


Perinatal Neuroscience & Skin-to-Skin Contact



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Overview



- Perinatal neuroscience
 - brain development
 - Normal newborn behaviour
- Separation effects
 - physiology of crying
- Defining the original paradigm
 - Perinatal Neuroscience

NEUROSCIENCE

90% of what we know about the brain has been discovered in the last 15 years

Society of Neuroscience estimate
 Dr Sandra Witelson, McMaster

OVERVIEW



"PERINATAL NEUROSCIENCE"

- Neurobehaviour
- Neurodevelopment
- Neurochemistry

FETAL BRAIN DEVELOPMENT

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


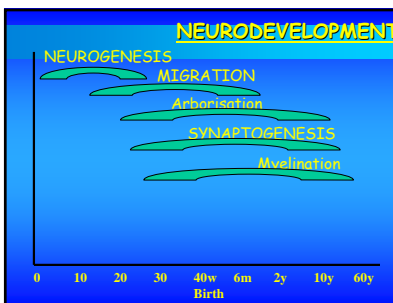
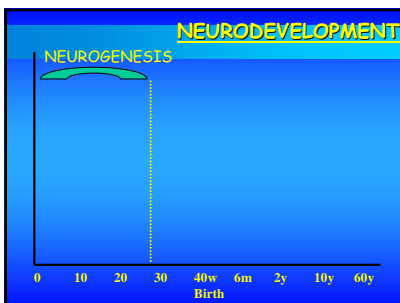
Thereafter, brain growth is an active process.

FETAL BRAIN DEVELOPMENT

Neuron = chief actor

Neurons push out a tree of connections (dendrification)

The also migrate ...

FIRST COMMANDMENT OF NEUROSCIENCE

Cells that fire together, wire together

(Carla Shatz)

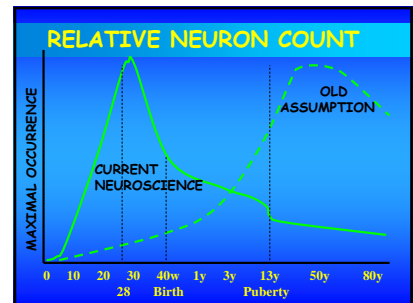
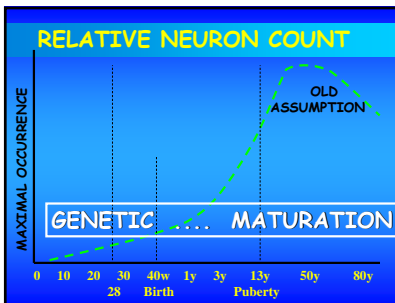
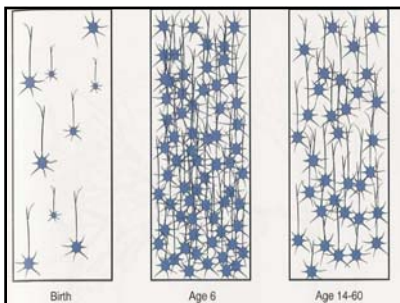
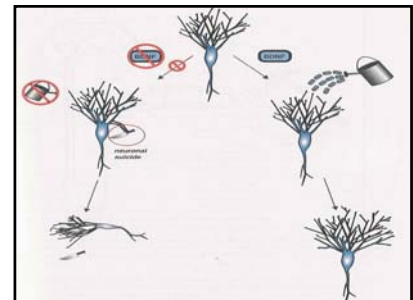
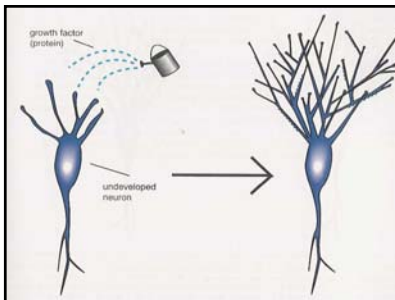
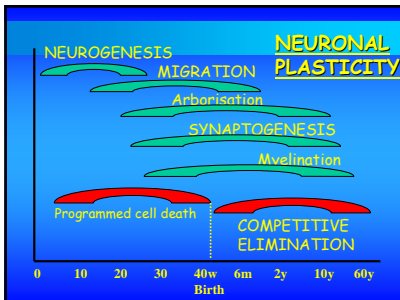
*"Cells which
**FIRE TOGETHER,
 WIRE TOGETHER,**
 and those which
 don't, won't."*
 Carla Shatz

SECOND COMMANDMENT OF NEUROSCIENCE

**USE IT,
 OR
 LOSE IT**

Neuronal Plasticity

- programmed cell death or apoptosis
- pruning and elimination of redundancy



EARLY DEVELOPMENT

Gestational age
20w all structures completed

parallel development
of structure & function

(Hugo Lagercrantz 2004)

Brain growth
depends on experiences !!

23w fetus is aware / conscious
parallel development of structure & function

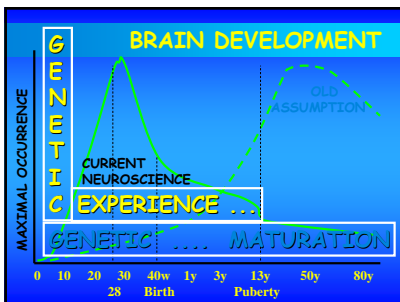
Neurobehaviour and neurodevelopment

are inseparable
a single integrated whole.

23w fetus is aware / conscious
parallel development of structure & function

FUNCTION and STRUCTURE
Neurobehaviour and neurodevelopment

are inseparable
a single integrated whole.



EARLY DEVELOPMENT

Gestational age
20w all structures completed

parallel development
of structure & function

(Hugo Lagercrantz 2004)

Brain growth
depends on experiences !!

EARLY DEVELOPMENT

"The brain
is not a
computer, it
is a jungle."

