorphins that help numb and raise the pain threshold.

Decreases
Heart Rate • Blood Pressure
Temperature • Muscle Tone
Facial Expressions • Eye Contact
Intonations • Awareness of the Human Voice • Social Behavior • Sexual Responses • Immune Response

SYMPATHETIC NERVOUS SYSTEM

Increases
Blood Pressure • Heart Rate
Fuel Availability • Adrenaline
Oxygen circulation to vital organs
Blood Clotting • Pupil Size

Decreases
Fuel Storage • Insulin Activity
Digestion • Salvation
Relational Ability
Immune Response

PARASYMPATHETIC NERVOUS SYSTEM
VENTRAL VAGAL

Increases
Digestion • Intestinal Motility
Resistance to Infection
Immune Response
Rest and Recuperation
Circulation to non-vital organs (skin, extremities)
Oxytocin (neuromodulator involved in social bonds that allows immobility without fear)
Ability to Relate and Connect

Decreases
Defensive Responses



Secure Base Solutions

Spirituality

“We are not human beings having a spiritual experience; we are spiritual beings having a human experience”

Pierre Teilhard de Chardin

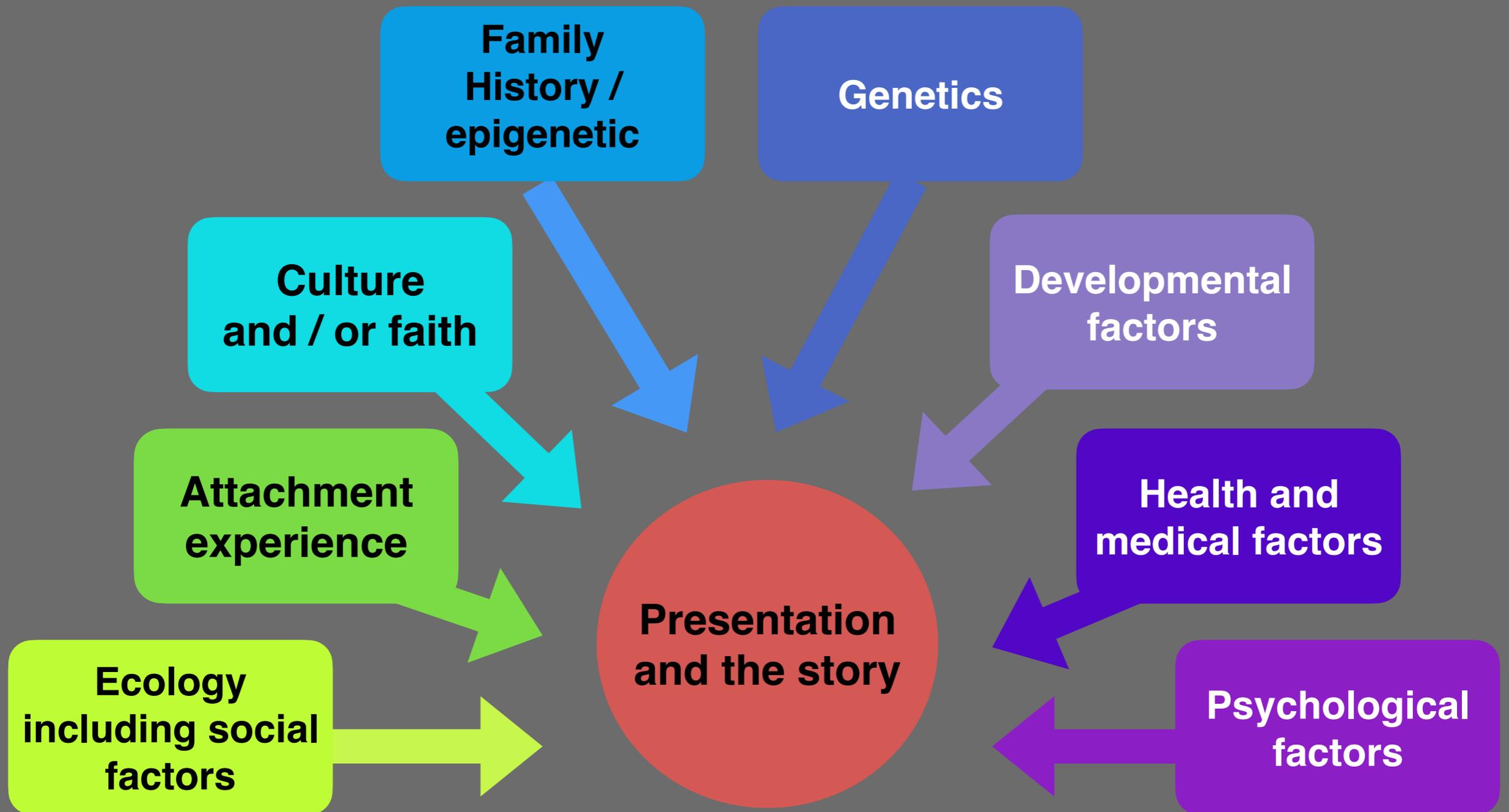




Secure Base Solutions

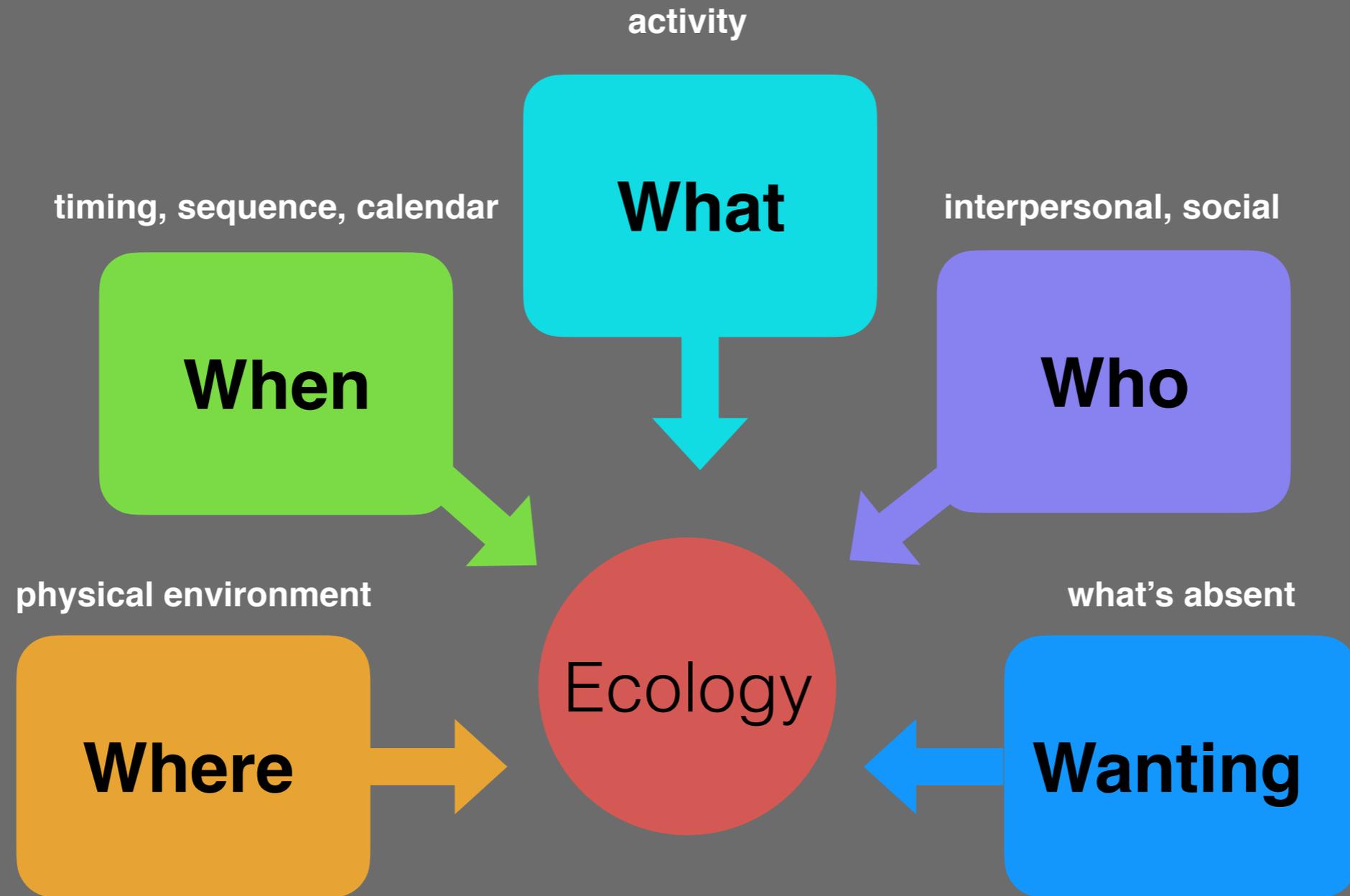
