

Perinatal Neuroscience and Skin-to-Skin Contact



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FETAL BRAIN DEVELOPMENT

The first 10 - 14 weeks,
fetal brain growth is
determined by genes (the DNA)

Thereafter,
brain growth is an active process.

FETAL BRAIN DEVELOPMENT

The neurons migrate,
extend their axons and branches,
and make synapses (thousands)
connecting to sensory organs
More sensations → more synapses

Brain growth
depends on experiences !!

Gestational age

20w all structures completed

23w fetus is aware / conscious

parallel development of structure & function

Neurobehaviour and neurodevelopment
are inseparable
a single integrated whole.

"The perinatal sensorium
is never in chaos

... the infant's world is structured,
competent and organized,
developing in an ever ordered,
yet ever more complex and
more flexible field of perception"

(Laughlin)

Porges SW Polyvagal theory.

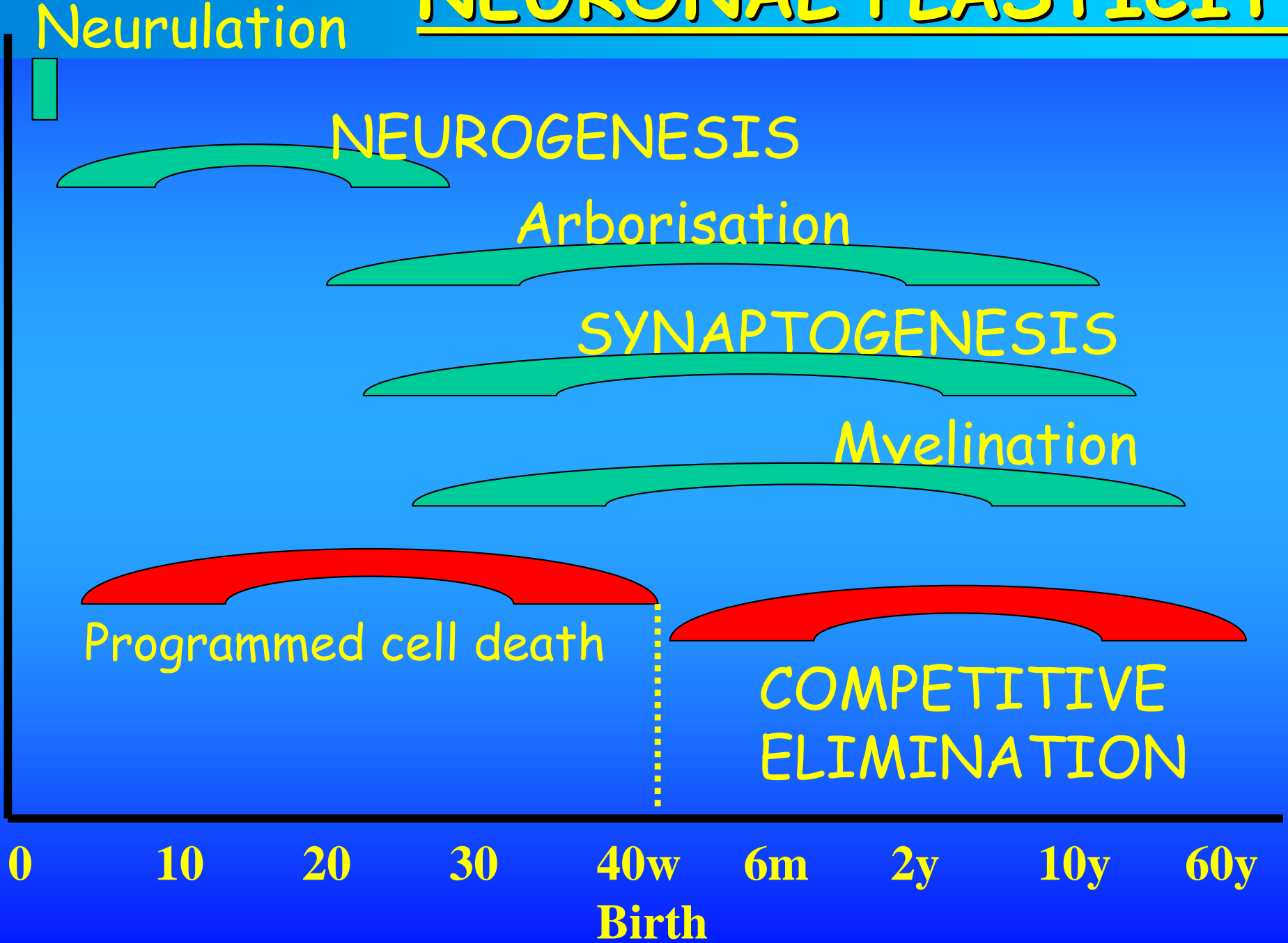
evolution of autonomic nervous system

- 1st primitive unmyelinated vagus
immobilisation behaviours
- 2nd sympathetic nervous system,
Behaviours for “fight or flight”
- 3rd myelinated vagus – rapid regulation
cardiac output
engagement / disengagement

FETAL BRAIN DEVELOPMENT

Cells that
fire together,
wire together.
Use it, or lose it.

