

# NDC concept of conditioned sympathetic nervous system hyperarousal in infants: 'conditioned dialling up'

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# ‘Sensitised stress or fear response’ ‘Neural sensitisation of stress’ = Conditioned SNS hyperarousal

Douglas & Hill 2013



## A neurobiological model for cry-fuss problems in the first three to four months of life

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### ABSTRACT

Although problem crying in the first three to four months of life is usually self-limiting, it is not a trivial condition. Early intervention is important, yet families receive conflicting advice from health professionals. The past decade has seen significant advances in neuroscience, lactation science, and developmental psychology, including new insights into the significance of developmentally sensitive windows. We propose a neurobiological model to explain the mechanisms of cry-fuss problems in the first months of life, and the mechanisms which underlie effective intervention, with a view to facilitating research collaboration and consistency of advice across health disciplines. We hypothesise that crying in the first three to four neurodevelopmentally sensitive months signals activation of the hypothalamic-pituitary-adrenal axis and adrenergic neuronal circuitry in response to perceptions of discomfort or threat. Susceptible infants may be conditioned by early stress, for example, by unidentified feeding difficulties, into a sensitised stress response, which usually settles at three to four months of age with neurodevelopmental maturity. Bouts of prolonged and unsoothable crying result from positive feedback loops in the hypothalamic-pituitary-adrenal and adrenergic systems. Importantly, epigenetic modulation of the infant's limbic neuronal circuitry may explain correlations between regulatory problems in the first months of life, and behavioural problems including feeding problems in later childhood.

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### Background

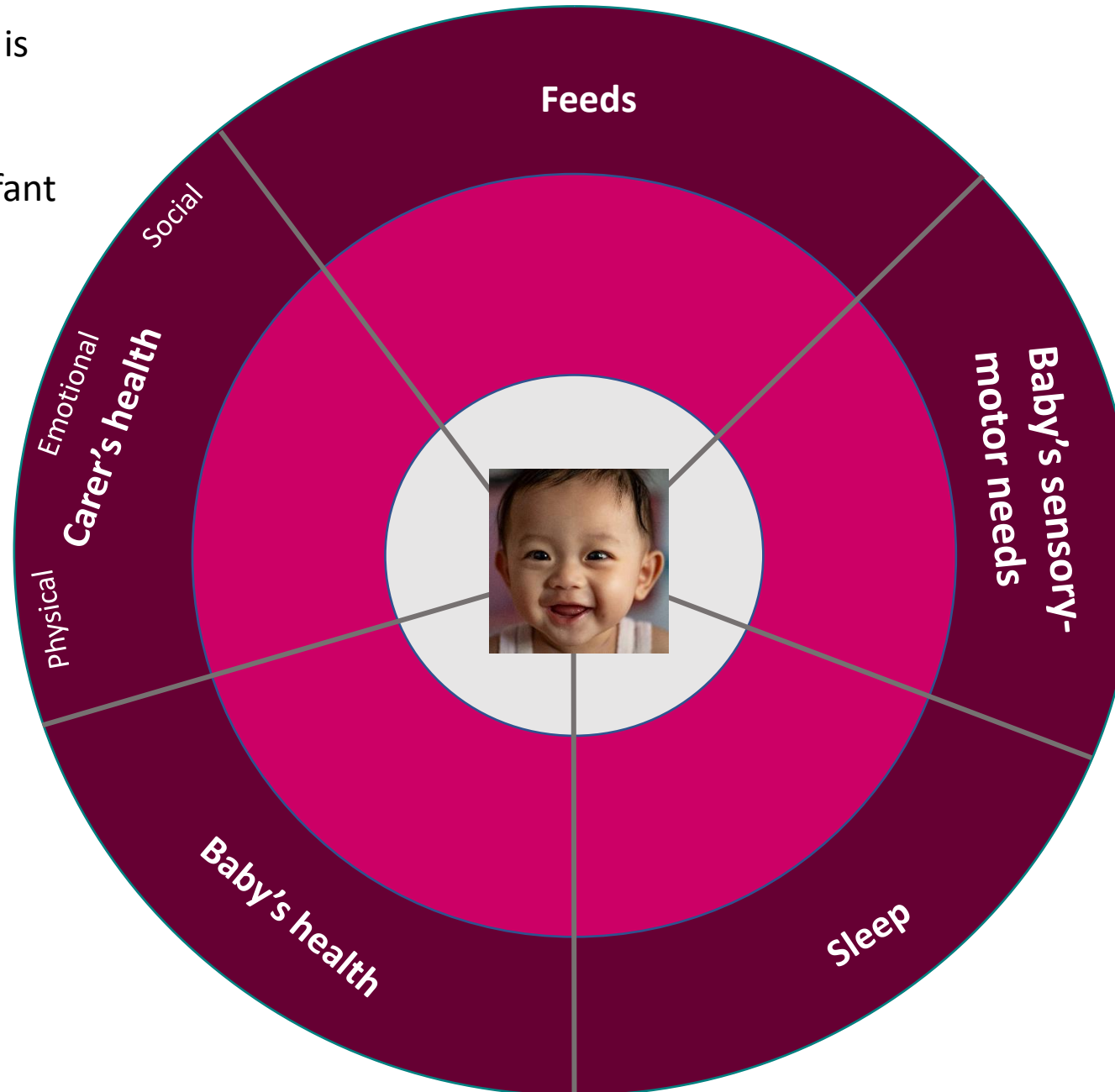
One of the most common problems parents bring to paediatricians, general practitioners, child health nurses, midwives, psychologists and Emergency Departments in the first weeks and months of life is the baby who cries and fusses. One in five new parents report that their baby has problem crying [1]. Infant cry-

