PARENTAL PERINATAL BEHAVIOUR

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Disclosure of Financial Interest

- I, Nils Bergman, DO have a financial interest with one or more organizations that could be perceived as a real or apparent conflict of interest in the context of the subject of this presentation, they are:

  - Affiliation/Financial Interest
  - Owner / Director

- NINO Academy produces educational and promotional materials related to Kangaroo Mother Care, and a garment for skin-to-skin contact.

Hominines were prey at Sterkfontein, "Cradle of Mankind"

Immediate feeding response to crying
Father frequently and closely involved ...
EXTREME Egalitarianism

Equality (gender, age, capacity)

Intense social cohesion

→ No aggression !!!!!

Unique hominin feature: carry food home to share ...

BerGMAN ‘sharing phenotype’

Duration of human subsistence patterns

The hunter gatherer (cont)

Infant care patterns in such societies (which are closest to our origins):

1. Infant carried most of time
2. Mother sleeps with infant same bed
3. Immediate feeding response to crying
4. Breastfeeding 24 months or more
5. Father frequently and closely involved ...

Nurturescience

The DNA 

Epigenetics 

The Brain 

Neurodevelopment 

Evolutionary Biology 

Environment 

Adaptation 

Experience 

Reproductive Fitness 

Baby 

Bonding 

Breastfeeding 

Feed → Sleep Cycles 

Secure Attachment 

Brain basis of early parent-infant interactions: psychology, physiology, and in vivo functional neuroimaging studies

The psychology of human parent-infant relationships

Parenting is regulated by key hormones and neurotransmitters

Neuroanatomical circuits of parenting

Integrative physiology of normal parenting behaviors

Brain imaging of human parent-infant relationships

The neurobiology of empathy and parenting

Conclusions and critical summary

(Swain et al, 2007)
Even before the child is born, parents preoccupy themselves with creating a safe and secure infant environment. Human nestbuilding type behaviors are common, including major cleaning and renovation projects ...

**Table 1.** Common behavioral elements of maternal care across mammalian species

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| Nest building and maintenance (place preference)  
| Perceptual exploration (identification of nest and/or offspring)  
| Retrieval (reciprocated calls)  
| Grooming and kissing or licking  
| Crouching or preferred nursing positions  
| Nursing and lactation and/or feeding  
| Prolonged physical contact/sleeping together  
| Aggressive behavior in response to perceived threats to their offspring |

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**Doula care**

In 127 out of 128 societies (reported in a major anthropological study of non-industrialised, geographically isolated societies) "a woman is in attendance throughout labour" not the father .... not a midwife!!

**WHAT IS NORMAL MOTHER BEHAVIOUR?**

**Doula:**

An ancient Greek word meaning "handmaid."

The reproductive program is in the mother and the baby

**WHAT IS NORMAL MOTHER BEHAVIOUR?**

**Doula:**

An ancient Greek word meaning "handmaid."

The term has come to represent a compassionate, experienced woman who provides physical, emotional, educational and practical support to another woman and her family during all the events surrounding childbirth

buthdoulasofpittsburgh.com
Neocortex
Limbic brain
FETUS
MOTHER
PARTNER
DOULA
- Shorter labor
- Decreased distress
- “Happier baby”

Neocortex
Limbic brain
FETUS
MOTHER
PARTNER
DOULA
- OXYTOCIN
- DOPAMINE
- CORTISOL
- EMOTION
- CONTROL CENTRE

Neocortex
Limbic brain
FETUS
MOTHER
PARTNER
DOULA
- AM I SAFE ??
- REPRODUCTION
- NUTRITION
- DEFENCE
- HORMONES
- NERVES
- MUSCLES

“Happier baby”
Oxytocin release mechanisms
- Via the parvocellular neurons of the PVN and SON into the brain (as a neurotransmitter)
- Via the neurohypophysis into the blood stream (hormonal action)
- Directly via cell bodies and dendritic parts of the neuron by volume transmission

With permission from Kerstin Uvnäs Moberg

Centrally released oxytocin coordinates the onset of maternal nurturing behavior at parturition and plays a role in mother-infant bonding.

Ross 2009

Oxytocin comes from
Cervical dilatation
Breastfeeding
Skin-to-skin contact
Eye-to-eye contact

FERGUSON REFLEX
Head stretches lower uterine segment → Positive feedback loop of oxytocin

What about PITOCIN? (Synthetic OXYTOCIN)
Loss of myometrial oxytocin receptors during oxytocin-induced and oxytocin-augmented labour

Olza 2012 Acta Paed 101 (7): 749-754
...intrapartum exogenous oxytocin seems to disturb sucking and breastfeeding duration
Association of peripartum synthetic oxytocin administration and depressive and anxiety disorders within the first postpartum year.