100 billion neurons x 20000 synapses

"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)

"The perinatal sensorium
is never in chaos

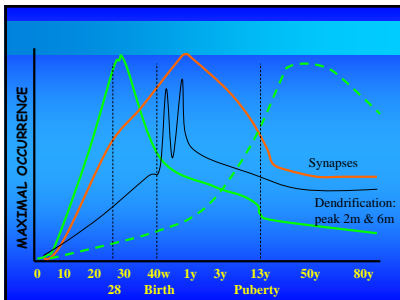
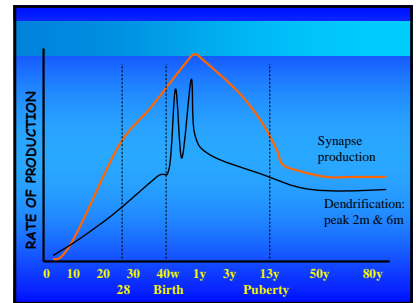
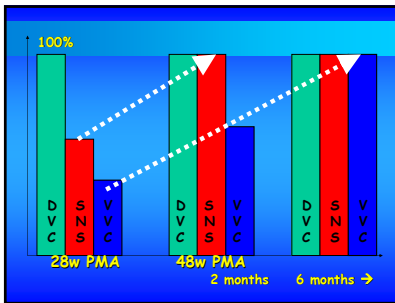
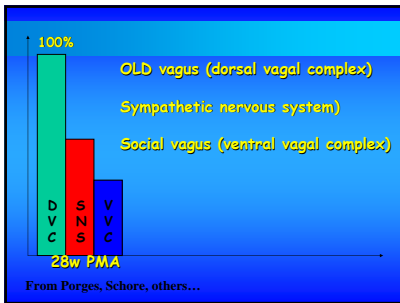
DEVELOPMENT IS →
EVER MORE ORDERED

1 st	28w	unmyelinated
2 nd	2 m	sympathetic
3 rd	6 m	myelinated vagus

"The perinatal sensorium
is never in chaos

DEVELOPMENT IS →
EVER MORE ORDERED

COMPETENT	1 st 28w	unmyelinated	↓	IMMOBILISE
↓	COMPETENT	2 nd 2 m	sympathetic	→ MORE COMPLEX
↓	COMPETENT	3 rd 6 m	myelinated vagus	→ MORE FLEXIBLE
↓	ALWAYS!		engage/disengage	



SYNAPSE DEVELOPMENT

At birth, the human being has more synapses in its brain than at any other stage of life.

SYNAPSE DEVELOPMENT

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

SENSORY STIMULUS

synapse store chemical signal

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".

STIMULATION
...fires and wires brain

In utero:
 from 8w ? ... → 20 weeks

Sensory experience ... ??

auditory, olfactory, contact, position
 MUTED: visual, other sensory

... the activity occurring during
neonatal REM sleep
 (or active sleep) seems to be
particularly important
 to the developing organism
 (spontaneous synchronous firing)

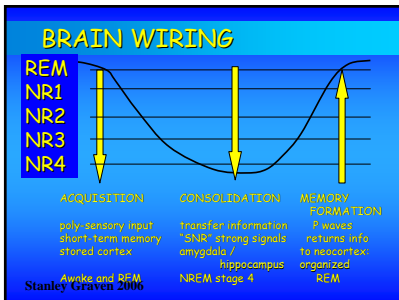
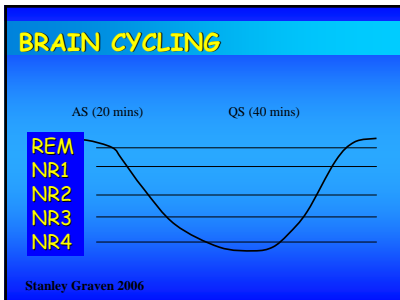
Marks et al 1995

deprivation of REM sleep
 early in life can result
 in behavioral problems,
 permanent sleep disruption,

decreased brain mass

more neuronal cell death.

Marks et al 1995



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."

Schore

Critical period concept :

"brain is exquisitely susceptible to adverse factors" at particular times or stages

Schore

Critical period :

"Early interpersonal events positively and negatively impact the **structural organisation of the brain.**"

AT BIRTH,

the brain has **TWO CRITICAL SENSORY NEEDS:**

SMELL CONTACT

connect direct to the amygdala

THE NEWBORN BRAIN	THE NEWBORN BRAIN
SKIN-TO-SKIN CONTACT fires and wires the amygdala-prefronto-orbital cortical pathway	... which is the first and essential first part of an efficiently regulated and organised right brain

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

FETAL BRAIN DEVELOPMENT

The fetus has well developed sensations for touch and position (tactile and kinesthetic sensations).

"The infant actively seeks to adhere to as much skin surface on the mother's body as possible"
 (Harlow 1958, from Schore 2001)

NEWBORN DEVELOPMENT

skin-to-skin contact
 Tactile stimulations build the amygdala - preorbital cortical tract during the first 8 weeks

The next pathway requires eye-to-eye contact

This is the basis of healthy right brain development!

Brain-to brain interaction
 Face-to-face communication
 Eye-to-eye orientations
 voice, hands, movements

Interpersonal awareness
 Emotions

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!

Myron Hofer

... the private realm of sensory stimulation constructed by the mother and infant from numberless exchanges of subtle clues.
 (Gallagher 1992)

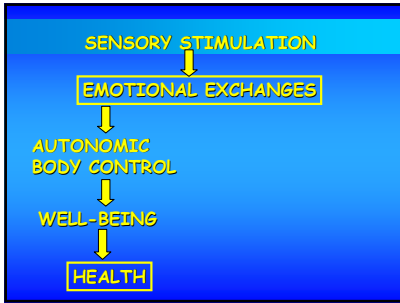
Through "hidden maternal regulators" ... a mother precisely controls every element of her infant's physiology, from its heart rate to its release of hormones from its appetite to the intensity of its activity
 (Gallagher 1992)

ATTACHMENT - REGULATION

the objective is to achieve the ability to establish:

'STABILITY THROUGH CHANGE'

The foundation for INFANT MENTAL HEALTH

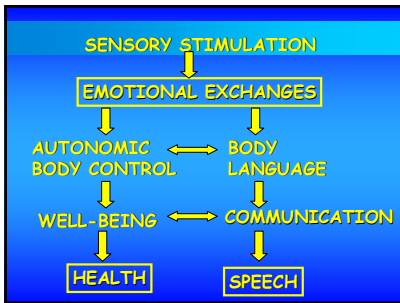


The First Idea (Greenspan & Shanker p39)

"It is necessary for a child to be engaged in a series of affective (emotional) interactions that give rise to the development of motor sensory and social capacities, which, when combined with symbol formation, lead to language.