Promoting Relational Resilience

What we need to know?

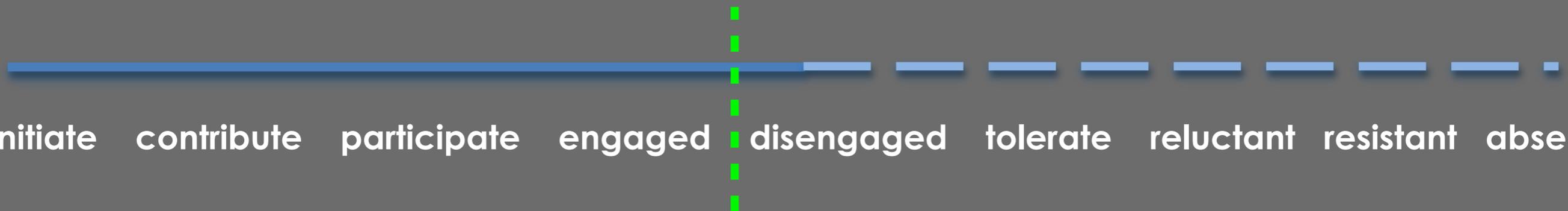


:

What we need to do?



Attachment / Engagement Continuum



initiates - strong sense of belonging and purpose

contributes - engagement is strong and meaningful

participates - engagement increases when prompted

engages - connected, present and accepting

disengages - disconnected, dissociative, distracted

tolerates - present but unaccepting

reluctant - present but unwilling

resistant - overt / covert, conscious / unconscious

absent - includes being there and not 'present'



References

Felitti, V.J & Anda R.F <https://www.cdc.gov/violenceprevention/childabuseandneglect/acestudy/index.html>

Amit Bernstein - Professor of Psychology at the University of Haifa and director of the Observing Minds Lab
Observing Minds Lab <http://irca-haifa-6h5e.squarespace.com>

Rachel Yehuda - Professor of Psychiatry and Neuroscience, Director of the Traumatic Stress Studies Division at the Mount Sinai School of Medicine.

Dr. Martin Teicher at Harvard University, have theorised, on the basis of considerable research, that many of these seemingly negative effects are best understood as survival-based alterations that are actually highly adaptive.

Centre on the Developing Child - Harvard University

Lisa Gardiner - Secure Base Solutions - Attachment Continuum



<http://health.thewest.com.au/news/2147/long-may-kids-health-study-raine>

<https://rainestudy.org.au>

Raphael B, Swan P, Martinek N. Intergenerational aspects of trauma for Australian Aboriginal people. In: Danieli Y (ed). International handbook of multigenerational legacies of trauma. Boston: Springer, 1998:327-39.

Bagot RC, Meaney MJ. Epigenetics and the biological basis of gene x environment interactions. J Am Acad Child Adolesc Psychiatry 2010;49:752-71.

Wolynn, M. (2016) It Didn't Start With You : Penguin Random House

Kellermann, Natan P. F. (2001). Transmission of Holocaust Trauma – An Integrative View. Psychiatry: Interpersonal and Biological Processes: Vol. 64, September, pp. 256-267.

van der Kolk, (1996) Traumatic Stress, The Effects of Overwhelming Experience on Mind, Body, and Society

Bar-On, D. Legacy of Silence: Encounters with Children of the Third Reich. Cambridge, Massachusetts and London, England: Harvard University Press 1989.