CONCLUSIONS:
Contrary to our hypothesis, results indicate a higher risk of receiving a documented depressive or anxiety disorder diagnosis.

Effects of doula care

<table>
<thead>
<tr>
<th></th>
<th>No doula</th>
<th>Doula</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA (Kennell et al 1991)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epidural</td>
<td>55%</td>
<td>8%</td>
</tr>
<tr>
<td>Caesarean section</td>
<td>18%</td>
<td>8%</td>
</tr>
<tr>
<td>Forceps delivery</td>
<td>26%</td>
<td>8%</td>
</tr>
<tr>
<td>Fetal distress</td>
<td>24%</td>
<td>10%</td>
</tr>
</tbody>
</table>

Birth Findings – review

- 50% less Caesar Rate
- 30% less Medication
- 60% reduction in Epidurals
- 40% reduction in Forceps

"If a Doula was a drug, it would be unethical not to use it"

Dr. John Kennell

1922 -2013

OXYTOCIN IS A DRUG!!

NOVEL HEALTH CADRE
KANGAROU
KANGAROO Mother Care plus DOULA care

First 1000 minutes
Strictly: 16.6 hours = basically: First day!
Impact depends on previous 1000 minutes!
**“ECD” Early Childhood Development**

First 1000 days =
- gestation: 270 days
- year one: 365 days
- year two: 365 days
- total: 1000 days

**NOVEL HEALTH CADRE**

**KANGAROULA**

*KANGAROO Mother Care* plus *DOULA* care

First 1000 sec = 16 minutes = 1st hour
First 1000 min = 16.6 hours = 1st day
First 1000 hrs = 41.6 weeks = 1st six weeks
First 1000 days = ... first two years of life

---

**DOULA and KANGAROULA**

**BIRTH**

*previous 1000 minutes*

DOULA protects OXYTOCIN during labour.

KANGAROULA protects OXYTOCIN after birth.

---

**DOULA and KANGAROULA**

**OXYTOCIN**

- 1000 min **BIRTH**
- 1000 min **1000 days**

---

**DOULA and KANGAROULA**

**OXYTOCIN**

- 1000 min **BIRTH**
- 1000 min **1000 days**

---

**DOULA and KANGAROULA**

**CORTISOL** → Enemy of oxytocin

Stress:
- Hunger
- thirst
- Skin-to-skin
- Sucking
- "good night's sleep"
- Skin-to-skin
- Sucking

Stressors:
- Sarcasm
- Lithotomy
- Suctioning
- Crying
- White coat
- Perfume
- Lights
- Bathing
- Crowds
- "good night's sleep"
- White coat
- Sucking
- Skin-to-skin
- Skirt-to-skirt
- "good night's sleep"
**DOULA**

- Labour
- Birth
- Transition Parenting

**MOTHER SUPPORT**

- Prematurity
- Attachment Parenting
- Counseling

**NEWBORN SUPPORT**

- Counseling

**KANGAROULA**

- Protects OXYTOCIN after birth.

**DOULA and KANGAROULA**

- Protects OXYTOCIN during labour.
- Protects OXYTOCIN after birth.

- *The first 1000 minutes*
- *Previous 1000 minutes*

**Counselling**

- Counselling

**KANGAROULA**

- Supports breastfeeding

**DOULA**

- Supports natural birth
- Supports caesarean

**Kangaroula**

- Supports breastfeeding

**Zero separation**

- Skin-to-skin
- Eye contact
- Zero separation

**Protect OXYTOCIN**

- Before and after BIRTH

- Before and after BIRTH
Reflections for practice

Protect OXYTOCIN
Before and after BIRTH
The mother should NEVER BE ALONE

The Neuroscience of Birth & Breastfeeding

- The DNA
- The Brain
- Epigenetics
- Neurodevelopment
- Behaviour
- Evolutionary Biology
- Environment
- Adaptation
- Experience
- Reproductive Fitness

BIRTH
- Bonding
- Sensitization

BEYOND
- Breastfeeding
- Feed & Sleep Cycling
- Secure Attachment
- Attuned Parenting