ing and fussing [7]. Attempts to quantify unsettled infant behaviour have been confused, and 'colic', as defined by the Wessel's or modified Wessel's criteria, is an arbitrary upper end to the wide spectrum of infant crying in healthy infants. Clinically, problem crying is most usefully defined by parental perception, and this paper uses the terms excessive crying, cry-fuss problems, and unsettled infant behaviour interchangeably. Because crying, feeding and sleep problems interact and exacerbate each other



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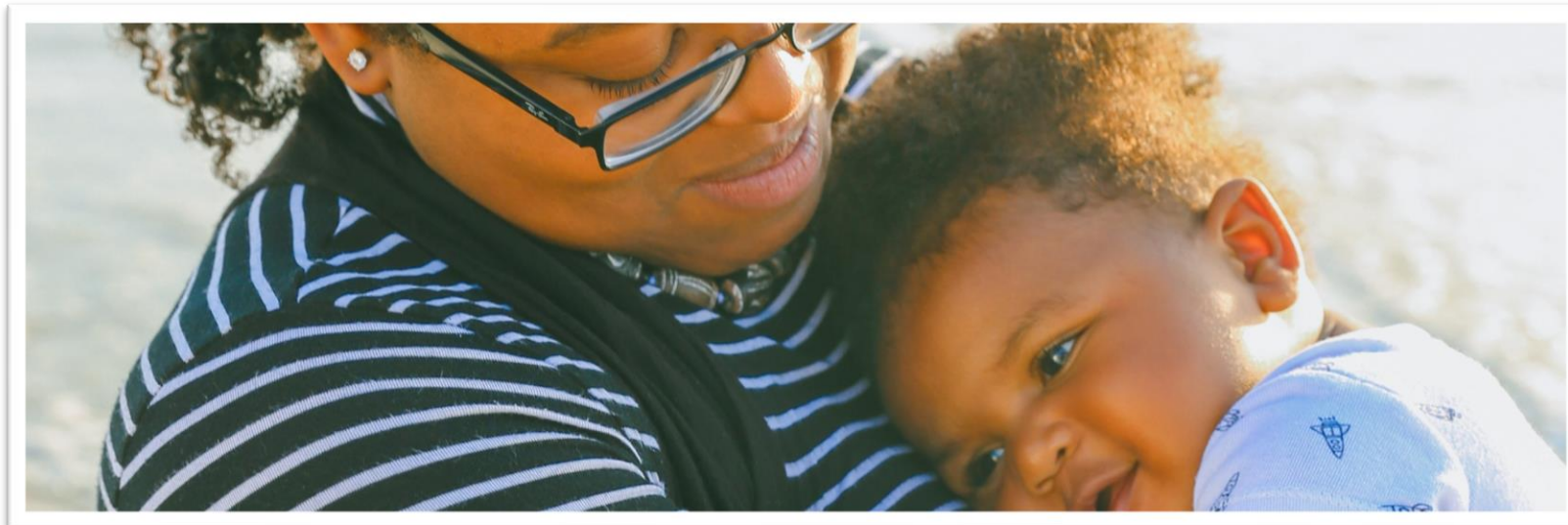
Conditioned dialling up is  
fundamental concept  
in NDC or Possums  
5-domain approach to infant  
cry-fuss problems



