

Your Baby's Brain: the latest neuroscience



Nils & Jill Bergman

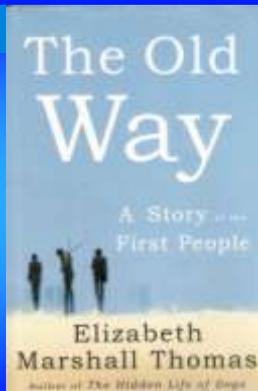
Cape Town, South Africa

www.kangaroomothercare.com

Your Baby's Brain: the latest neuroscience

2. What harms your baby's brain

Why babies in hospitals are
separated from mother
Separation and stress
effects on the brain



"For species such as
primates, the mother
IS the environment."

Sarah Blaffer Hrdy, *Mother Nature* (1999)

Nothing an infant can or
cannot do makes sense,
except in light of mother's body

Babies Celebrated, Beatrice Fontana and Clare D'Harcourt, © 1998 Harry N. Abrams, Inc.

YOUR BABY'S BRAIN DEVELOPMENT ...

... requires the
presence of

MOTHER

UMHC Central Nursery, April 2008

**WHY
DO WE
SEPARATE
BABIES
FROM
MOTHERS ???**

Ignaz SEMMELWEISS 1818 - 65

Hungarian obstetrician
1840's - Vienna 30% died
of puerperal fever -
Pushed handwashing,
cleanliness & standards:
Maternal death rate
from 12% to 1% in 2 years

Ostracised by peers,
Died insane

Stephane TARNIER 1828 -97

French obstetrician

Saw a warmed box for
hatching chickens, had
one designed for
"weaklings" ...
... invented incubator

Pierre BUDIN 1846 - 1907

Friend of Tarniers ...took
Incubators, made centres
for the care of weaklings,
wrote book on subject.

Political support ...
France versus Germany

**BUDIN was very particular to include
mother, reason for the glass window**

Martin COUNEY 1860 - 1950

Born in Germany

claims he learned
the techniques for
Budin

Berlin Exhibition 1896, success !

Photograph: Pan-American Exhibition in Buffalo, New York, 1901.

Martin COUNEY 1860 - 1950

Berlin 1896, success
London 1898, fiasco

to USA: Buffalo →
Omaha 1902-4,

New York Worlds Fair, 1939

Chicago Fair 1932 2nd highest receipts,
Last show New York 1940.

Martin COUNEY 1860 - 1950

... famous for
"preemie road show".

MONEY MAKING SHOW

PERMANENT pavilion in Dreamland

Dreamland delivered novel and fantastic diversions of the odd and unusual ... Catering to the public's endless fascination with oddities and freaks . It was the home to scientific, ethnological and cultural exhibits, including Dr. Couney's Baby Incubator pavilion ...

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Martin COUNEY 1860 - 1950

Born in Germany

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Berlin Exhibition 1896, success!
London World fair 1898, fiasco!
ALL THE BABIES DIED ...
"MOTHERS TO BLAME"

Martin COUNEY 1860 - 1950

Couney successfully raised 5000 prems!

BUT -

used wet-nurses,
excluded mothers
(mother got free pass to the shows !)

Mothers were excluded - "germs" ...

With the advent of artificial infant formula,
mother not needed at all !!

Habitat AND niche now synthetic !!

The modern era

Sarah Morris Hospital,
Chicago 1923,
others followed -

accepting the
"policy of strict separation".

PARADIGM CONSTRUCT

Paradigm: "in the philosophy of science, a generally accepted model of how ideas relate to one another, forming a conceptual framework within which scientific research is carried out"

MSN Encarta

BASIC ASSUMPTION:
= INCUBATORS STABILIZE
MOTHERS ARE DANGEROUS FOR BABIES

HOW MUCH
SCIENCE ??
RESEARCH ??

BASIC ASSUMPTION:
= INCUBATORS STABILIZE
FOUNDATION / PLATFORM / BASE

WHY

do we
separate
mothers from
babies ??