Highly conserved

DEFENSE  NUTRITION  REPRODUCTION

HORMONES  NERVES  MUSCLES

Neuro-endocrine behavior

The reproductive programme is in the mother and the baby

DEFENSE  NUTRITION  REPRODUCTION

HORMONES  NERVES  MUSCLES

MICE

Enhanced Foraging
Time to find a baited food well:
- Non-mother: 130 sec
- Mother mouse: 40 sec
Enhanced problem solving

A maze with food
At end: Mother mouse learns her way through
ONE DAY
Non-mother
ONE WEEK

MEMORY permanently improved

Same MAZE, TWO YEARS LATER:
Mother mouse REMEMBERS TWICE AS FAST

Stress responsiveness

“Open Arm” – exposed and scary for mouse.
“Closed arm” – secluded and safer, less anxiety.

Mother mouse
30–40%

Non-mother
5–10%

More emotional resilience
LESS ANXIETY

BDNF (=Brain Derived Neurotropic Factor)

“The picture that begins to emerge is one of a healthy, “protected” brain that may provide benefits to its owner well into senescence.” (p517)

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.”

The Neuroscience of Birth & Breastfeeding

The Brain

Evolutionary Biology

Environment
Adaptation
Experience
Reproductive Fitness

BIRTH

Bonding
Sensitization

Lactating Breasts

“needed neural processes”
Breastfeeding mothers have HIGHEST VAGAL TONE → Stress Resistance

LOWER systolic blood pressure → Stress tolerance

In lactating women, these phenomena could theoretically:
# conserve energy required for lactation
# protect against stress associated inhibition of lactation,
# relieve psychological stress, and
# enhance immune function

Mock job interview:

The Relation of Early Mother-Infant Skin-to-Skin Contact to Later Maternal Sensitivity in South African Mothers of Low Birth Weight Infants

Ann E. Bigelow, et al.

From Bergman et al 2004 RCT
SSC time first 24 hr correlated with SSC time first month.

THE RELATION BETWEEN EARLY MOTHER-INFANT SKIN-TO-SKIN CONTACT AND LATER MATERNAL SENSITIVITY IN SOUTH AFRICAN MOTHERS OF LOW BIRTH WEIGHT INFANTS

ANN E. BIGELOW
St. Francis Xavier University, Antigonish, Nova Scotia, Canada

INFANT MENTAL HEALTH JOURNAL. Vol. 31(3), 369–377 (2010)
© 2010 Michigan Association for Infant Mental Health.
Published online in Wiley InterScience (www.interscience.wiley.com).
DOI: 10.1002/imhj.20509

During the first 24 hours correlation with Maternal Behaviour Q Sort predicts attachment security

Dose of SCC first 24 hours correlates
Maternal behaviour Q Sort
Predicts attachment security

Dose of SCC first 24 hours correlates
NCATS (Nursing Child Assessment Teaching Scale)
Predicts cognitive outcome

SENSITIZATION

SENSITIZATION
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."

a mother’s brain ...

SENSITIZATION

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

Joy Browne 2004

Is this feeding ??

Effect of early breastmilk expression

Parker LA. J Perinatol. 2012
Parker LA. Breastfeeding Medicine 2015

• First hour expression (vs. hrs. 2-6) ↓ time to lactogenesis and ↑ production by 130% at 6 weeks (613.0 vs. 267.2)

Milk Volumes From Day 1 To 6 Weeks

Parker, J Perinatol, 2012

Suckling and expression should start very early!

During the first 24 hours of life newborns ingested 15 g of milk.
When oxytocin is released within the brain, its effects are to diminish fearfulness; this not only encourages social investigation of newcomers, but also may enhance a tendency to express aggression toward an intruder. Leng 2008

Measure of "good mammal mother": FEROCITY OF DEFENCE OF YOUNG.

"Scientific foundation" ... synthesis

"needed neural processes"
The first hours after birth are a CRITICAL PERIOD

mutual psycho-neuro-physiological caregivers

PRATHIBA REEBYE

BIDIRECTIONAL !!

Affect regulation

“Human brains are RELATIONAL”

... co-creating touch
... signature unique to caregiver

NURTUREMENT

The DNA The Brain
EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOGY

ENVIRONMENT ADAPTATION EXPERIENCE REPRODUCTIVE FITNESS

BIRTH BEYOND

BONDING Sensitization

EMOTIONAL INTELLIGENCE

SOCIAL INTELLIGENCE

NURTURESCIENCE

The DNA The Brain
EPIGENETICS NEURODEVELOPMENT EVOLUTIONARY BIOLOGY

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BIRTH BEYOND

BONDING Sensitization

EMOTIONAL INTELLIGENCE

SOCIAL INTELLIGENCE

... infant cues - suckling, vocalisation and tactile stimulation - stimulate OXYTOCIN release in the hypothalamus, which may result in the activation of the DOPAMINE reward pathway leading to behavioural reinforcement

... toxic stress

... that contribute to maternal caregiving behaviour ... the oxytocinergic and dopaminergic systems.