NEURONAL PLASTICITY



SENSORY STIMULUS



synapse store chemical signal



chemical signal stronger



THRESHOLD →



EXEMPT from elimination
(synapse stabilised)



PATHWAY

(Rima Shore 1997)

FETAL BRAIN DEVELOPMENT

Development is a process of "pruning" some, and developing other synapses - creating "neural pathways".

These can be good or bad - depending on type of sensations and experience of the newborn

R Shore

Critical period concept :

“Windows of opportunity in early life when a child’s brain is exquisitely primed to receive sensory input in order to develop more advanced neural systems.”

NEWBORN DEVELOPMENT

Tactile stimulations

“facilitate the flow of affective information from the infant ... to the mother”

“the language of mother and infant consists of signals produced by the autonomic nervous system of both parties”.

This is the basis of healthy development!

Schore

In early postnatal life, maintenance of critical levels of tactile input ... is important for normal brain maturation.

Areas of the amygdala
are in a critical period of maturation,
... in the first two months of life

Myron Hofer

... the private realm of sensory stimulation constructed by the mother and infant from numberless exchanges of subtle clues.

(Gallagher 1992)

Through such "hidden maternal regulators" he discovered that a mother precisely controls every element of her infants physiology, from its heart rate to its release of hormones from its appetite to the intensity of its activity

(Gallagher 1992)

Hofer discovered that what seems to be a single physical function, such as grooming or nursing, is actually a kind of umbrella that covers stimuli of touch, balance, smell, hearing and vision, each with a specific effect on the infant.

(Gallagher 1992)

a kind of invisible hothouse

"the wiring of the brain's pathways is best supported when it can integrate quality sensory input through several pathways at once, particularly during critical periods of development." *(McCain 1999)*

Neuronal Plasticity

“the first three years are decisive”

The cortex retains some plasticity
throughout life ...

But the limbic system
and the midbrain
is fixed after the age
of three years ...

Neuronal Plasticity

“the first three years are decisive”

→ platform for
subsequent
development of
higher cognitive
functions.

Attachment
Regulation
Emotion
Control

Arousal
Appetite
Sleep

Infant brain development

Early brain
development is

INTERACTIVE

RAPID

DRAMATIC

Infant brain development

CRITICAL PERIODS

require

specific stimulations

at specific times

Infant brain development

Quality SENSORY
STIMULATION

makes brain able to
think and regulate

Infant brain development

Negative experiences

(both absence of good ...
and presence of bad)

have long lasting
effects

Current paradigm versus NEW:

Infant brain development

- | | |
|-------------------------------|--------------------|
| 1. Genetically determined | EXPERIENCE |
| 2. Develops in linear time | CRITICAL PERIOD |
| 3. Activity increases w age | GREATEST 3 yrs |
| 4. Mother = good context | = WIRES BRAIN |
| 5. Deficits correctable later | Limbic FIXED at 3y |

(Rima Shore 1997)

“The mammalian brain is designed to be sculpted into its final configuration by the effects of early experience”

These experiences are embedded in the attachment relationship.