**Adapted by Dr Pamela Douglas 8/3/23**  
**from:** Neuner-Jehle et al. *BMC Family Practice* 2013, 14:100 doi:  
10.1186/1471-2296-14-100

**NDC concept of conditioned dialling up in infants  
helps remedy inappropriate medicalisation and unnecessary treatments:**

- Reflux
- Allergy
- Gut pain/discomfort/dysbiosis
- Tongue-tie
- Avoidable weaning
- Nasogastric tube use
- Cascades of family distress → developmental effects long-term





## **‘Dial on the sympathetic nervous system’**

- SNS-HPA axis
- Patterns of sensible responses over time with aim of keeping the baby’s dial turned down





## **First wave**

Classical conditioning (Pavlov)  
Operant conditioning (Skinner) – hungry rats

## **Second wave**

Cognitive Behavioural Therapy  
Family Systems Therapy  
Rational Emotive Behaviour Therapy  
Eye Movement Desensitisation and Reprocessing  
Rational Emotive Behaviour Therapy

## **Third wave**

Mindfulness Based Cognitive Therapy  
Dialectical Behaviour Therapy  
Behaviour Analysis  
Applied Functional Contextualism (or ACT)

**Operant conditioning:**

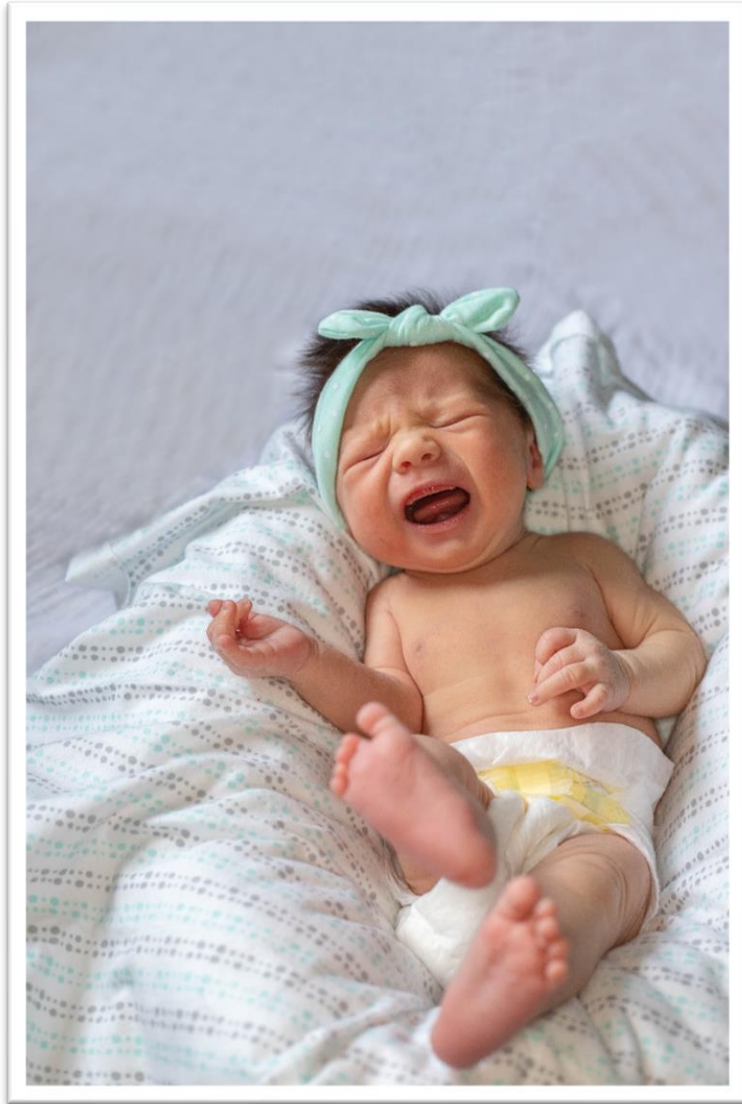
**X = aversive stimulus  
which increases or reinforces a  
behaviour or response**

