

## 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)*

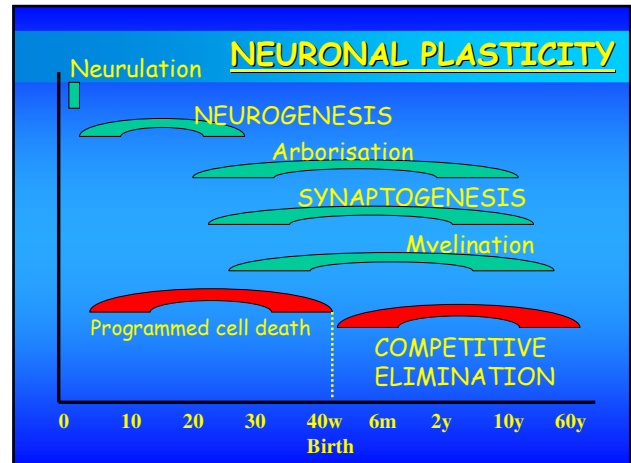
## Porges SW Polyvagal theory.

### evolution of autonomic nervous system

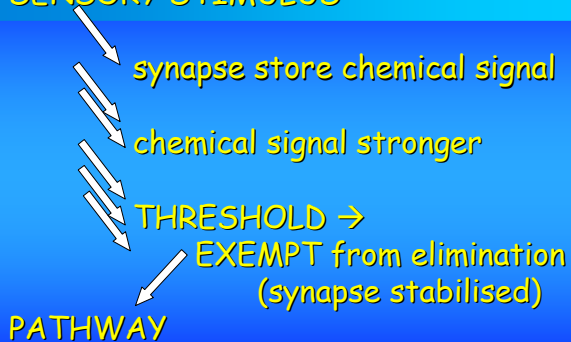
- 1<sup>st</sup> primitive unmyelinated vagus  
immobilisation behaviours
- 2<sup>nd</sup> sympathetic nervous system,  
Behaviours for "fight or flight"
- 3<sup>rd</sup> myelinated vagus – rapid regulation  
cardiac output  
engagement / disengagement

## FETAL BRAIN DEVELOPMENT

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



## SENSORY STIMULUS



(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”

Attachment  
Regulation  
Emotion  
Control

Arousal  
Appetite  
Sleep

→ platform for  
subsequent  
development of  
higher cognitive  
functions.

## 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**

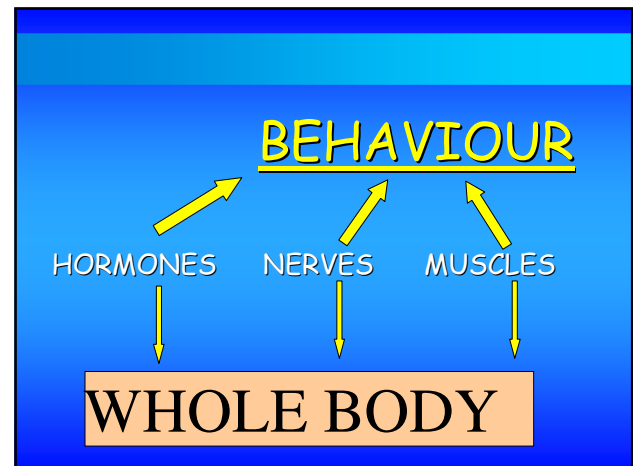
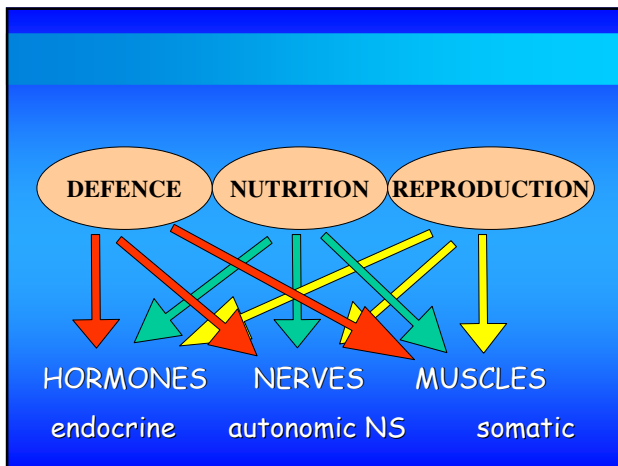
(autonomic nervous system)

**hypophysis**

(endocrine system, hormones)

**cerebellar connections**

(somatic system)



All mammals have set sequence of behaviours at birth .....