The neurobehavioural programmes
originate in the **LIMBIC SYSTEM**

Expressed through

hypothalamus

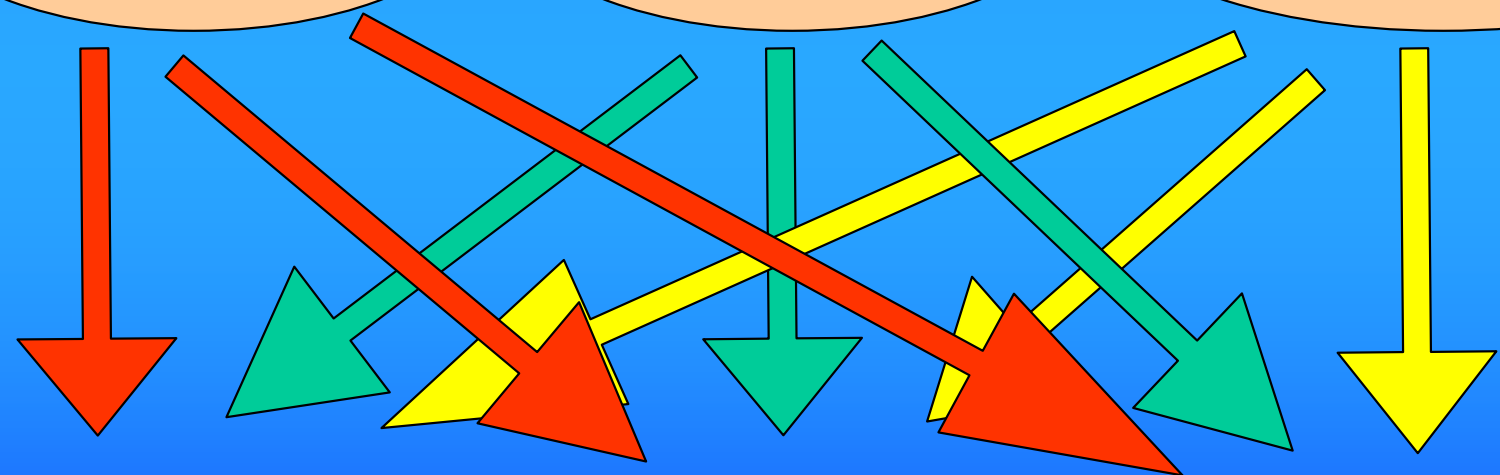
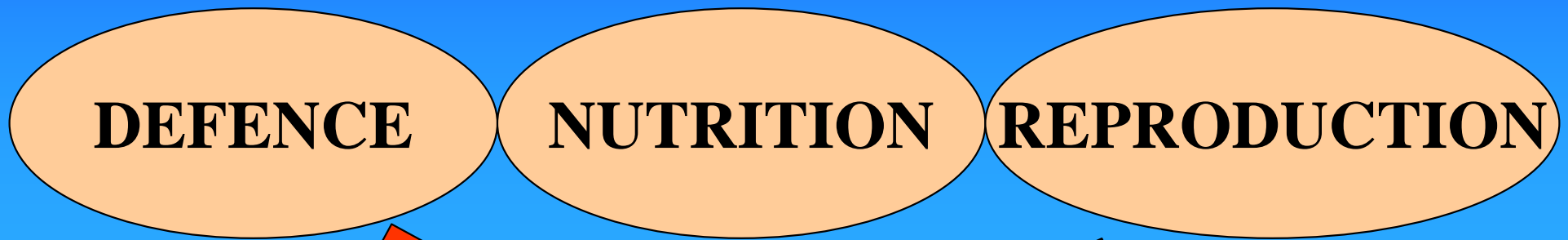
(autonomic nervous system)

hypophysis

(endocrine system, hormones)

cerebellar connections

(somatic system)



HORMONES

NERVES

MUSCLES

endocrine

autonomic NS

somatic

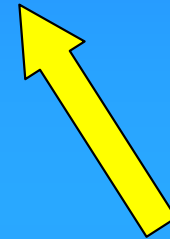
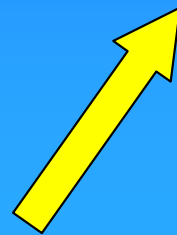
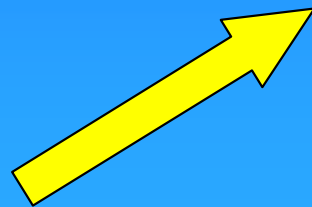
BEHAVIOUR

HORMONES

NERVES

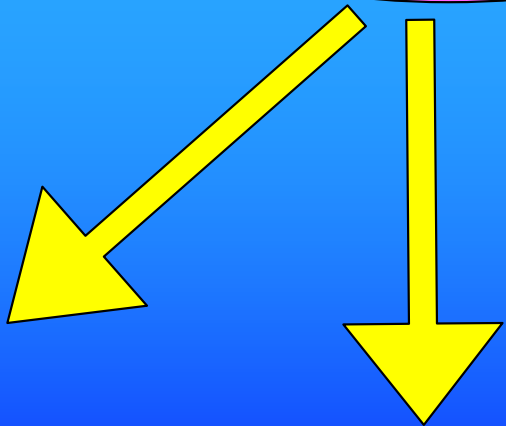
MUSCLES

WHOLE BODY



All mammals have set sequence of behaviours at birth

REPRODUCTION



... MUSCLES

..... All with a single purpose : to

BREASTFEED

After birth, events are
determined ...

... by the neonate
stimulating the mother!

(Rosenblatt 1994)

Breast-feeding is “established through a set of mutual, complex sensory stimulations in mother and child.”

(Kjellmer & Winberg 1994)

In all mammals

.... the newborn is
responsible for
initiating
breastfeeding,

not the mother !!

EXCEPT IN HUMAN ???