**X → distress/dialling up  
reinforced by repetitive experience of  
aversive stimulus  
= conditioned dialling up**

# **The waves of behaviourism**



# What is conditioned dialling up in infants?



Neurobiological model of infant crying:

1. First 16 weeks of neurological sensitivity
2. Conditioned dialling up with feeds
  - A. Breast
  - B. Bottle
3. Conditioned dialling up with sleep
  - A. Cot
  - B. Waking
4. *[Conditioned dialling up with*
  - A. *Tummy time*
  - B. *Highchair*
  - C. *Pram*
  - D. *Car*
  - E. *Others]*

# 1. What is conditioned dialling up in an infant < 16 weeks old?

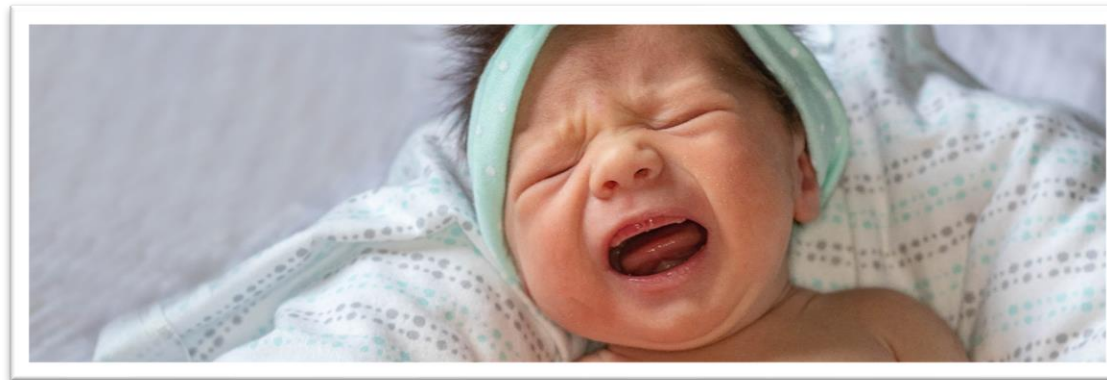
Neurobiological model of infant crying:

Repeated experiences of high levels of SNS arousal

→ dialling up of SNS with even small or undetectable aversive stimuli

→ temporary lowering of stress threshold = 'dial stuck on high'

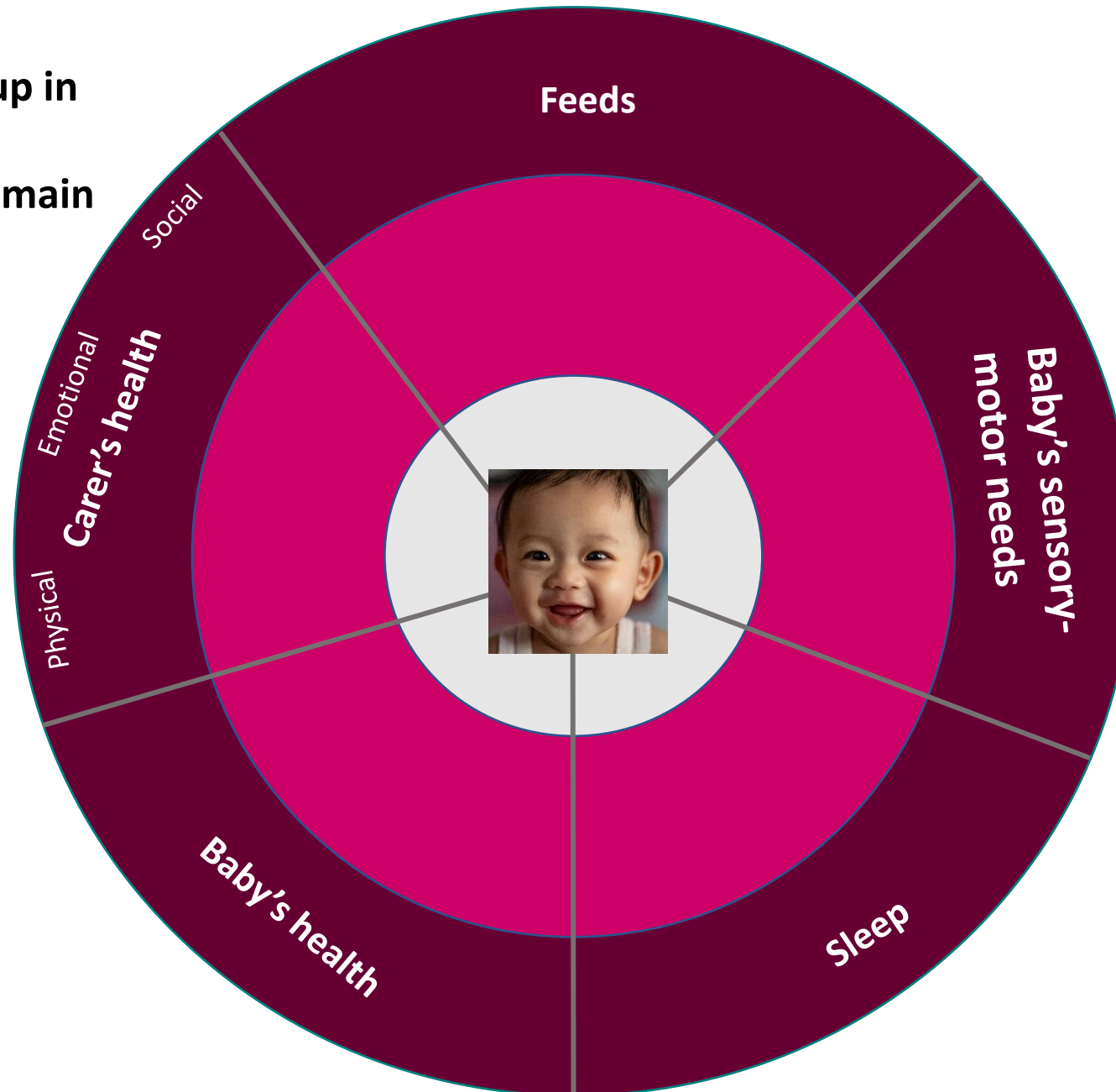
→ long-term alteration of stress response (epigenome) = butterfly effect in complex system