... dopamine pathways contribute to the processing of infant-related sensory cues leading to a behavioural response.
“absence of the buffering protection of adult support”

Toxic Stress

• Disrupts brain architecture ...
  ... increasing the risk of stress-related physical and mental illness

CORTISOL

The Neuroscience of Birth & Breastfeeding

The DNA  The Brain  Neurodevelopment  Behaviour
Epigenetics  Neurodevelopment  Evolutionary Biology

Environment  Adaptation  Experience  Reproductive Fitness

Birth  Bonding  Sensitization  Toxic stress

Beyond  Breasftfeeding  Feed & Sleep Cycling  Secure Attachment  Attuned Parenting

BIRTH  BEYOND

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BIRTH  BEYOND

Specifying the Neurobiological Basis of Human Attachment: Brain, Hormones, and Behavior in Synchronous and Intrusive Mothers

... anxious parenting mediated by stress-related mechanisms and greater neural disorganization.

CORTISOL

Specifying the Neurobiological Basis of Human Attachment: Brain, Hormones, and Behavior in Synchronous and Intrusive Mothers

Well-adapted parenting ... reward-related motivational mechanisms, temporal organization, and affiliation hormones

OXOTOCIN

Can this be influenced ??

OXOTOCIN

FERGUSON REFLEX

Head stretches loweruterine segment → Positive feedback loop of oxytocin

Can this be influenced ??

Oxytocin surge absent in Caesarean

Maternal brain response to own baby-cry is affected by cesarean section delivery

Figure 1: Maternal brain activity of VD vs. CSD (Baby-cry vs. Control Sound) (n = 7, p < .05, two-tailed). There are trends, none of the group contrast between regional activity in VD and Caesarean section delivery in CA for the contrast own baby-cry = instrinct sound (p = .05, uncorrected). Please see Table 1 for a detailed list of corrected p-values.
Can this be influenced??

Vaginal birth → unique patterns → sensory processing, empathy, arousal, motivation, reward and habit-regulation circuits … MORE SENSITIVE

Maternal brain response to own baby-cry is affected by cesarean section delivery

James E. Swain, 1 Ezra Yangin, 2 Linda C. Mayes, 1, 2 Ruth Feldman, 1, 2 R. Todd Constable, 3 and James F. Leckman 1

CORTISOL

Brain differences between VD & CSD mothers … may contribute to mental health risks & RESILIENCY in the mother-infant dyad.

OXYTOCIN comes from

Cervical dilatation
Breastfeeding
Skin-to-skin contact
Eye-to-eye contact

Oxytocin surge absent in Caesarean

Solution: continuous skin-to-skin contact, and hourly breastfeeding

DOULA and KANGAROULA

Breastfeeding
Skin-to-skin contact
Eye contact
Zero separation
Sticking

Maternal brain response to own baby-cry is affected by cesarean section delivery

OXYTOCIN comes from

Breastfeeding
Skin-to-skin contact
Eye-to-eye contact
Oxytocin, prolactin, milk production and their relationship with personality traits in women after vaginal delivery or Cesarean section.

Social desirability and oxytocin pulsatility were also correlated with the amount of milk transferred from the mother to the baby. The correlations indicate that central oxytocin … may be involved in behavioral adaptations to the maternal role.
OXYTOCIN-RICH MUM “CORTISOL” MUM
SYNCHRONOUS or “in-tune” mum INTRUSIVE not in tune with baby
SENSITIVE to approach crying baby ABLE TO IGNORE her crying baby, is distant
REWARD related motivation STRESS DRIVEN response to Baby’s cry
COMPASSION and empathy for baby ANXIETY AND WORRY as to how to care for baby
INSTINCTIVE care INTELLECTUAL care
CARE IS EASY and natural CARE IS HARD WORK though can be very good

Attachment
Contingent infant directed
Synchronous Sensitive

Non-contingent
Intrusive Insensitive

Multiple environmental factors

HEALTH DISEASE
The psychology of human parent-infant relationships

Parenting is regulated by key hormones and neurotransmitters

Neuroanatomical circuits of parenting

Integrative physiology of normal parenting behaviors

Brain imaging of human parent-infant relationships

The neurobiology of empathy and parenting

Conclusions and critical summary

(Swain et al, 2007)

Even before the child is born, parents preoccupy themselves with creating a safe and secure infant environment. Human nestbuilding type behaviors are common, including major cleaning and renovation projects ...