Sequence human newborn breast-feeding

Pre-requisite = habitat

hand to mouth

tongue moves

mouth moves

eye focuses nipple

crawls to nipple

latches to nipple

suckles

(Widstrom et al 1994)

The first hours after birth are a
CRITICAL PERIOD

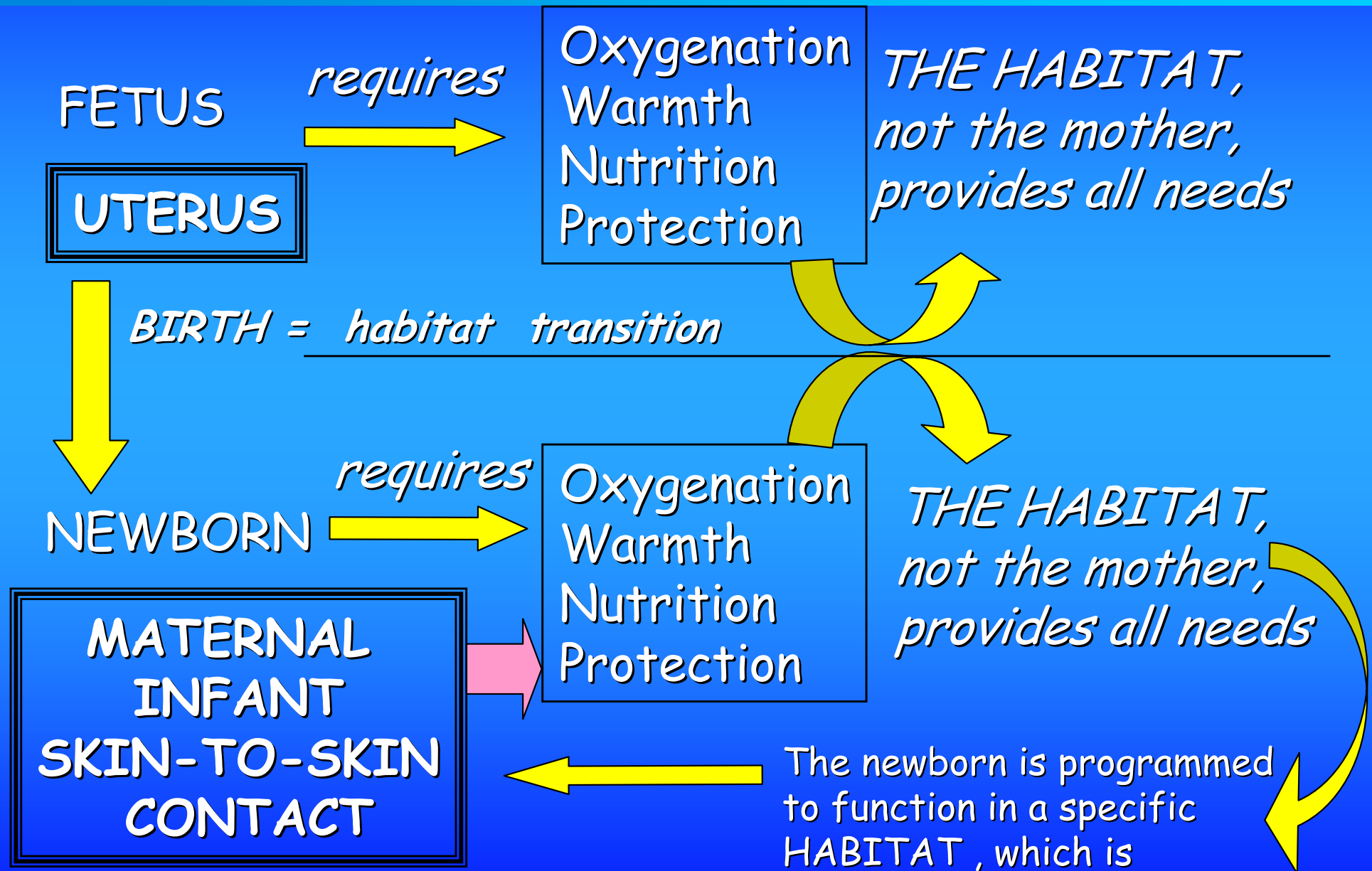
mutual
psycho-physiological
caregivers

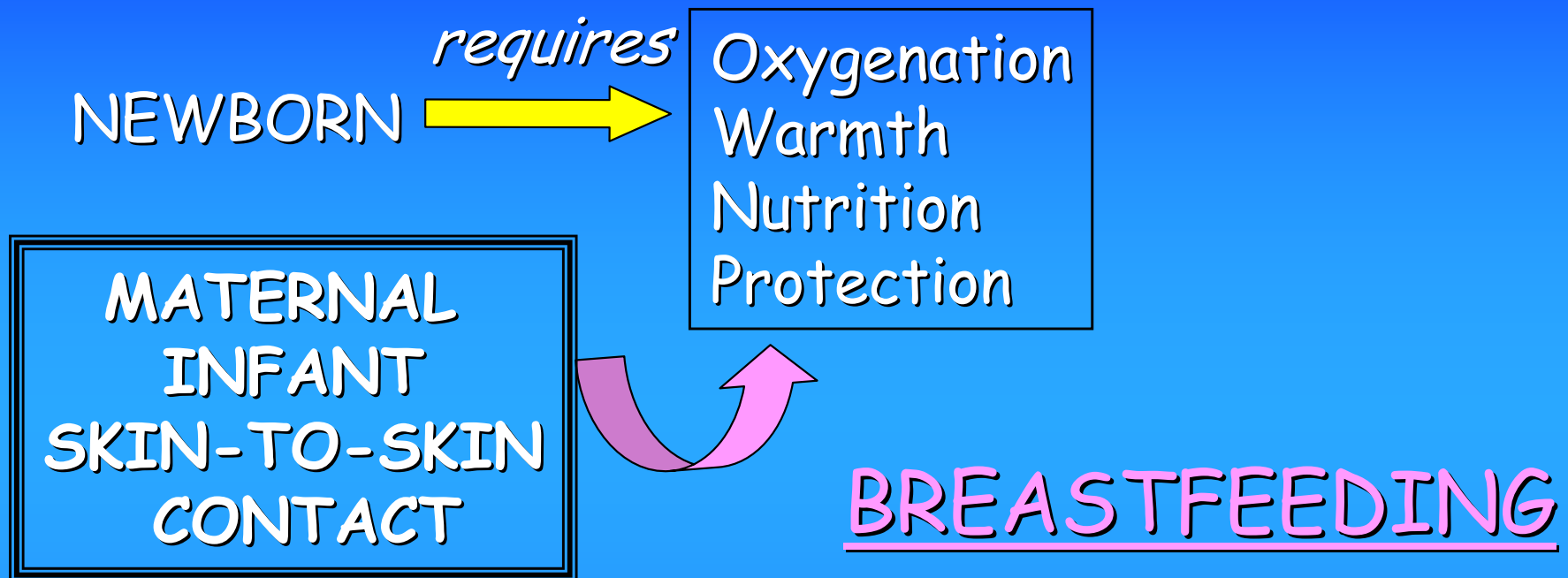