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**

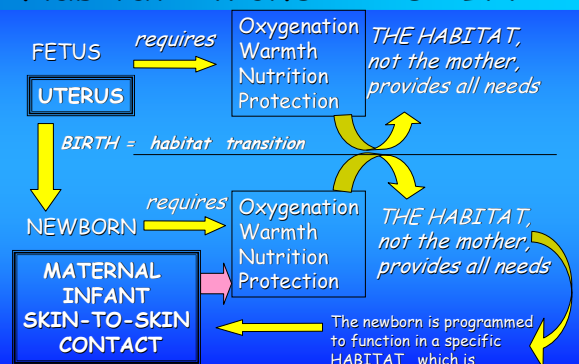
**mutual psycho-physiological caregivers**

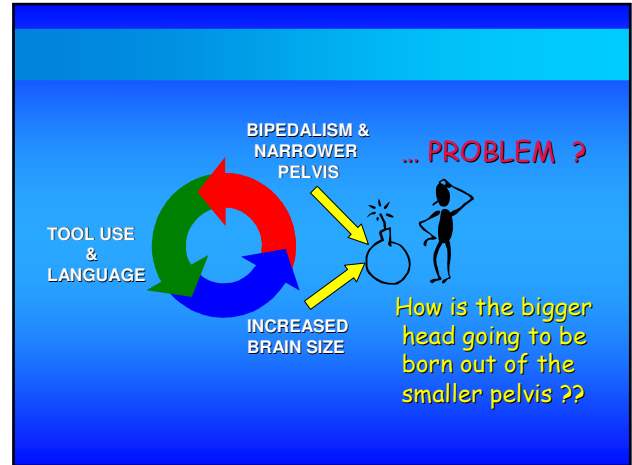
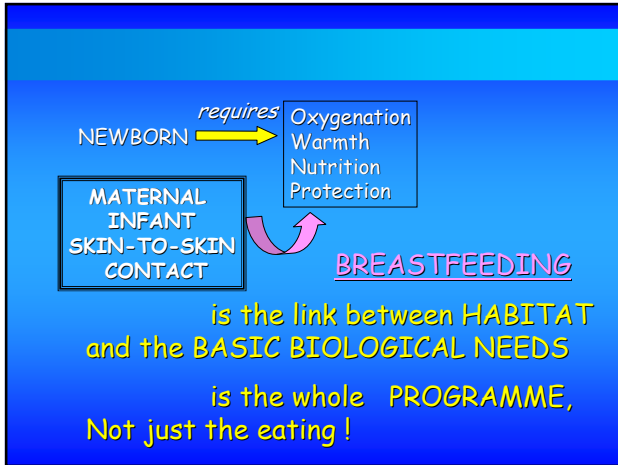
Warming, feeding and protection **behaviours** are intricately, inseparably linked to the right place.

(Alberts 1994)

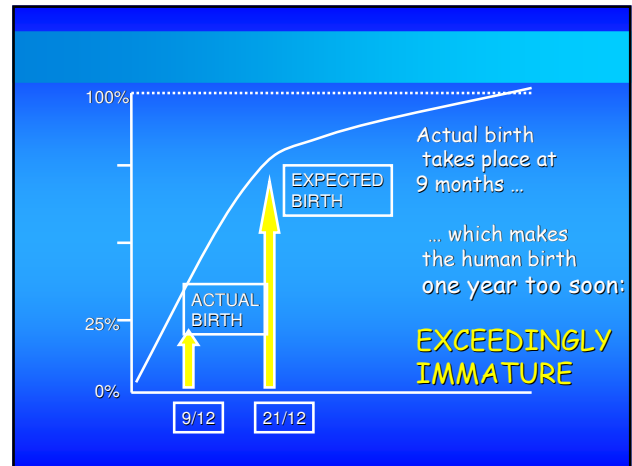
**= NUTRITION PROGRAMME**

### **"Habitat - niche" - AGAIN**





**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)



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      **PLACE or HABITAT**
- Breastfeeding    **BEHAVIOUR or NICHE**
- Protection        **SUPPORT to DYAD**

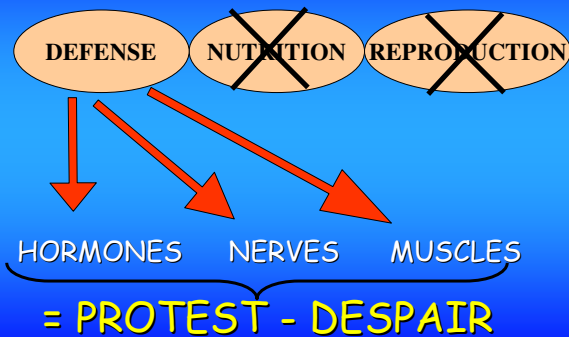
### KANGAROO MOTHER CARE

**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



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** (Schoore 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



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!!

<u><i>P. granulatus</i></u> sympathetic (= adrenergic)	<u><i>P. transvaalicus</i></u> parasympathetic (= cholinergic)
Pulmonary oedema	Fatal syncope

**PROTEST**                      **DESPAIR**  
**HYPERAROUSAL**            **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