The First Idea (p39)

"The symbolic use of language, in turn, creates the foundation for more advanced social and intellectual capacities, including higher and higher levels of reflective thinking.



The First Idea

"the capacity to create symbols and to think stems from what was often thought of by philosophers as the 'enemy' of reason and logic: our passions and emotions."

these "uniquely human abilities" are learned; not passed on genetically or through natural selection.

TRAWL for IQ genes in 7000 children

Article Preview **NewScientist**
 29 November 2007 Andy Coghlan Magazine issue 2632

Six most powerful genes accounted for 1% of variation in intelligence

Effects are so small that for the most part they are barely detectable. This does not mean, however, that intelligence is not inherited. The research, led by Robert Plomin of the Institute of Psychiatry in London, identified six genes that were strongly associated with high or low intelligence, but even the most powerful of these accounted for just 0.4 per cent of the variation in intelligence between individuals. The six together accounted for about 1 per cent of the variation in intelligence.

Alternatively:
 there is no gene for intelligence !!!

Moderation of breastfeeding effects on the IQ by genetic variation in fatty acid metabolism

Avshalom Caspi^{1,2*}, Benjamin Williams¹, Julia Kim-Cohen¹, Ian W. Craig¹, Barry J. Miles¹, Richie Poulton¹, Leonard C. Schalkwyk³, Allan Taylor³, Helen Watts³, and Terrie E. Moffitt^{1,2}

¹Medical Research Council Social, Genetic, and Developmental Psychiatry Centre, Institute of Psychiatry, King's College London, London, UK; ²VA Medical Center, Department of Psychiatry and Behavioral Sciences, and Institute for Genome Sciences and Policy, Duke University, Durham, NC, USA; ³Department of Psychology, York University, New Northwick, New Northwick, University of York, YO1 5DD, UK; *Correspondence: A.Caspi@kcl.ac.uk

Published online on November 5, 2007, 10.1073/pnas.0704292104
 PNAS | November 20, 2007 | vol. 104 | no. 47 | 18860-18865

BUT:
 there is a gene for breastfeeding to improve intelligence !!!

Caspi 2007

Table 1. Comparison of children in two birth cohorts, grouped according to genotype (rs174676) and breastfeeding, on tested intelligence (IQ) and covariates

Sample and measure	rs174676 GG homozygotes		rs174676 GG heterozygotes		rs174676 GG homozygotes	
	Not breastfed	Breastfed	Not breastfed	Breastfed	Not breastfed	Breastfed
New Zealand (Dunedin) birth cohort	n = 183	n = 238	n = 153	n = 207	n = 35	n = 48
Children's IQ	80.4 (15.2)	93.2 (15.9)	85.2 (15.4)	100.1 (17.4)	90.1 (17.2)	93.9 (15.8)
Socioeconomic status (1 = low; 3 = high)	1.9 (0.40)	2.0 (0.42)	1.9 (0.39)	2.1 (0.40)	1.9 (0.37)	1.9 (0.38)
Maternal cigarette intake	8.1 (15.2)	9.2 (15.2)	8.6 (15.1)	10.0 (15.4)	10.0 (15.4)	10.3 (14.8)
Maternal age (years)	26.3 (1.7)	26.3 (1.7)	26.3 (1.7)	26.3 (1.7)	26.3 (1.7)	26.3 (1.7)
Birthweight (g)	3,300 (525)	3,370 (495)	3,340 (500)	3,447 (492)	3,447 (492)	3,344 (487)
British (2-yr study) birth cohort	n = 124	n = 488	n = 375	n = 107	n = 41	n = 43
Children's IQ	87.1 (14.1)	104.0 (15.3)	92.1 (15.1)	104.0 (17.3)	89.9 (15.3)	100.7 (17.1)

CC homozygote for "FADS2", "missing" NOT Brf DID Brf DID Brf

	NOT Brf	DID Brf	DID Brf
NZ	98.4	103.2	98.9
UK	97.3	104.0	100.7

Results:
 Consistent with previous reports, the difference in IQ test scores between breastfed children and those not breastfed was 5.8 (s.e.) and 3.3 IQ points in the Dunedin and 2-yr study cohorts, respectively.

**ATTACHMENT
 REGULATION
 WELL-BEING**

WELL-BEING created defined

THE NETWORK BRAIN
... which is the most part of efficiently regulated and organized right brain

CONCEPTUAL VIEW OF DEVELOPMENT

ATTACHMENT creates scaffold for

- abstraction INTELLIGENCE
- speech SOCIALISATION
- emotional REGULATION
- autonomic HOMEOSTASIS
- brainstem PHYSIOLOGY

HIERARCHY OF LANGUAGES

CONCEPTUAL HIERARCHIES

ATTACHMENT scaffold for

- abstraction INTELLIGENCE
- speech SOCIALISATION
- emotional REGULATION
- autonomic HOMEOSTASIS
- brainstem PHYSIOLOGY

HIERARCHY OF LANGUAGES

CONCEPTUAL HIERARCHIES

ATTACHMENT scaffold for

abstraction	INTELLIGENCE	INTEGRATION
speech	SOCIALISATION	RELATIONSHIP
emotional	REGULATION	BEHAVIOUR
autonomic	HOMEOSTASIS	FUNCTION
brainstem	PHYSIOLOGY	STRUCTURE

parallel development of structure & function &
(Hugo Lagercrantz 2004)

Neuronal Plasticity

"the first three years are decisive"

The cortex retains some plasticity throughout life ...

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

→ platform for subsequent development of higher cognitive functions.