Warming, feeding and protection **behaviours** are intricately, inseparably linked to the right place.

(Alberts 1994)

= NUTRITION PROGRAMME

"Habitat - niche" - AGAIN

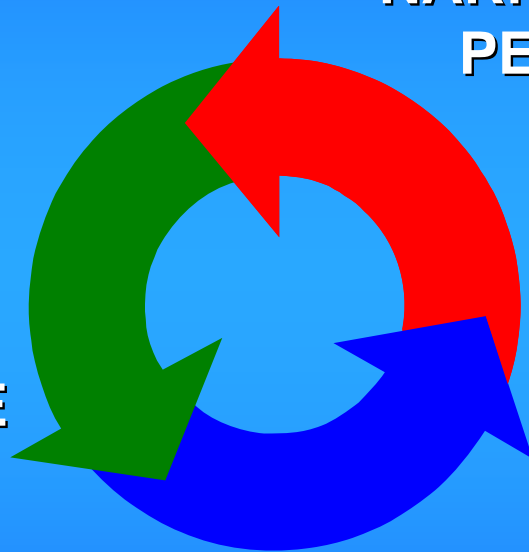




is the link between HABITAT
and the BASIC BIOLOGICAL NEEDS

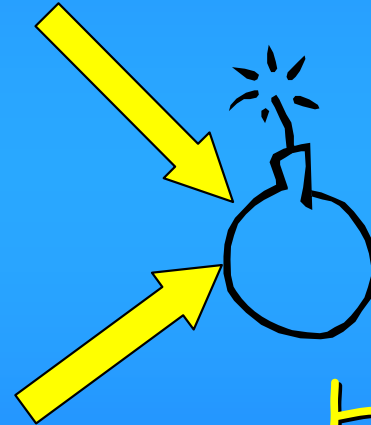
is the whole PROGRAMME,
Not just the eating !