"Scientific" features of love

Table 1 Common behavioral elements of maternal care across mammalian species

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Figure 2 Human parental brain areas. Brain regions expected to be important to human parenting, based on

In early parental love, initial data suggests that parents frequently feel compelled to shape their own behavior to the perceived needs of the baby (Leckman et al., 1999). Frequently, these behavioral responses have a 'just right' character, such that they need to exactly fit the apparent needs of the baby.

This heightened sense of responsibility that usually accompanies this state may lead to increased vigilance, repeated behaviors aimed at ensuring the safety of the infant (Leckman et al., 2004) and increased sensations of reward.

Healthy parent-infant interactions, which may themselves be addiction-like (Insel, 2003), are disrupted by artificial stimulants of the dopaminergic system, such as cocaine which may act as a highly reinforcing infant substitute (Meaney, Brake, & Gratton, 2002).

NOTA BENE

The circuitry we have problems with

In substance abusing mothers, MAY BE PRIMARY PARENTING CIRCUITS

"highly conserved neuro-endocrine behavior"

Healthy parent-infant interactions, which may themselves be addiction-like (Insel, 2003), are disrupted by artificial stimulants of the dopaminergic system, such as cocaine which may act as a highly reinforcing infant substitute (Meaney, Brake, & Gratton, 2002).
The circuitry we have problems with in substance abusing mothers, may be primary parenting circuits: highly conserved neuro-endocrine behavior.

The newborn is the real object of this behavior/neural network:
1. It is plastic.
2. It could be harnessed →

The picture that begins to emerge is one of a healthy, “protected” brain that may provide benefits to its owner well into senescence.” (p517)

Breastfeeding does not treat or cure NAS but allows skin-to-skin contact that could lessen ...
(Courty & Nacache 2012)

Interventions that support breastfeeding in the treatment of NAS include skin-to-skin contact ...
(Pritcham 2013)

Numerous studies indicate breastfeeding decreases NAS severity. (Logan 2014)

Nonpharmacologic interventions, particularly breastfeeding, may decrease NAS severity.
Douglas KENRICK (2010)

“We revisit the idea of a motivational hierarchy in light of theoretical developments at the interface of evolutionary biology, anthropology, and psychology.”

http://www.psychologicalscience.org/journals/jpp/5_3_inpress/Kenrick.pdf

Fathers ??
Currently available data are broadly consistent with a working hypothesis that the expression of parental behavior will involve homologous neuroendocrine circuits in male and females.

Wynne-Edwards 2001

8 % of mammals paternal caregiving

between partners. This pattern of hormonal change in men and other, paternal mammals, and its absence in non-paternal species, suggests that certain hormones also play key roles in priming males to provide care for their young (Storey, Walsh, Quinton, & Wynne-Edwards, 2000).

The reproductive programme is in the mother and the baby

THE HUNTER GATHERER (cont)

Infant care patterns in such societies (which are closest to our origins):

1. Infant carried most of the time
2. Mother sleeps with infant same bed
3. Immediate feeding response to crying
4. Breastfeeding 24 months or more
5. Father frequently and closely involved ...

WHAT IS NORMAL MOTHER BEHAVIOUR?
WHAT IS NORMAL FATHER BEHAVIOUR ??
5 Father frequently and closely involved ...

24 videotapes

Using a modified frequency method, behaviors were identified in four main categories: proximity, gaze, touch, and movement.

The analysis showed that proximity and gaze were high-frequency behaviors and touch and movement were low-frequency behaviors. Tomlinson 1991

Twelve parents (6 mothers and 6 fathers)

Taken by surprise: For mothers, the premature birth created a feeling of powerlessness and they experienced the immediate postnatal period as surreal and strange.

The fathers experienced the birth as a shock, but were ready to be involved immediately. Fegran 2008

Mothers engaged in more caregiving, talking, and holding during initial contacts, but the disparity in maternal and paternal interactions decreased with time.

Except for caregiving, in which mothers still surpassed fathers, fathers equaled mothers in all other activities at the time of the infants’ discharge from the hospital.

Fathers consistently surpassed mothers in playing and stimulating. Levy-Schiff 1989
Father during C/S

FAMILY CENTERED CARE
→ DO IT LITERALLY!!