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)

Canada: Early Years Study	USA: From Neurons to Neighborhoods
Reversing the Real Brain Drain	The Science of Early Childhood Development

http://www.gov.on.ca/children/graphics/stel02_183397.pdf

Stanford Report July 12, 2006
Forget the latest toys: All kids really need is love
Authors say public policy should focus on helping children have good experiences in their earliest years

Return on investment

Preschool School Post-school

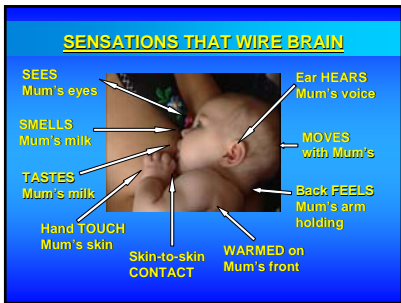
Stage of life

Knudsen et al. 2006

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)

“... creates a kind of invisible hothouse in which the infant's development can unfold.”
(Hofer in Gallagher 1992)



The brain is a

SENSORY ORGAN

BREAST - FEEDING = BRAIN - WIRING

SOCIAL ORGAN

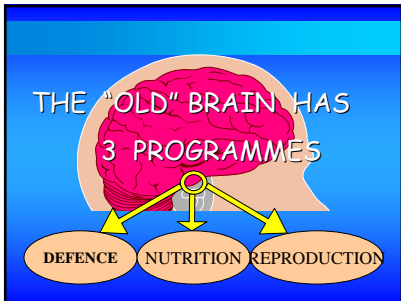
“The brain is designed to be sculpted into its final configuration by the effects of early experiences”

These experiences are embedded in the attachment relationship.

OVERVIEW

“PERINATAL NEUROSCIENCE”

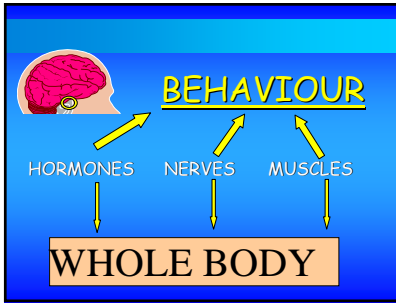
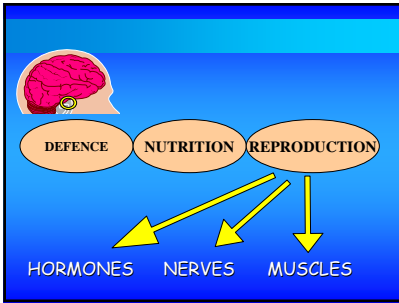
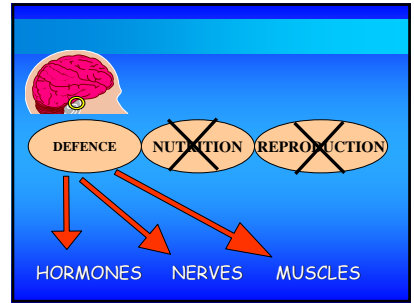
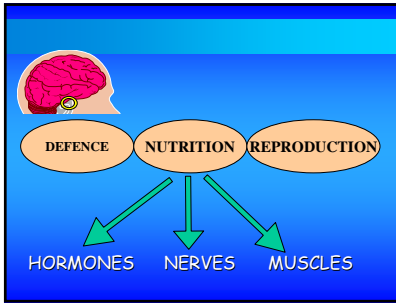
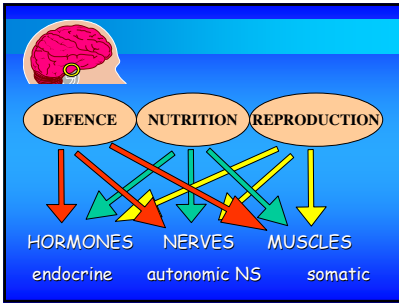
- Neurodevelopment
- Neurobehaviour
- Neurochemistry



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

REPRODUCTION

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

... MUSCLES



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)



**HABITAT
DETERMINES
BEHAVIOUR**

**BEHAVIOUR
ENSURES
BIOLOGICAL
NEEDS**

Warming, feeding and protection **behaviours** are intricately, inseparably linked to the right place.
 (Alberts 1994)

= **NUTRITION PROGRAMME**




In all mammals

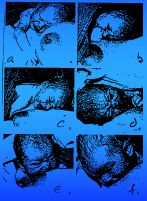
..... the **newborn is responsible** for initiating breastfeeding,
not the mother !!

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)

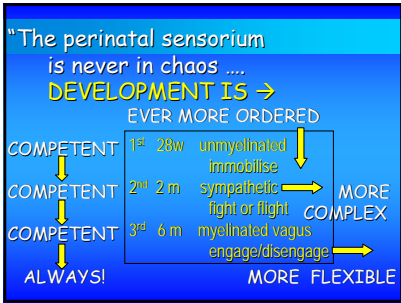


“The newborn may appear helpless, but displays an impressive and purposeful motor activity which, **without maternal assistance**, brings the baby to the nipple.
 (Michelson et al 1996)

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



(Alberts 1994)



Is this feeding ??



BIRTH SKIN-TO-SKIN CONTACT
 CRITICAL PERIOD BEHAVIOUR
 BIRTH SKIN-TO-SKIN CONTACT
 PLACE DEPENDENT COMPETENCE

The first hours after birth are a **CRITICAL PERIOD**



mutual
 psycho-physiological
 caregivers

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.”

Clinics in Perinatology,
 June 2004, Vol 31(2) page 210
 Stanley Graven
 Early neurosensory visual
 development of fetus and newborn.
 “It is a serious mistake to assume that the principles derived from careful animal studies do not apply to human infants. The risk of suppression or disruption of needed neural processes ... is very significant and potentially lasts a life time.

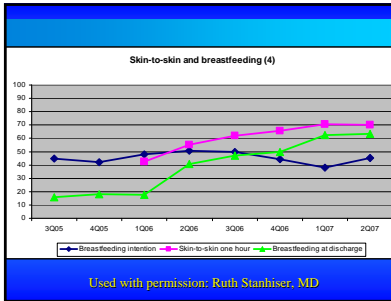
Arrowhead Regional
 Medical Center
 June 28, 2007



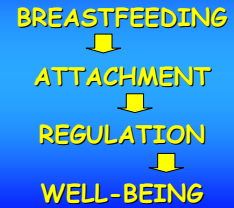

PSN Vision
 PSN envisions a community that embraces its mothers and babies, and values the unique opportunity at birth to impact the physical and emotional well-being of the newborn.

Target #1 for 2005:

Report that 65% of infants are placed and remain in direct skin to skin contact with their mothers for at least one hour during the first three hours after birth.