**Management of the  
conditioned dialling up in  
first months of life:  
NDC or Possums 5 domain  
approach**

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## 2A. What is conditioned dialling up with breastfeeds?

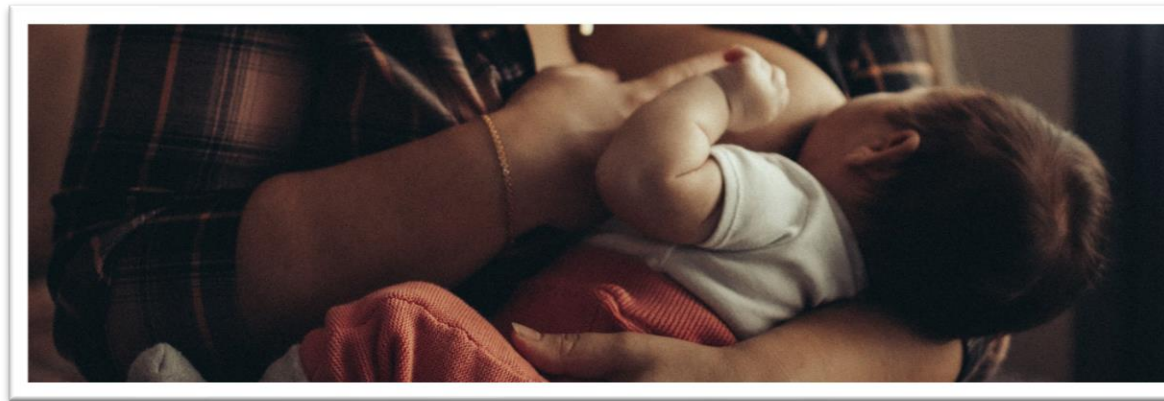
Repeated experiences of high levels of SNS arousal: negative association