INCUBATOR & SEPARATION
= ACCIDENT of HISTORY

What harms your baby's brain



**MATERNAL-INFANT
SEPARATION**

**HAS NO SCIENTIFIC
FOUNDATION.**

What harms your baby's brain

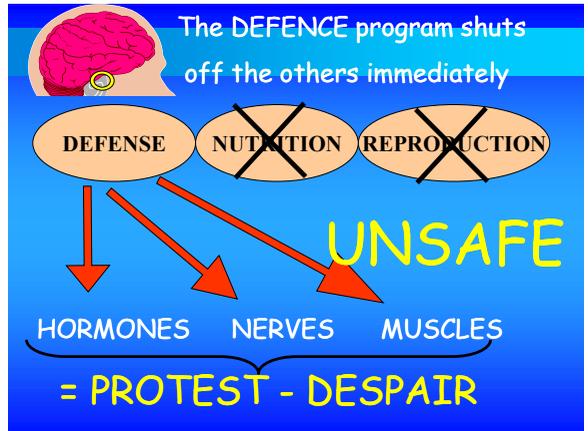
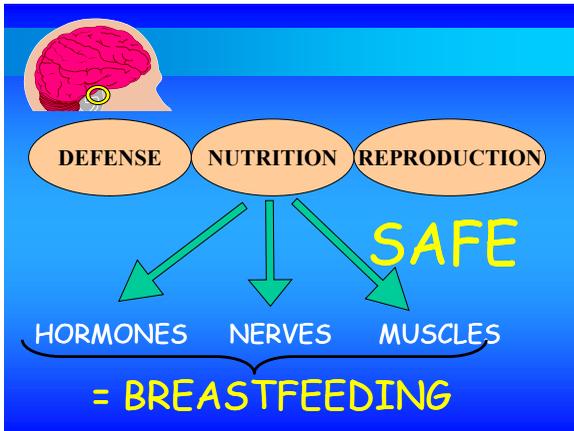
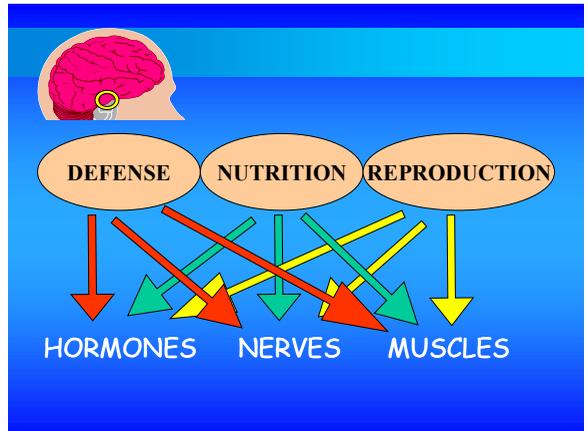
**THE
INCUBATOR**

**HAS NO SCIENTIFIC
FOUNDATION !!**

Your Baby's Brain: the latest neuroscience

2. What harms your baby's brain

separated from mother
Separation and stress
effects on the brain



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.**



NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

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.



NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

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**

"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."

(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, 2005 • 25(12):5329–5336

Jirina Ziabreva, Gerl Pogoda, Reinhold SchmeU, and Katharina Bruner

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

The Journal of Neuroscience, June 15, 2005 • 25(12):5329–5336

Irina Zlabreva, Gerl Pösgel, Rainald Schaubel, and Katharina Bruner

South American small rodent separated for 6 minutes only twice daily from d8 to d10
 → altered aminergic function in hippocampus and amygdala
 → (modulated by mother's voice)

These results demonstrate that such of these emotional experiences alter aminergic function within the hippocampus and amygdala and that the mother's voice, a powerful emotional signal, can modulate these effects in the developing limbic system.

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

The Journal of Neuroscience, June 15, 2005 • 25(12):5329–5336

Irina Zlabreva, Gerl Pösgel, Rainald Schaubel, and Katharina Bruner

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

1. 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.

Scientific Committee 2002

Report of the Scientific Committee on Animal Health and Animal Welfare

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 (Mimela 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

Report of the Scientific Committee on Animal Health and Animal Welfare

Social deprivation alters neurobiological systems.