TOOL USE
&
LANGUAGE

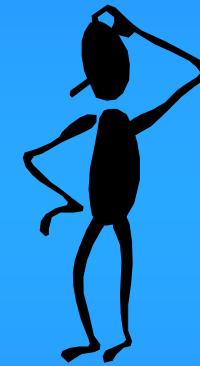


BIPEDALISM &
NARROWER
PELVIS

INCREASED
BRAIN SIZE



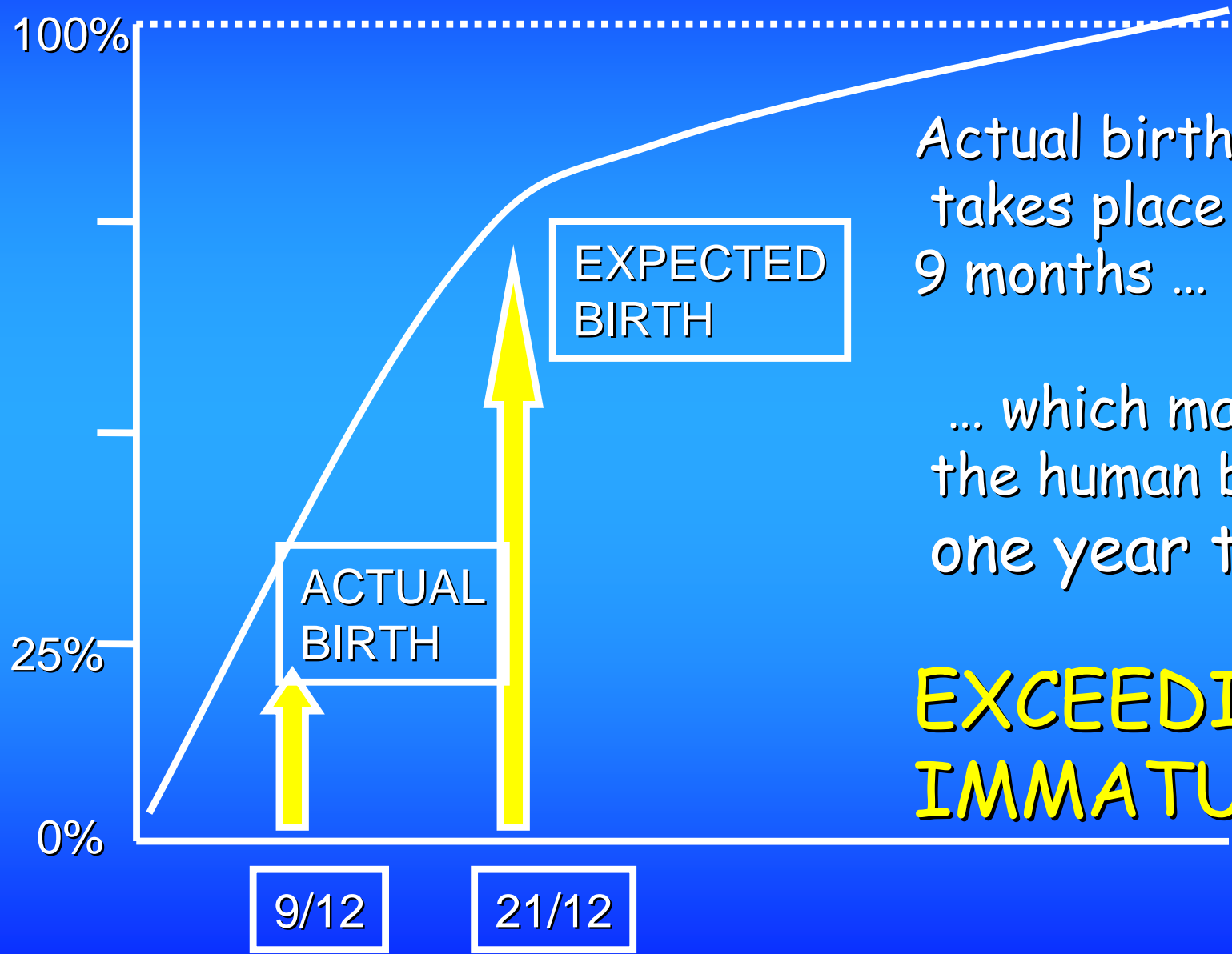
... **PROBLEM ?**



How is the bigger
head going to be
born out of the
smaller pelvis ??

SOLUTION: “the birth of exceedingly neurologically immature infants for whom the majority of brain growth will occur postnatally and not in the womb.”

(McKenna 1993)



Actual birth
takes place at
9 months ...

... which makes
the human birth
one year too soon:

**EXCEEDINGLY
IMMATURE**

Human milk is the means
whereby the immature infant
CONTINUES ITS GESTATION.

UTERUS UMBILICAL CORD

Oxygenation	+++
Warmth	-
Nutrition	+++
Protection	++

CHEST

MOTHER'S MILK
(BREAST)

Oxygenation	(+)
Warmth	+
Nutrition	+++
Protection	++

WHY KANGAROO ?