Bar-On, D. Fear and Hope: Three Generations of the Holocaust. Cambridge, Massachusetts and London, England: Harvard University Press 1995.

Bar-On, D. The Indescribable and the Undiscussable: Reconstructing Human Discourse after Trauma. Budapest: Central European University Press 1998.



<https://elemental.medium.com/science-confirms-that-the-vagus-nerve-is-key-to-well-being-c23fab90e211>

<https://marumali.com.au>

<https://marumali.com.au/sites/marumali.com.au/files/chapter20.pdf>

<https://onbeing.org/programs/resmaa-menakem-notice-the-rage-notice-the-silence/>

<http://richardlouv.com/books/last-child/>

https://healingfoundation.org.au//app/uploads/2019/06/HF_Glossary_of_Healing_Terms_A3_Poster_Jun2019_V2_WEB-2.pdf

<https://attachmentdisorderhealing.com/developmental-trauma-3/>

<https://healingfoundation.org.au/intergenerational-trauma/ourfuture/>

[https://www.audible.com.au/pd/My-Grandmothers-Hands-Audiobook/B078KGHR2B?](https://www.audible.com.au/pd/My-Grandmothers-Hands-Audiobook/B078KGHR2B?source_code=M2MOR131091619005N&ds_rl=1252391&gclid=EAlaIQobChMlvNfL6r786wIVadOWCh2LKQgdEAAYASAAEgIJtvD_BwE&gclsrc=aw.ds)

[source_code=M2MOR131091619005N&ds_rl=1252391&gclid=EAlaIQobChMlvNfL6r786wIVadOWCh2LKQgdEAAYASAAEgIJtvD_BwE&gclsrc=aw.ds](https://www.audible.com.au/pd/My-Grandmothers-Hands-Audiobook/B078KGHR2B?source_code=M2MOR131091619005N&ds_rl=1252391&gclid=EAlaIQobChMlvNfL6r786wIVadOWCh2LKQgdEAAYASAAEgIJtvD_BwE&gclsrc=aw.ds)

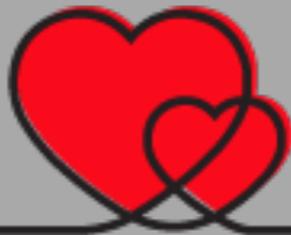


Secure Base Solutions

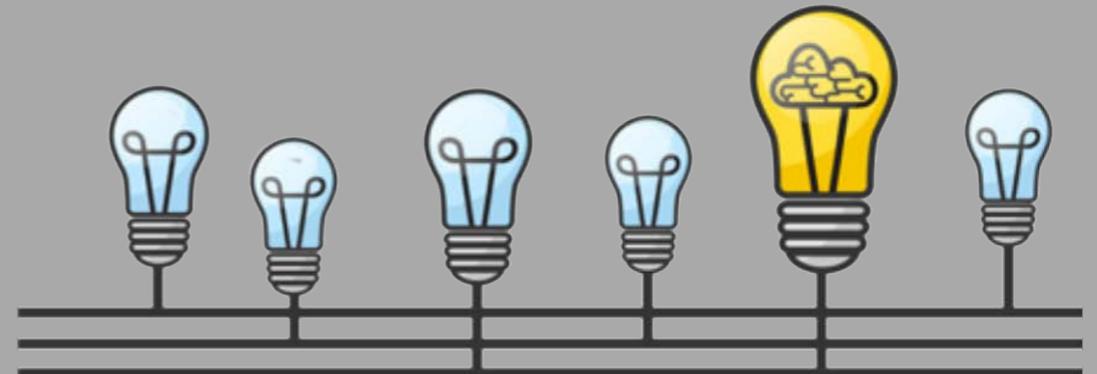
Promoting Relational Resilience

Lisa Gardiner
+61 0405126540

lisa@securebasesolutions.com.au
www.securebasesolutions.com.au



Secure Base Solutions
Promoting Relational Resilience



Developing Practice Collaboratively
www.lisagardiner.com.au