1986). Several reports indicate that social deprivation may also alter neurobiological systems (Struble and Riesen, 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 ...

Scientific Committee 2002

3-day separation:

induces physiological changes (immune system, heart rate, sleep, cortisol, loss of body temperature..

anaclitic depression:

- hyperactivity
- conservation- withdrawal;
- death or recovery

Slide & photo from James McKenna

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

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

(Orangutan)

from McKenna

SEPARATION !!!

THE "PRIMARY VIOLATION"

... the very worst thing ...

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



DEFENSE

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 (Schorre 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 (Schore 2001)

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

HYPERAROUSAL - DISSOCIATION (Schore 2001)

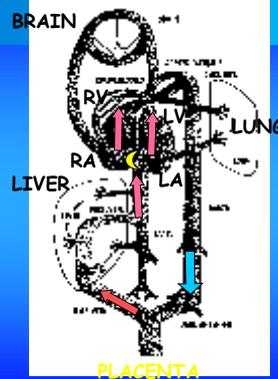
"in the developing brain, states organize neural systems, resulting in enduring traits."

CELLS THAT FIRE, WIRE

"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)



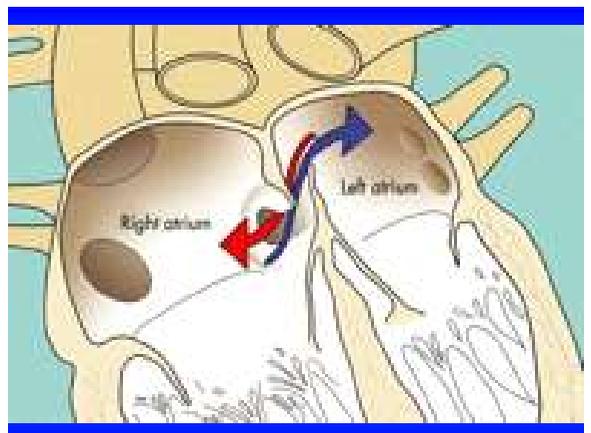
FETAL CIRCULATION
(from J Lind et al)

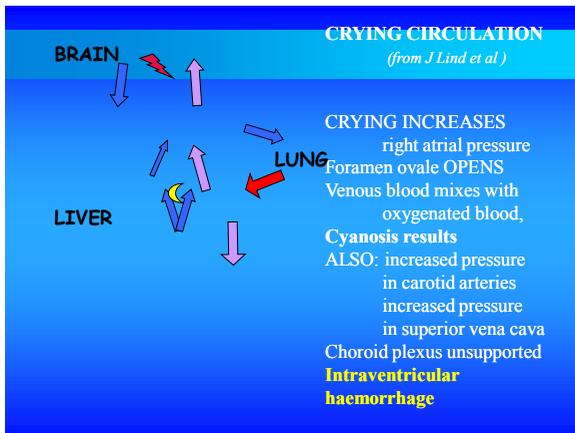
Oxygen rich blood from placenta, First through liver, to inf vena cava, Divides in heart, through FORAMEN OVALE Right flow to brain Left flow to body, AND back to placenta

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.

~~PLACENTA~~





CRYING IS BAD FOR BABY !!

"Crying depletes energy reserves and oxygenation, increases intracranial pressure, white blood count and base excess, reestablishes fetal circulation, and interferes with the infant's ability to interact appropriately with caregivers."

Gene Cranston Anderson (1984)

CRYING IS BAD FOR BABY !!

These effects place fullterm and preterm infants at greater risk for

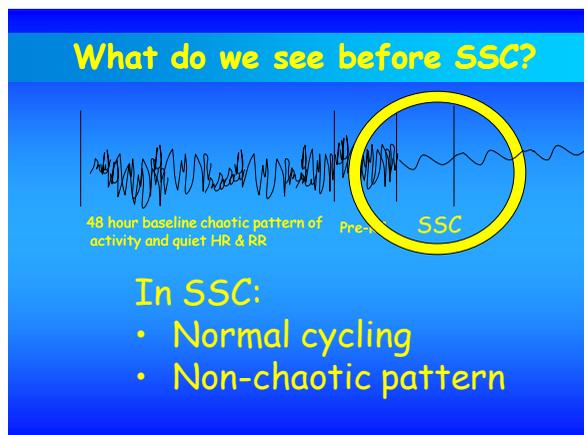
delayed
psychosocial adaptation
to extrauterine life."