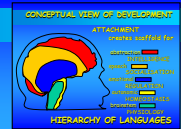
SKIN-TO-SKIN CONTACT



KANGAROO MOTHER CARE

A mother and baby **DYAD** are a single psychobiological organism

"The mother and infant at birth are ready to develop optimal attachment relationships" (Browne)



The mother and infant at birth are ready to develop optimal attachment relationships and to work together toward organised cognitive, social and emotional development.

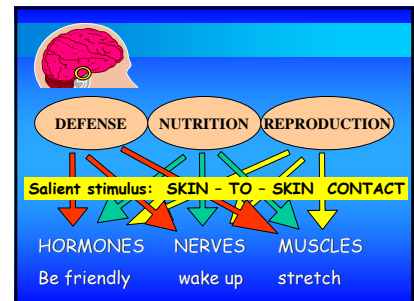
Clinics in Perinatology, June 2004, Vol 31(2) p293
Robert White
"Mothers' arms – the past and future locus of neonatal care?"

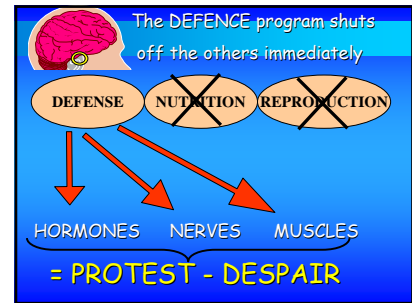
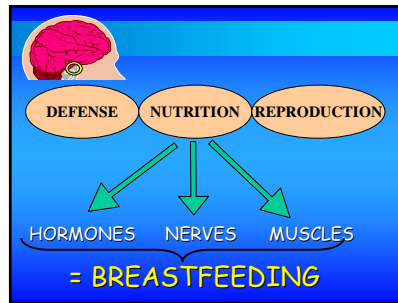
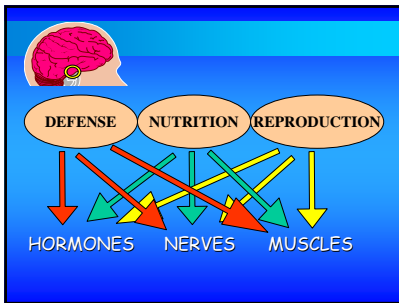
... the baby must spend most of its time in its mothers arms to get the full benefit of her sensory environment as experienced throughout our evolution"

HUMANITY FIRST

Baby Stohm, 780g

TECHNOLOGY SECOND





**SEPARATION IS
LIFE
THREATENING
(WRONG PLACE)**

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

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

Positive Stress

- Moderate, short-lived stress responses, such as brief increases in heart rate or mild changes in stress hormone levels.
- Precipitants include the challenges of meeting new people, dealing with frustration, getting an immunization, or adult limit-setting.
- **An important and necessary aspect of healthy development that occurs in the context of stable and supportive relationships.**

Tolerable Stress

- **Stress responses that could disrupt brain architecture, but are buffered by supportive relationships that facilitate adaptive coping.**
- Precipitants include death or serious illness of a loved one, a frightening injury, parent divorce, a natural disaster, terrorism, or homelessness.
- Generally occurs within a time-limited period, which gives the brain an opportunity to recover from potentially damaging effects.

Toxic Stress

- **Strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.**
- Precipitants include extreme poverty, physical or emotional abuse, chronic neglect, severe maternal depression, substance abuse, or family violence.
- **Disrupts brain architecture** and leads to stress management systems that respond at relatively lower thresholds, thereby **increasing the risk of stress-related physical and mental illness.**

Basic Biological Need

AIR




Baby filling lungs with

AIR ? ? ? ? ? ? ?




“Crying, the highest behavioural state, is **DETRIMENTAL**.”



It impairs lung functioning, jeopardizes the closure of the foramen ovale, increases intra-cranial pressure, and initiates a cascade of stress reactions”.

(Anderson 1996)

“Crying, the highest behavioural state, is **DETRIMENTAL**.”



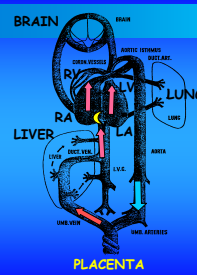
Separated infants cry much more

	SSC babies	Cot babies
Number of cries	4	41
Seconds cried	70	2839

(Christenson 1992)

FETAL CIRCULATION

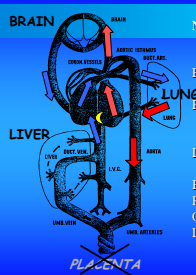
(from J Lind et al.)



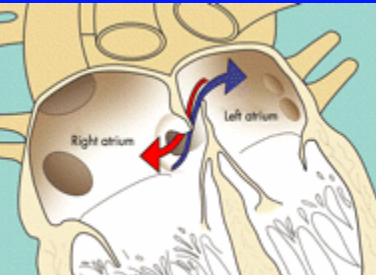
Oxygen rich blood from placenta. First through liver, to inf vena cava. Divides in heart, through **FORAMEN OVALE**. Right flow to brain. Left flow to body, AND back to placenta

NEONATAL CIRCULATION

(from J Lind et al.)



Expansion of lungs (takes one third second.) Pushes volume of fluid to left ventricle, pressure **CLOSES** foramen ovale. Left ventricle pushes blood to brain and body. Blood returns via both vena cava. Right heart pumps to LUNGS. Oxygenated blood to left heart. Left atrial pressure keeps **foramen ovale closed.**




NEONATAL CIRCULATION

(from J Lind et al.)

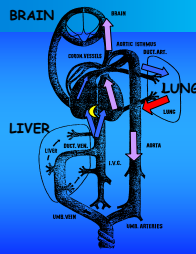
There is a small amount of contrast shunted to LA.

Note also that contrast refluxes easily up into the superior vena cava



CRYING CIRCULATION

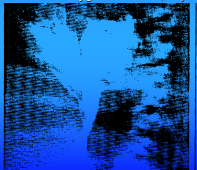

(from J Lind et al.)



CRYING INCREASES right atrial pressure. Foramen ovale **OPENS**. Venous blood mixes with oxygenated blood. **Cyanosis results**

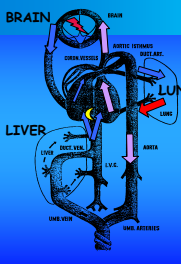
CRYING CIRCULATION
(from J Lind et al.)