Marsupials have a

pouch

...which has

four nipples

... and can close tight
for protection

KANGAROO MOTHER CARE

-Skin-to-skin	CALOR	warmth
-Breastfeeding	LECHE	milk
-Protection	AMOR	love

KMC started by
Drs Rey and Martinez,
(1979) Bogota, Colombia.
UNICEF report 1983
"remarkable claims"

KANGAROO MOTHER CARE

- Skin-to-skin
- Breastfeeding
- Protection

PLACE or HABITAT

BEHAVIOUR or NICHE

SUPPORT to DYAD

.

KANGAROO MOTHER CARE

Skin-to-skin contact

Breastfeeding

Support to the dyad

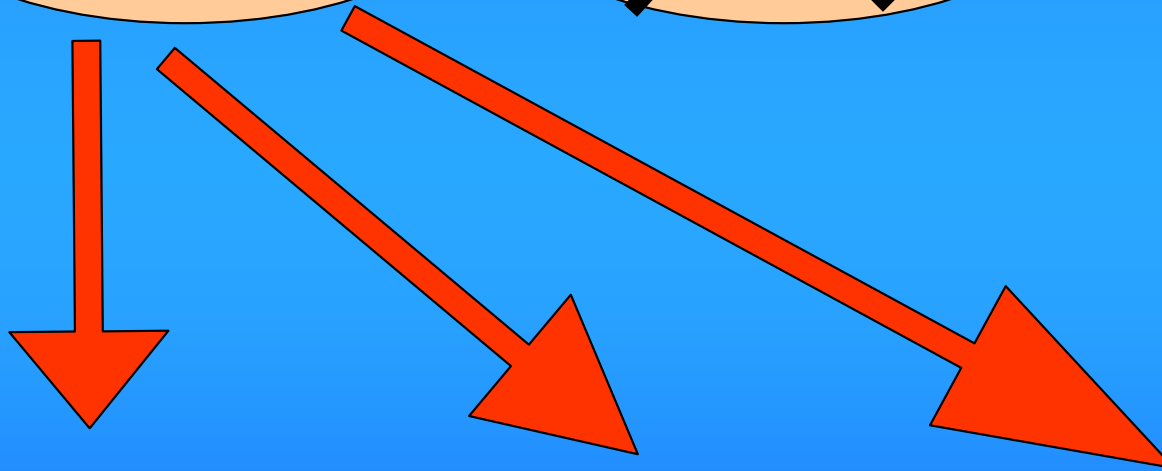
KANGAROO MOTHER CARE

A mother and baby

DYAD

are a single
psychobiological
organism

The DEFENCE program shuts
off the others immediately



HORMONES NERVES MUSCLES

= PROTEST - DESPAIR

Universal response to
separation (wrong habitat):

protest - ...

... intense
activity,
trying to
find the
habitat ...

Universal response to
separation (wrong habitat):

- ***despair response***

...when separation
is prolonged ...

...system shuts down for
prolonged survival

HYPERAROUSAL - (Schoore 2001)

"... sympathetic system activated,
increasing HR, BP, tone, vigilance,

distress is expressed as in
crying then screaming, a state of
"frantic distress" or "fear-terror"

hypermetabolic state in the brain"

DISSOCIATION (Schore 2001)

"... later forming, parasympathetic, state of "conservation-withdrawal"

a hypometabolic process, in which the individual passively disengages "to conserve energies" ...

"to foster survival by the risky posture of feigning death".

HYPERAROUSAL - DISSOCIATION (Schoore 2001)

"in this state both sympathetic
and parasympathetic components
are hyperactivated ... Creating

... chaotic biochemical alterations

... a toxic neurochemistry in the
developing brain

HYPERAROUSAL - DISSOCIATION (Schoore 2001)

"in the developing brain,
states organize neural systems,
resulting in enduring traits."

HYPERAROUSAL - (Schoore 2001)

"... sympathetic system activated,
increasing HR, BP, tone, vigilance,

distress is expressed as in
crying then screaming, a state of
"frantic distress" or "fear-terror"

hypermetabolic state in the brain"

CRYING IS BAD FOR BABY !!

“Crying ...

**depletes energy reserves and oxygen,
increases intracranial pressure,
increases white blood count and
increases base excess,
re-establishes fetal circulation,
interferes with the infant’s ability to
interact with caregivers.”**

Gene Cranston Anderson (1984)

CRYING IS BAD FOR BABY !!

“These effects place fullterm and preterm infants at greater risk for respiratory distress, pneumothorax, acute or subclinical intra-ventricular haemorrhage, unnecessary treatment for pseudosepsis, delayed circulatory and psychosocial adaptation to extrauterine life.”

Gene Cranston Anderson (1984)

SEPARATION IS HARMFUL

“Origins of many behavioural deviations are unknown ...