Gene Cranston Anderson (1984)

BABIES SHOULD NEVER CRY

What harms your baby's brain

**CRYING
IS HARMFUL
both to shortterm
body regulation,
and to building
emotional trust.**



Jacksonian Dissolution

The more threatened the individual, the more 'primitive' (or regressed) becomes the style of thinking and behaving.

Perry 1995

Perry: Responses to threat

Adaptive Response	REST (Adult Male)	VIGILANCE	FREEZE	FLIGHT	FIGHT
Hyperarousal / Continuum	REST (Male Child)	VIGILANCE (Crying)	RESISTANCE Freeze	DEFIANCE 'Posturing'	AGGRESSION
Dissociative Continuum	REST (Female Child)	AVOIDANCE (Crying)	COMPLIANCE Freeze	DISSOCIATION 'Numbing'	FAINING 'Mini-psychosis'
PRIMARY secondary Brain Areas	NEOCORTEX Subcortex	SUBCORTEX Limbic	LIMBIC Midbrain	MIDBRAIN Brainstem	BRAINSTEM Autonomic
Cognition	ABSTRACT	CONCRETE	'EMOTIONAL'	REACTIVE	REFLEXIVE
Mental State	CALM	AROUSAL	FEAR	TERROR	

REFLEXIVE

CHAPTER 10: DANGEROUS ANIMALS

1. To the best of my knowledge this survey, while incorporated into the research of several people, has not yet been published as such. The data was recorded on thousands of file cards, and I was able to see most but not all of them. I was also able to discuss certain findings of this study with John Marshall and Claire Ritchie. For years, John kept the file cards in his barn and eventually gave them to the anthropologist Polly Wiesner.

2. Marshall, *Nyae Nyae Kang Beliefs and Rites*, p. 183.

3. Marshall, "Medicine Dance," p. 574. I render a phrase in the sixth sentence as, "They took their children in their arms . . ." In the article, the phrase is, "They took their screaming children in their arms . . ." I omitted the word screaming because, without further explanation, it didn't seem possible. Ju/'wa children didn't scream, and in my experience, when faced with lions, the children made no sound at all. To scream could have substantially increased the danger, and probably if they had screamed their parents would have tried to slush them. The wording came by way of an interpreter, and also was repeated

Cerebral Cortex Journal 10(10) 175-176
doi:10.1002/cx.c.10010
© 2006 Wiley Periodicals, Inc. 175

Rising Sound Intensity: An Intrinsic Warning Cue Activating the Amygdala

Domènec E. Bach*, Hans-Joachim Schackinger†, John D. Swadlow†, Federico Espadas†, Francisco J. Soto†, Christoph Achermann†, Marco D'Esposito†, Klaus Schöller‡, and Frank Schickel‡

Rising intensity sounds produced neural activity in the amygdala, which was accompanied by activity in intraparietal sulcus, superior temporal sulcus, and temporal plane. Our results indicate that rising sound intensity is an elementary warning cue eliciting adaptive responses by recruiting attentional and physiological resources.

amygdala and left temporal areas. This provides direct evidence for the warning properties of rising sound intensity. STS and

Schore

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.

HYPERAROUSAL - DISSOCIATION (Schorr 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 ...

... can some be traced back to violations of an innate agenda?"