CRYING INCREASES right atrial pressure
The foramen ovale OPENS. Venous blood mixes with oxygenated blood. Cyanosis results

CRYING CIRCULATION
(from J Lind et al.)

CRYING INCREASES right atrial pressure
Foramen ovale OPENS
Venous blood mixes with oxygenated blood.
Cyanosis results
ALSO: increased pressure in carotid arteries
increased pressure in superior vena cava
Choroid plexus unsupported
Intraventricular haemorrhage



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)

CRYING IS BAD FOR BABY !!

These effects place fullterm and preterm infants at greater risk for

delayed physiological and psychosocial adaptation to extrauterine life.”

Gene Cranston Anderson (1984)

HARVARD UNIVERSITY Gazette

April 09, 1998
Children Need Touching and Attention,
Harvard Researchers Say

America's "let them cry" attitude toward children may lead to more fears and tears among adults, according to two Harvard Medical School researchers.

Instead of letting infants cry, American parents should keep their babies close, console them when they cry, and bring them to bed with them, where they'll feel safe, according to Michael L. Commons and Patrice M. Miller, (at the Medical School's Department of Psychiatry.)

<http://www.hso.harvard.edu/gazette/1998/04/09/ChildrenNeedTou.html>

BABIES SHOULD NEVER CRY



SEPARATION is LIFE THREATENING (WRONG PLACE)

“PROTEST” is NOT harmful to the brain !!!
unless it is prolonged or repetitive / frequent:
“allostatic load”
Required to develop RESILIENCE

“DESPAIR” does HARM

"structural organisation of the brain."

(Kanitz 2004)
Piglets in optimal rearing conditions 90 (versus 89 controls)




Available online at www.sciencedirect.com

Consequences of repeated early isolation in domestic piglets (*Sus scrofa*) on their behavioural, neuroendocrine, and immunological responses

(Kanitz 2004)

Days 3 to 11
 separated for 2 hours then back "opaque plastic box, straw of floor, same temperature & humidity as pen"


Days 12 and 36
 weight
 behavior
 immune parameters
 hormonal parameters
 brain parameters



Decreased weight gain (218 vs 244 g/d)
 Decreased activity (despair-depression)
 Higher plasma basal ACTH and cortisol
 Suppression of immune function
 Increased glucocorticoid receptors
 Higher interleukin conc' in limbic area
 CRH activation in hypothalamus and amygdala

"structural organisation of the brain."

(Ziabreva 2003)
South American small rodent




Separation-Induced Receptor Changes in the Hippocampus and Amygdala of *Octodon degus*: Influence of Maternal Vocalizations

The Journal of Neuroscience, June 15, 2003 • 23(12):5329–5336

Irina Zlabreva, Gerald Proegler, Reinhold Schnabel, and Katharina Braun

South American small rodent
 separated for 10 minutes only twice daily from d8 to d10



→ altered aminergic function in hippocampus and amygdala
 → (modulated by mother's voice)

Interestingly, the limbic brain regions in which maternal vocalizations can alter activity patterns or receptor densities in the rodent pup are the same areas that in a human mother show responses to her infant's cries (Lorberbaum et al., 2002). Thus, stress-induced lasting changes in brain regions that play a role in emotional behavior during infancy may affect maternal behavior later in the adult and perhaps also limit other socio-emotional capacities. The clinical literature reveals that social loss and emotional deprivation are one of the most powerful antecedents to clinical depression. (Furukawa et al., 1998, 1999; Draijer and

Langeland, 1999; Agid et al., 1999). Maternal/parental separation is a widely used model to investigate the consequences of parental loss on the developing brain (McKinney et al., 1971; Suomi and Harlow, 1975; Suomi, 1991; Blass et al., 1995; Joseph, 1999; Kandel, 1999; Albright et al., 2000; Meaney, 2001). Separation-induced receptor changes and the resulting dysregulation of the glutamate (Zlabreva et al., 2000), GABA, and monoamine systems may contribute to the pathophysiology of various clinical disorders (Krystal et al., 2002) such as post-traumatic stress disorder (Spivak et al., 2000), attention deficit hyperactivity disorder (Daly et al., 1999; Andersen and Teicher, 2000; Sadile, 2000), depression (Sanacora et al., 2002), schizophrenia (Perry et al., 1984; Benes, 2000; Cotter et al., 2002; Reynolds et al., 2002), and autism (Dhossche et al., 2002).

The welfare of non-human primates used in research

Report of the Scientific Committee on Animal Health and Animal Welfare

Adopted on 17 December 2002

I. MANDATE

The EU Commission has asked the Scientific Committee on Animal Health and Animal Welfare to prepare a report on the welfare of non-human primates used for experiments.

The Scientific Committee, taking into account the most recent scientific information should propose how the welfare of these animals can be improved, and identify the most important issues within the EU.

PROTEST - DESPAIR

9.4.1. Separation of infants

causes

The impact of separation from the mother is quite profound in the infant primate and is well-documented in infant macaques. They typically display a biphasic response characterised by an initial stage ('protest') of hyperactivity associated with distress vocalisations, followed by a depressive stage ('despair') featured by social withdrawal, a decrease in play, and the development of a typical slouched posture (Minskis and Suomi, 1978; Capitanio, 1986). This is accompanied by physiological disturbances in the regulation of heart rate, body temperature, sleep patterns, cortisol secretion and the immune system (Laudenslager et al.,

DYSREGULATION

**NO separation
6 months**

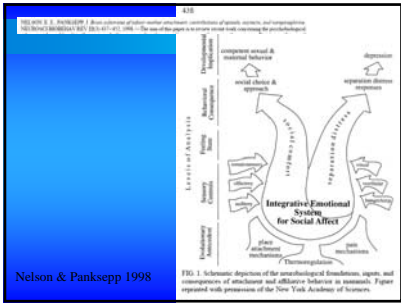
According to the guidelines of the IPS (1993 a,b), young individuals should not be separated from their mothers at an early age (i.e. less than 6 months). They should remain in contact for one year to 18 months in monkeys like macaques, baboons and capuchins. The guidelines of the Primate Vaccine Evaluation Network also state that infants should not be weaned before 6 months and recommend separation at 12 months old (Poole and Thomas, 1995).