... can some be traced back to

violations of an innate agenda?”

(Kjellmer and Winberg 1994).

Contemporary neuroscience

currently exploring early beginnings
of adult brain pathology ...

... alterations in the functional
organisation of the human brain ...
... correlated with the absence
of early learning experiences.

Schore / Bergman

"developmental psychoneurobiological model"

good attachment →

→ efficient right brain regulation →

→ infant mental health →

→ adult mental health .

Poor adult mental health → caused by

Poor infant mental health → caused by

Poor right brain regulation → caused by

POOR ATTACHMENT → caused by

lack of skin-to-skin contact → caused by

SEPARATION

In medical literature –
two conditions uniquely
show hyperstimulation
of both arms of the ANS

NEWBORN
SEPARATION
and
BUTHID
SCORPIONISM

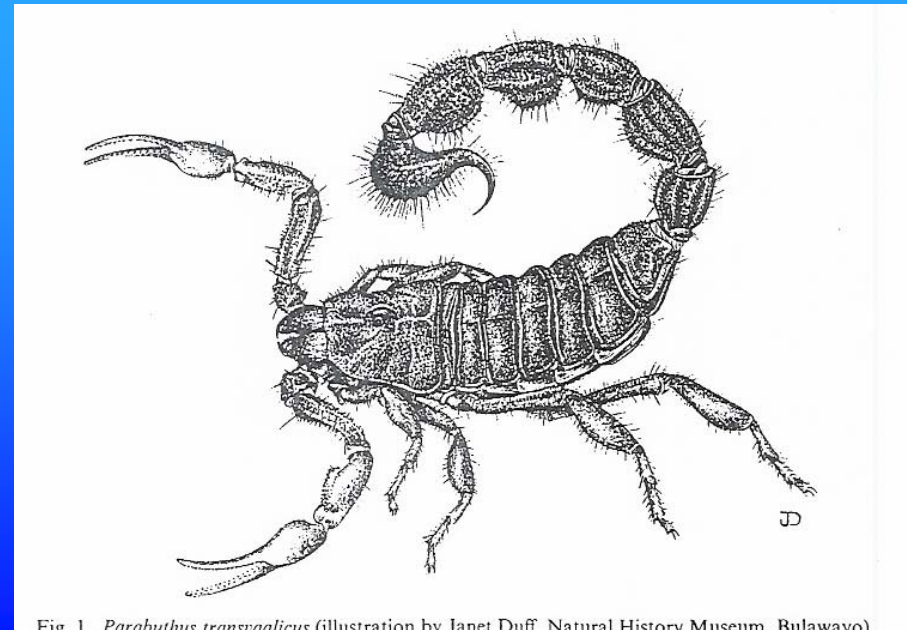


Fig. 1. *Parabuthus transvaalicus* (illustration by Janet Duff, Natural History Museum, Bulawayo)

At birth, the human being has
sensory perceptions
with no "filters" -
it experiences all its
sensations maximally.

As it develops,
it learns to "dampen down"
sensory inputs.

BUTHID SCORPIONISM

Buthid scorpionism ...

**... is a potentially
deadly condition,**

**... causes the most severe pain
possible and imaginable ...**

**Biblical writers use “scorpion sting” as a
metaphor to convey the worst kind of pain !!**

BUTHID SCORPIONISM

Unique – *P. transvaalicus* cholinergic without adrenergic - thought impossible!!

P. granulatus

sympathetic

(= adrenergic)

Pulmonary oedema

PROTEST

HYPERAROUSAL

P. transvaalicus

parasympathetic

(= cholinergic)

Fatal syncope

DESPAIR

DISSOCIATION

HYPERAROUSAL - DISSOCIATION (Schoore 2001)

"in this state both sympathetic and parasympathetic components are hyperactivated ... Creating

... chaotic biochemical alterations

... a toxic neurochemistry in the developing brain

Mother and offspring live in a biological state that has much in common with addiction. When they are parted the infant does not just miss its mother; it experiences a physical and psychological withdrawal from a host of her sensory stimuli, not unlike the plight of a heroin addict who goes cold turkey.

(Gallagher 1992)

THE SEPARATED BABY THAT
HAS "SETTLED" IS NOT HAPPY ,

IT IS IN DESPAIR ,
DISSOCIATION

IT IS
HARDWIRING PRIMITIVE
DEFENCE PATHWAYS !!!

SEPARATION !!!!

THE "PRIMARY
VIOLATION"

... the very
worst thing ...

to any newborn
according to biologists is

SEPARATION.

SEPARATION

VIOLATES

THE INNATE AGENDA

OF MOTHER

AND NEWBORN

MATERNAL-INFANT

SEPARATION

= ABUSE