

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

Dr Pamela Douglas  
[ndcinstitute.com.au](http://ndcinstitute.com.au)

Associate Professor, School of  
Nursing and Midwifery, Griffith  
University; Senior Lecturer, General  
Practice Clinical Unit, The University  
of Queensland

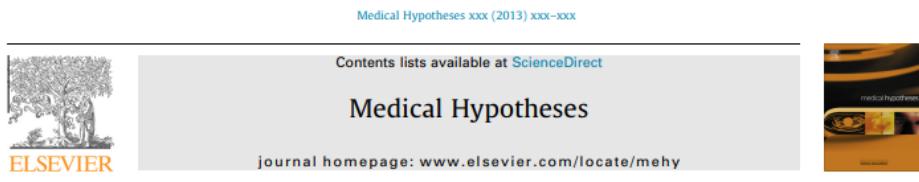
Project ECHO  
10 August 2023

# ‘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

Pamela Sylvia Douglas <sup>\*</sup>, Peter Stewart Hill <sup>1</sup>

Discipline of General Practice, The University of Queensland, Health Sciences Building, Royal Brisbane and Women's Hospital, Herston 4029, Queensland, Australia

#### ARTICLE INFO

Article history:  
Received 4 July 2013  
Accepted 3 September 2013  
Available online xxxx

#### 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-

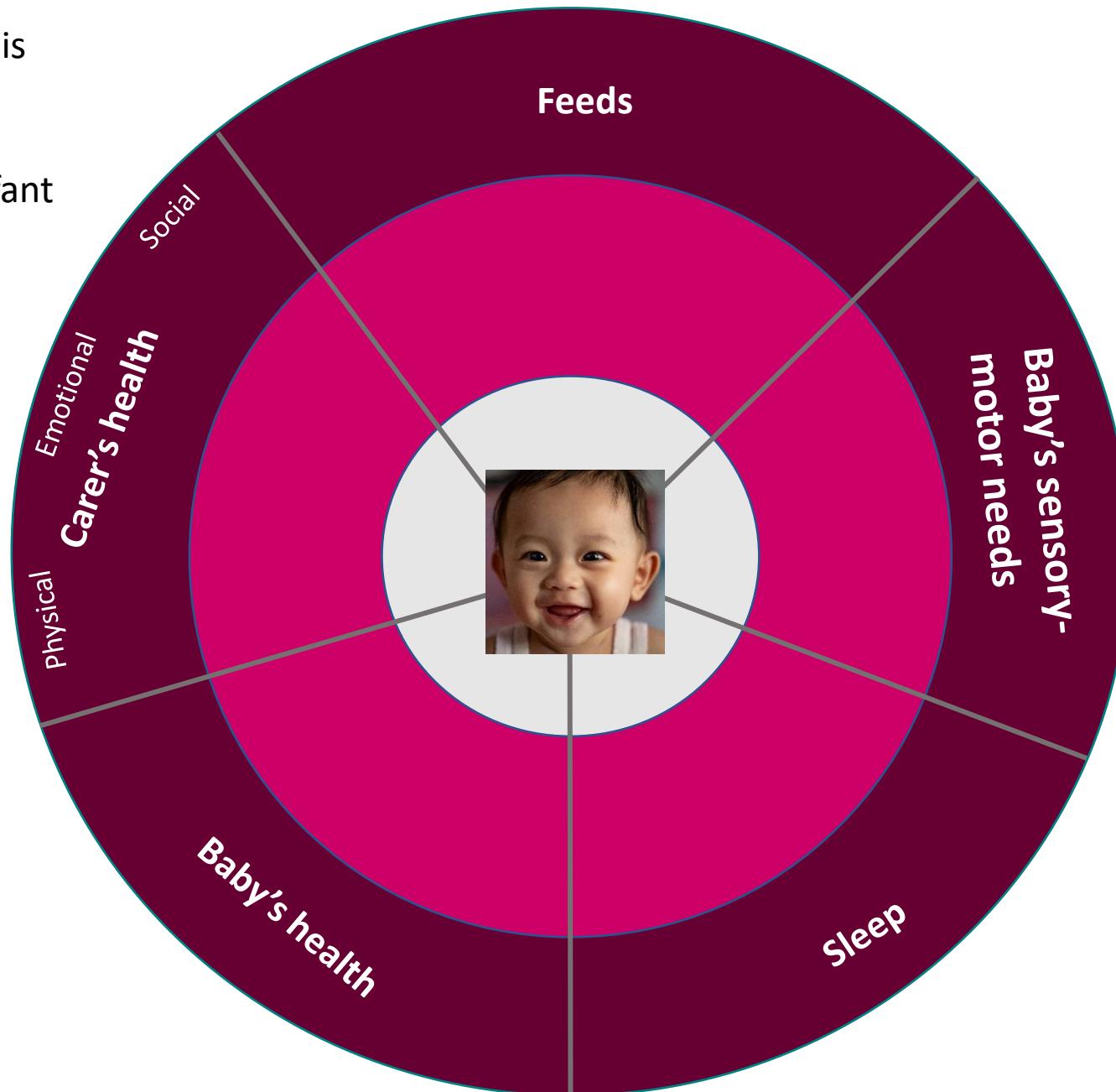
crying and fussing [7]. Attempts to quantify unsettled infant behaviour have been confused, and 'colic', as defined by the Wessel's or modified Wessel's criteria, is an arbitrary upper end to the wide spectrum of infant crying in healthy infants. Clinically, problem crying is most usefully defined by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