Triplets ... requires a team

Results demonstrated that both mothers and fathers rated their experiences of love significantly higher when holding their infants skin to skin than when holding their infants wrapped in blankets. (Differences: two types of holding: mothers p = 0.0002; fathers p = 0.0001)
Gloppstedt 1998

Oxytocin and the Development of Parenting in Humans

Maternal OT was related to the amount of affectionate parenting behaviors ... whereas paternal OT correlated with the degree of stimulatory parenting behaviors ...

Specifying the Neurobiological Basis of Human Attachment: Brain, Hormones, and Behavior in Synchronous and Intrusive Mothers

Well-adapted parenting ... reward-related motivational mechanisms, temporal organization, and affiliation hormones
Given the central importance of rewards for survival, reproduction, and competitive gains, it may not be surprising that several specialized and only partly overlapping brain mechanisms have developed during evolution.

PROLACTIN and testosterone levels in first-time fathers during skin-to-skin contact with their babies soon after birth.

Rebecka Bradshaw
Noah Veranyuy Ozeaye
Nils Bergman
(University of Cape Town, South Africa.)

Rebecka initiated the project as a medical student project, Nils completed the vaginal birth cases, and supervised Vera. Vera did all the caesarean cases, as a thesis towards a Masters in Nursing.

The dopamine hypothesis of reward: past and current status

Riezu Spongel and Edz柒et Nlue

Evidenee that dopamine is involved in the formation of associations between salient contextual stimuli and internal rewarding or aversive events. This evidence suggests that dopaminergic-neuron activation aids the organism in learning to recognize stimuli associated with such events. Thus,

Father during C/S

Effect of place on PRL

Thus, PRL homeostasis should be viewed in the context of a fine balance between the action of dopamine as an inhibitor and the many hypothalamic, systemic, and local factors, acting as stimulators, none of which has yet emerged as a primary PRL releasing factor.
... infant cues - suckling, vocalisation and tactile stimulation - stimulate OXYTOCIN release in the hypothalamus, which may result in the activation of the DOPAMINE reward pathway leading to behavioural reinforcement.

Yes I am still feeling the Awe of being a new father.

I was going to send you pictures from the theater as I feel privileged to have been part of the trial. I obviously can’t compare the difference between having had her in the skin-to-skin position vs not, but I really feel connected to my beautiful little girl. She seems to find comfort in sleeping on my chest when she is unsettled and I am convinced that this is due to her early connection with me.

I would recommend and encourage all fathers to be involved in this way. Thank you for the opportunity, good luck with your trial, and I hope that what was achieved on Monday will aid other fathers to be dedicated to their children, as it has this one.

All the best, Justin

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First 1000 sec = 16 minutes = 1st hour
First 1000 min = 16.6 hours = 1st day
First 1000 hrs = 41.6 w = 1st six weeks
First 1000 days = ... first two years of life

---

Wire father’s brain → <1 hour
Wire baby’s brain → 6 hours
Wire mother’s brain → 20 hours

~ 1000 minutes
Taken together, these results indicate that, as with a number of other biparental species, human fathers are more responsive to infant cues than are non-fathers and fathers’ responses to infant cues are related to both hormones and to caregiving experience.

Fleming 2002

Dad is vital for stretching, stimulating play,

Best → midwife + doula + father

cortisol    oxytocin    dopamine

... continue until goes home, then until baby says “enough, thanks”
The baby is born, and a young lady becomes a mother, the couple become a family - a wonderful bonding experience - not to be disturbed.

The DNA

EPIGENETICS

The Brain

NEURODEVELOPMENT

Behavior

EVOLUTIONARY BIOLOGY

ENVIRONMENT

ADAPTATION

EXPERIENCE

REPRODUCTIVE FITNESS

BIRTH

MOTHER

SEPARATION

BONDING

SENSITIZATION

REFEDDING

FEED & CARE TAKE

Secure Attachment

Afferted parenting

Disordered Attachment

Resilience

Vulnerability

HEALTH

DISEASE

Infancy cannot be re-run later.

"It is necessary to work with Nature and not against her if we are to promote health and wellbeing in young children, their mothers, and society."

"MOTHERING" we can aim to bring our society, that we can change, into better harmony with our biological "givens" that we cannot change...

EMPOWER PARENTS BY SKIN-TO-SKIN CONTACT

SKIN-TO-SKIN EMPOWERS PARENTS

Infancy cannot be re-run later.