Continued contact 18 m

**Social deprivation
alters neurobiological systems.**

1986). Several reports indicate that social deprivation may also alter neurobiological systems (Struble and Rissen, 1978; Kraemer *et al.*, 1984). This pathology persists into adulthood and cannot be cured, although re-socialisation with companions may decrease the frequencies of abnormal patterns. Long-term effects may differ according to species;

This pathology ... cannot be cured ...



Maternal behavior among primates extends throughout an extremely long infant and juvenile period, with prolonged periods of physical contact.

(Orangutan)

At birth the human infant is the least neurologically mature primate of all, and the most reliant on physiological regulation by the caregiver for the longest period of time.

from McKenna

**SEPARATION IS
LIFE
THREATENING
(WRONG PLACE)**

SEPARATION !!!

THE "PRIMARY VIOLATION"
... the very worst thing ...
to any newborn according to biologists is **SEPARATION.**

Protest - despair
is also called
HYPERAROUSAL - DISSOCIATION

HYPERAROUSAL - (Schorre 2001)

hypermetabolic state
sympathetic system activated, increasing HR, BP, tone, vigilance,
distress is expressed first in crying ... then screaming, then "fear-terror"

DISSOCIATION (Schoore 2001)

hypometabolic state

later forming parasympathetic, state of "conservation-withdrawal" in which individual disengages the brain "to conserve energies" ... "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."

CELLS THAT FIRE, WIRE

Schoore

Critical period concept :

"brain is exquisitely susceptible to adverse factors" at particular times or stages

Schoore

Critical period :

"Early interpersonal events positively and negatively impact the **structural organisation of the brain.**"

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.

Contemporary neuroscience

"social stressors are far more detrimental than nonsocial aversive stimuli"

"infant's immature brain exquisitely vulnerable to early adverse experiences, including adverse social experiences."

HYPERAROUSAL - DISSOCIATION (Schoore 2001)

"early adverse experiences result in an increased sensitivity to the effects of stress later in life, and render an individual vulnerable to stress related psychiatric disorders."

SEPARATION IS HARMFUL

"Origins of many behavioural deviations are unknown - child neglect, abuse, abnormal shyness, attention deficiencies, hyperactivity, colic, sleep disorders etc,

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).

SEPARATION IS HARMFUL

"Early separation can produce major shifts in susceptibility to stress-induced pathology" (Hofer 1994)

(Maladaptive pathways have formed...

SEPARATION IS HARMFUL

"Early separation can produce major shifts in susceptibility to stress-induced pathology" (Hofer 1994)

Syndrome X BARKER HYPOTHESIS

- Obesity
- Diabetes
- Hypertension

Schore / Bergman


"developmental psychoneurobiological model"

Poor adult mental health	→ from
Poor infant mental health	→ from
Poor right brain regulation	→ from
POOR ATTACHMENT	→ from
lack of skin-to-skin contact	→ from
SEPARATION	

**SEPARATION
= CURRENT
ROUTINE !!**

INCUBATOR CARE

separates - causes
*"protest - despair
response"*



HYPERAROUSAL - DISSOCIATION (Schore 2001)

"in this state both sympathetic and parasympathetic components are hyperactivated ... Creating ... chaotic biochemical alterations ... a toxic neurochemistry in the developing brain

SEPARATION !!!

THE "PRIMARY VIOLATION"

... the very worst thing ...

to any newborn according to biologists is **SEPARATION.**



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)

Separation tolerance in mammals is measured in minutes

Separation tolerance in HUMANS is NOT measured

PubMed
A service of the National Library of Medicine and the National Institutes of Health
www.pubmed.gov

Quoted phrase not found: "separation tolerance"

Translations:

QUOTED PHRASE NOT FOUND

Database: PubMed

User query: "separation tolerance"

Google Scholar BETA

Your search – "neonatal separation tolerance" did not match any documents.

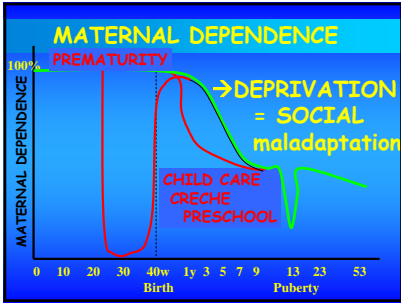
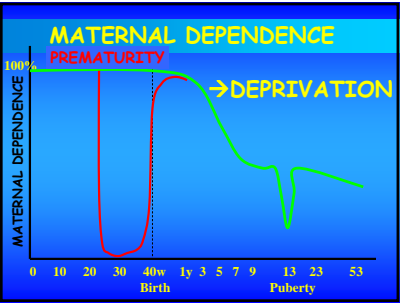
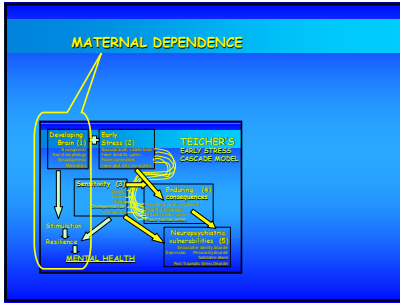
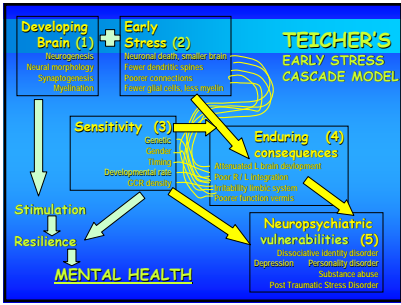
WBS
PSYCHIATRIC CLINICIAN NORTH AMERICA
Psychiatr Clin N Am 21 (2002) 397-426

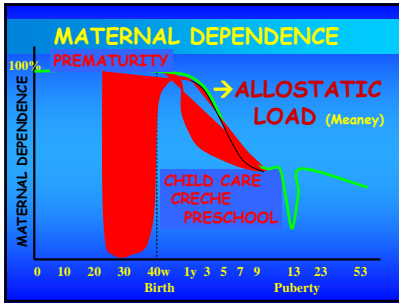
Developmental neurobiology of childhood stress and trauma

Martin H. Teicher, MD, PhD^{a,b,c,d}, Susan L. Andersen, PhD^{a,c}, Ann Polcari, PhD^b, Carl M. Anderson, PhD^{b,d}, Carryl P. Navalta, PhD^{b,h}

This article synthesizes two lines of research into a specific, testable, empirical model that outlines a cascade of alterations likely to follow from severe exposure to stress before the onset of puberty. One line of investigation

Basic outline of the cascade model
The cascade model is built on five fundamental premises. First, exposure





Published as Head and Neck in Pain, 2002 February; 13(1): 283-300.