Kjellmer & Winberg 1994

SENSORY STIMULATION

EMOTIONAL EXCHANGES

The First Idea:
Authors have based their work partly on study of **AUTISM**

The First Idea: How Symbols, Language, and Intelligence Evolved from our Primate Ancestors to Modern Humans
Stanley I. Greenspan & Stuart G. Shanker

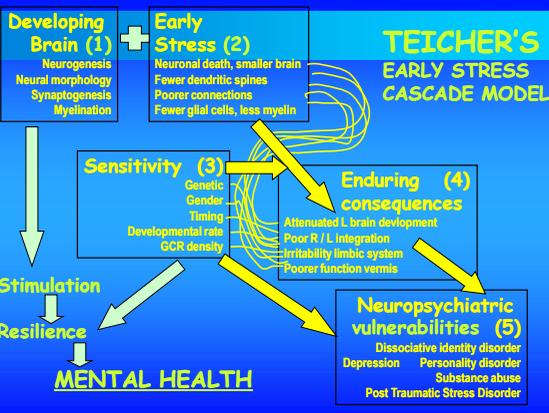


PSYCHIATRIC CLINICS OF NORTH AMERICA

Psychiatr Clin N Am 25 (2002) 387-401

Developmental neurobiology of childhood stress and trauma:

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



What harms your baby's brain



SEPARATION DYS-REGULATES (short-term)

Long-term maladaptation & susceptibility

AN EVOLUTIONARY PERSPECTIVE

- Early stress produces alterations in brain function and disrupts normal brain development.
- The developing brain copes adaptively to early stress.
- Prepared for harsh/malevolent environment

Teicher 2002

Adaptive Changes to stress

BRAIN CHANGES	CONSEQUENCE
<u>AMYGDALA</u> changes limbic irritability	→ fight-flight response → <u>aggressive</u> defence.
<u>HIPPOCAMPUS</u>	→ dissociation <u>defence</u> .
Left <u>HEMISPHERE</u> diminished maturation less R - L integration	→ augmented <u>anger</u> → more aggression.
Verbal development (<u>CEREBELLUM</u>)	→ limbic <u>irritability</u> , → maintains <u>hyperarousal</u> → sympathetic activation

Adaptive Changes to stress

HORMONE CHANGES CONSEQUENCE

Early stress produces a life-long :

VASOPRESSIN increase

→ Enhanced sexual arousal

OXYTOCIN reduction

→ Diminished sexual fulfillment

→ Deficient commitment to a single partner

→ Promiscuity :

Reproductive success in times of danger

In a malevolent world...

Important for survival and reproductive success to:

- Maintain a state of vigilance and suspiciousness to detect danger.
- Mobilize an intense fight-flight response.
- React aggressively to challenge without hesitation.

"Evolutionary"
the genes ensure
species survival in
malevolence ... an
alternative program

Belsky et al. Child Development 1991; Vol 62(4): 647-670
Childhood Experience, Interpersonal Development, and Reproductive
Strategy: An evolutionary Theory of Socialization.

Schore:

"Infant trauma will interfere with
critical period limbic organisation ...

future capacity to adapt ...
correlated with maladaptive
adult mental health"

Schore:

"long term alterations brain function

"risk for developing severe psychopathologies at later stages of life."

THE NEWBORN BRAIN



the first essential part of efficiently regulated and organised right brain →

Emotional & Social intelligence

OPEN ACCESS | Freely available online

PLoS ONE

Neonatal Handling Affects Durably Bonding and Social Development

Severine Herry^{1,2,3*}, Marie-Annick Richard-Yris¹, Sylvie Tordjman¹, Martine Hausberger¹

1 UMR 5175 IJL2, Ecole Française d'Équitation, Université de Rennes 1, Rennes, France, 2 UMR 5175 IJL2, Ecole Française d'Équitation, Institut National de la Recherche Agronomique, Rennes, France, 3 Centre Hospitalier Universitaire de Toulouse et de l'Institut Centre Hospitalier Galliéni, Université de Rennes 1, Rennes, France

Animal model: HORSE

Single birth,
Early suckling
Close mother-infant bond
Long lactation

HUMAN

Single birth,
Early suckling
Close mother-infant bond
Long lactation

Animal model: HORSE

Set sequence of early suckling:
Glances at mother → first standing
→ locomotion → suckling