Most commonly due to motoric positional instability

- Difficulty coming on or staying on breast
- Back arching
- Fussing at breast

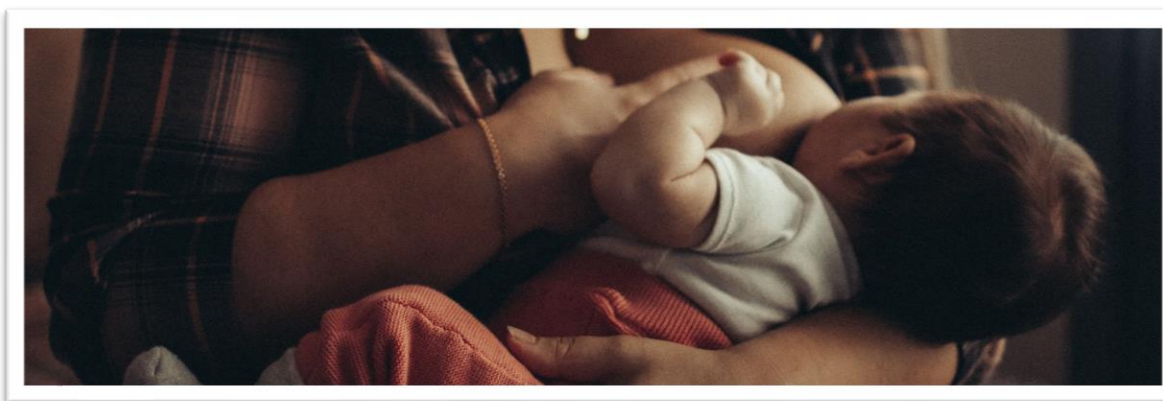
Pressure on feeds

- Experience of being forced to breast
- Experience of being coerced at breast
  - Weight gain concerns
  - Empty breast imperative – needs to stay on breast



## NDC management of conditioned dialling up with breastfeeds

- FREQUENT FLEXIBLE FEEDS
- Education re evolutionary drive
  - in parents
  - In infants
- Address underlying problems
- Grow positive experiences
- Stop negative experiences





**Sensory nourishment  
(or environmental enrichment)**



## 2B. What is conditioned dialling up with bottle feeds?

Repeated experiences of high levels of SNS arousal: negative association

Pressure on feeds

- Weight gain concerns
- Empty bottle imperative – needs to stay on bottle

[Motoric positional instability

- Difficulty coming on or staying on breast
- Back arching
- Fussing at bottle]






# NDC management of conditioned dialling up with bottle feeds

- PACED BOTTLE FEEDS
- Education re evolutionary drive
  - in parents
  - In infants
- Address underlying problems
- Grow positive experiences
- Stop negative experiences





A man with long, wavy blonde hair is shown in profile, looking down at a baby he is carrying in a colorful striped sling. The sling features horizontal stripes in shades of blue, green, yellow, orange, and red. The man is wearing a blue tank top. The background is a lush, green forest with many trees and foliage. The lighting is natural, suggesting daylight. The overall mood is calm and nurturing.

**Requires rich sensory nourishment  
(or environmental enrichment)**

### 3A. What is conditioned dialling up with sleep?

Negative association with cot or bedroom  
Misunderstood as 'resisting sleep'

**Management:**

- Avoid cot or bedroom
- Possums Sleep Program





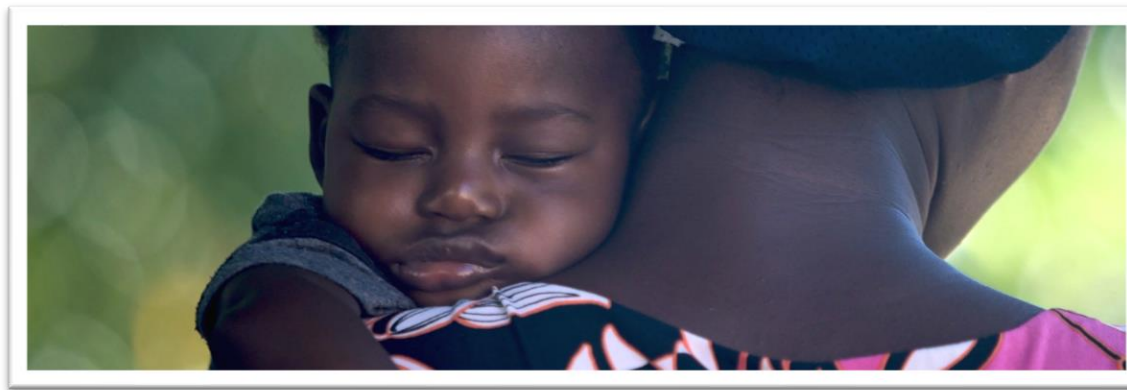
### 3B. What is conditioned dialling up with waking?

Negative association with waking


- 'Baby goes from 0-100'
- 'Piercing scream'

#### **Management:**

- Swift response when baby wakes → cuddle, feed
- Possums Sleep Program





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