Neonatal procedural pain exposure predicts lower cortisol and behavioral reactivity in preterm infants in the NICU

Ruth E. Grunau^{1,2,3,4*}, Lisa Holigh^{1,2}, David W. Haley^{1,2}, Tim Oberlander^{1,2,3}, Joanne Weisberg^{1,2}, Alfonso Solimano^{2,3}, Michael F. Whitfield^{1,2}, Colleen Fitzgerald¹, and Wayne Yu¹

... prolonged and repeated neonatal stress ... and pain exposure ... may alter self-regulation in multiple systems ...

... changes may underlie long term ... difficulties in this population.



Page, J o Perinatal Education 2004; 13(3): 10-17

Are there long-term consequences of pain in newborn or very young infants?

Youngest preterm neonates undergo 750 procedures during their hospital stay

less than 10% get opiates

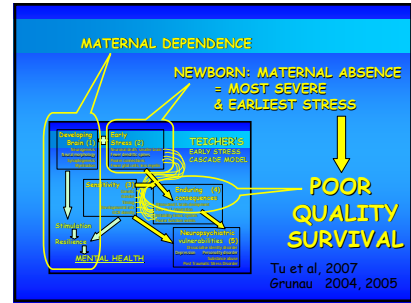
Growing evidence shows that early pain experiences in newborn infants may have long-term consequences ...

... only minimally monitored

Conclusion

Physiologic studies in animals indicate that very early pain experiences may have more than immediate consequences in infancy. Ongoing lowered pain thresholds in the injured area indicate that changes occur in the still-developing spinal cord. Early stress may lead to a reduced immune system response, resulting in consequences such as delayed wound healing and potentially an increased susceptibility to infection. Increased pain sensitivity, decreased immune system functioning, increased avoidance behavior, and social hypervigilance are all possible outcomes of untreated pain in early infancy.

Page, J o Perinatal Education 2004; 13(3): 10-17

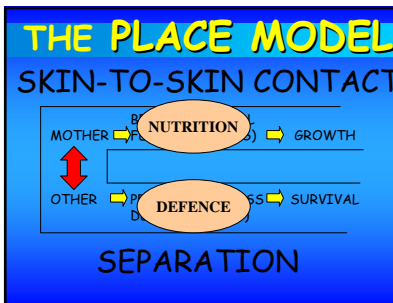
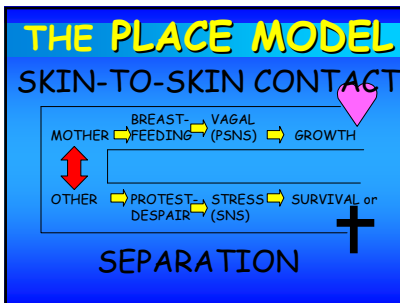
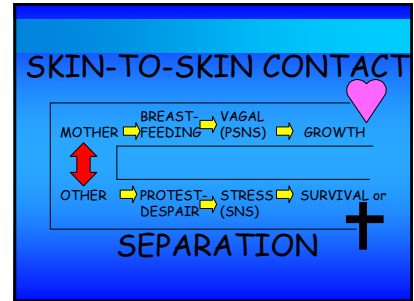
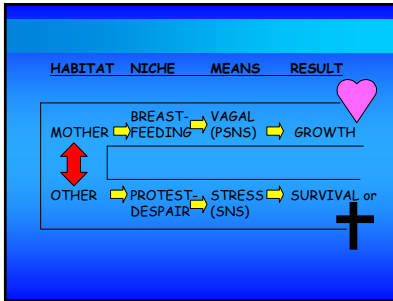
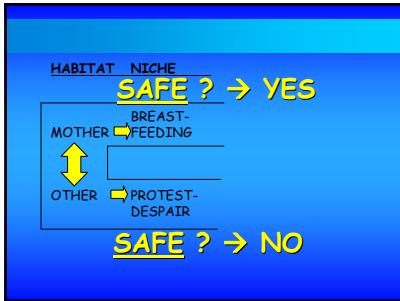
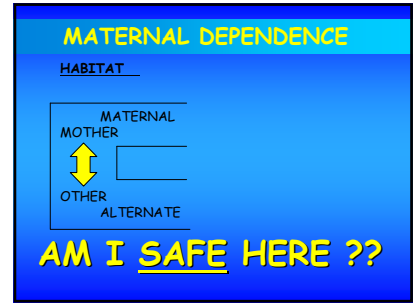
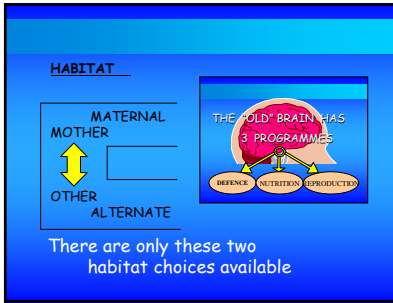
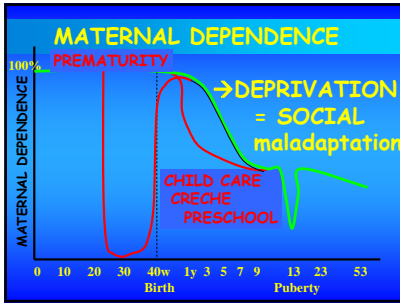


THE CURRENT "BELIEF SYSTEM"

SEPARATES MOTHERS & BABIES

MATERNAL-INFANT SEPARATION = ABUSE

SEPARATION VIOLATES THE INNATE AGENDA OF MOTHER AND NEWBORN



- Nurturing and responsive interactions build healthy brain architecture that provides a strong foundation for later learning, behavior, health.
- When protective relationships are not provided, persistent stress results in elevated cortisol levels that disrupt brain architecture by impairing cell growth and interfering with the formation of healthy neural circuits.

WHY
do we
separate
mothers from
babies ??



WHY
do we
separate
mothers from
babies ?

Next !!