How to Imprint Train a Newborn Foal

- Imprint training for newborn foals has made a big impact on how some people train horses. Imprint training a foal allows the horse to become familiar with humans and being worked with before there are any issues arise to instill fear or distrust in the horse. Imprint trained horses are easier to train later in life. Here's how to imprint train a horse.
- Instructions
- Step 1
- Enter the foal's stall or pen immediately after it is born. Begin by gently touching and rubbing the foal's body with your hands. Touch his mouth, nose, face, ears, neck, shoulders, stomach, back, hindquarters and legs. reaction to humans.
- Step 2
- Pick up the foal's hooves, rub a soft brush over his body and teach him to yield to pressure.
- Push gently on his shoulder until he moves over. Do this on the hindquarters also.
- Step 3
- Put a halter and lead rope on the foal and lead him around by placing a soft rope around his hindquarters to gently urge him along if he doesn't want to move forward.
- Step 4
- Touch the foal on every body part and in areas that you are going to work with later.
- Rub his ears so he doesn't become head-shy like many horses.
- pull gently on his tail and mane so he won't panic later when knots are pulled out with a comb and pick up each hoof and hold it as if you are trimming them.

http://www.ehow.com/how_2079951_imprint-train-newborn-foal.html

Imprint training: HORSE

(start within 10 min)
Stroke whole body,
(before standing)
Spray water
Brush with white towel
Rub with plastic bag
(each continued until foal was immobile)

Mare in close proximity
Procedure takes 72 min.

HUMAN: routine care

(start within minutes)
Wipe body with cloth
(before own moving)
Bathe in water
Dry with white towel
Rub off
(other care, swaddle until settled)

Mother nearby (or not)
Procedure takes 1- 3 hrs

Allocation trial experiment

Imprint training: HORSE

(start within 10 min)
Stroke whole body,
(before standing)
Spray water
Brush with white towel
Rub with plastic bag
(each continued until
foal was immobile)

Mare in close proximity
Procedure takes 72 min.

R Miller 1991

Control group: HORSE

same care first 10 min
(disinfection umbilicus)

Mare & foal
undisturbed

BOTH groups:
identical care thereafter



Orderly sequence of events,
suckling within 2 hours

Controls (n 10)
Imprinted (n 9)

Observed **BIRTH**
behaviours



Orderly sequence of events delayed,
suckling within 3 hours

Also: trembling (5), fast-breathing (7)
abnormal sucking patterns (9)
All "struggled" ... then lay "motionless
with high muscle tone."

9/10 played
with other foals

Controls (n 10) Behaviour **6 months**
Imprinted (n 9) (naturalistic in paddock)

2/9 played
with other foals.
All spent more
time close to mare

"only socio-emotional features involved ..."

Distressed 2 days,
then play with peers

Controls (n 10) Behaviour at **WEANING**
Imprinted (n 9) (7 months)

Distressed 4 days,
No playing observed.

Non-nutritional
suckling on peers.

Secure attachment → positive expectations →
→ "social and emotional capacities that promote
social competence"

Affiliative behaviours
3 times more common

Controls (n 10) Observed at **12 months**
Imprinted (n 9)

Socially withdrawn
Increased aggressiveness

Conclusion

This present study, based on a horse model, is, to our knowledge, the first report demonstrating that a short intervention immediately after birth, like a single 1-hour episode of maternal separation and handling, can have effects on the young's behavioral, social and emotional development from birth to at least adolescence. We anticipate our study to be a starting point for

Imprint training: HORSE

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Toxic Stress

•Strong and prolonged activation of the body's stress management systems in the absence of the buffering protection of adult support.

Schore:

"Infant trauma will interfere with critical period limbic organisation ...

future capacity to adapt ... correlated with maladaptive adult mental health"

What harms your baby's brain



**SEPARATION
DISTURBS
SOCIAL &
EMOTIONAL
DEVELOPMENT**

What harms your baby's brain



**SEPARATION
DYS-REGULATES
(short-term)**

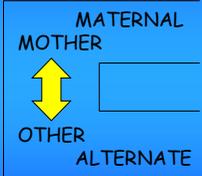
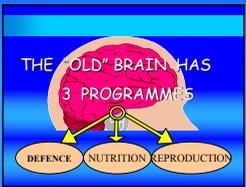
**Long-term
maladaptation &
susceptibility**

MOTHER

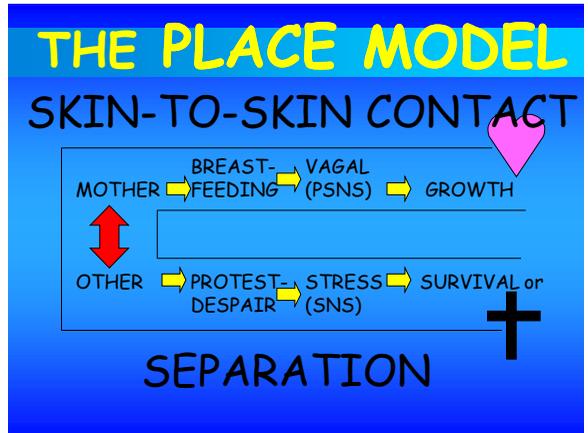
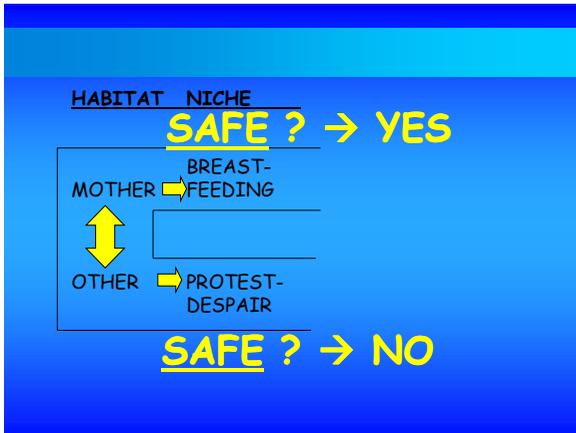
is the **KEY** for
NEURODEVELOPMENT

MATERNAL DEPENDENCE

HABITAT

AM I SAFE HERE ??



NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD

Relationships are the “Active Ingredients” of Early Experience

- 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.

Jack P. Shonkoff, M.D.

• Nurturing and responsive interactions build healthy brain architecture that provides a strong foundation for later learning, behavior, health.

MOTHER → BREAST-FEEDING → VAGAL (PSNS) → GROWTH

↑ ↓

OTHER → PROTEST-DESPAIR → STRESS (SNS) → SURVIVAL or

• 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.

RESTORING THE ORIGINAL PARADIGM

The PLACE MODEL

- scientifically derived
- alternative approach
- falsifiable/testable hypothesis

Oxygenation

SKIN-TO-SKIN

MOTHER → BREAST-FEEDING → VAGAL (PSNS) →

↑ ↓

OTHER → PROTEST-DESPAIR → STRESS (SNS) →

SEPARATION

Anderson, Brf Rev 1993

Oxygenation

**SEPARATION CAUSES
HYPOXIA, apnoeas
and periodic breathing**



Anderson, Brf Rev 1993

Oxygenation

**SEPARATION CAUSES
BRADYCARDIA,
and dysregulates heart**



Anderson, Brf Rev 1993

Temperature

SKIN-TO-SKIN



Syfrett & Anderson 1993

METABOLIC ADAPTATION

**SEPARATION CAUSES
HYPOGLYCAEMIA**

	SSC	Cot
Blood glucose (1 hr)	3.17	2.56
Base excess drop	3.4	1.8

(Christenson 1992)

**SEPARATION LOWERS
MILK PRODUCTION**

IN MILK PRODUCTION

Author	Parameter	SSC	Control
Schmidt	Volume milk/day	640 ml	400 ml
Hurst et al	Volume milk w4	851 ml	421 ml

**KEEP
US
TOGETHER
SKIN-TO-
SKIN!**

**MOTHER
is the
Only**

**Appropriate
ENVIRONMENT**