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

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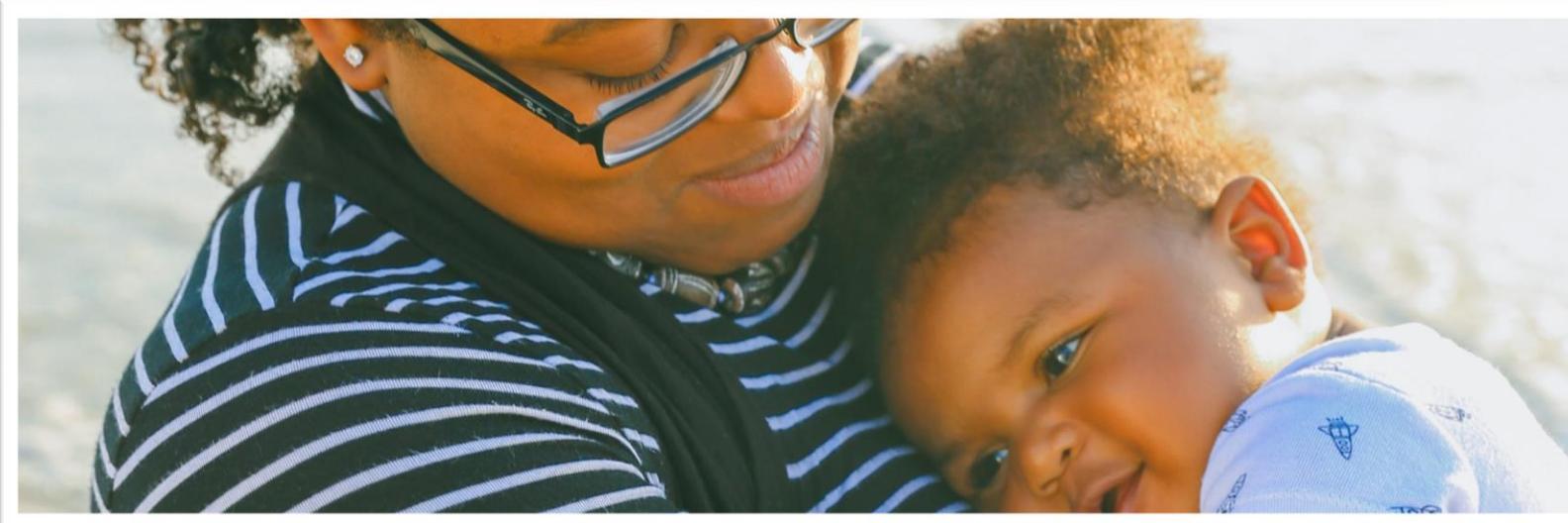


Adapted by Dr Pamela Douglas 8/3/23  
from: Neuner-Jehle et al. *BMC Family Practice* 2013, 14:100 doi:  
10.1186/1471-2296-14-100

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## **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:

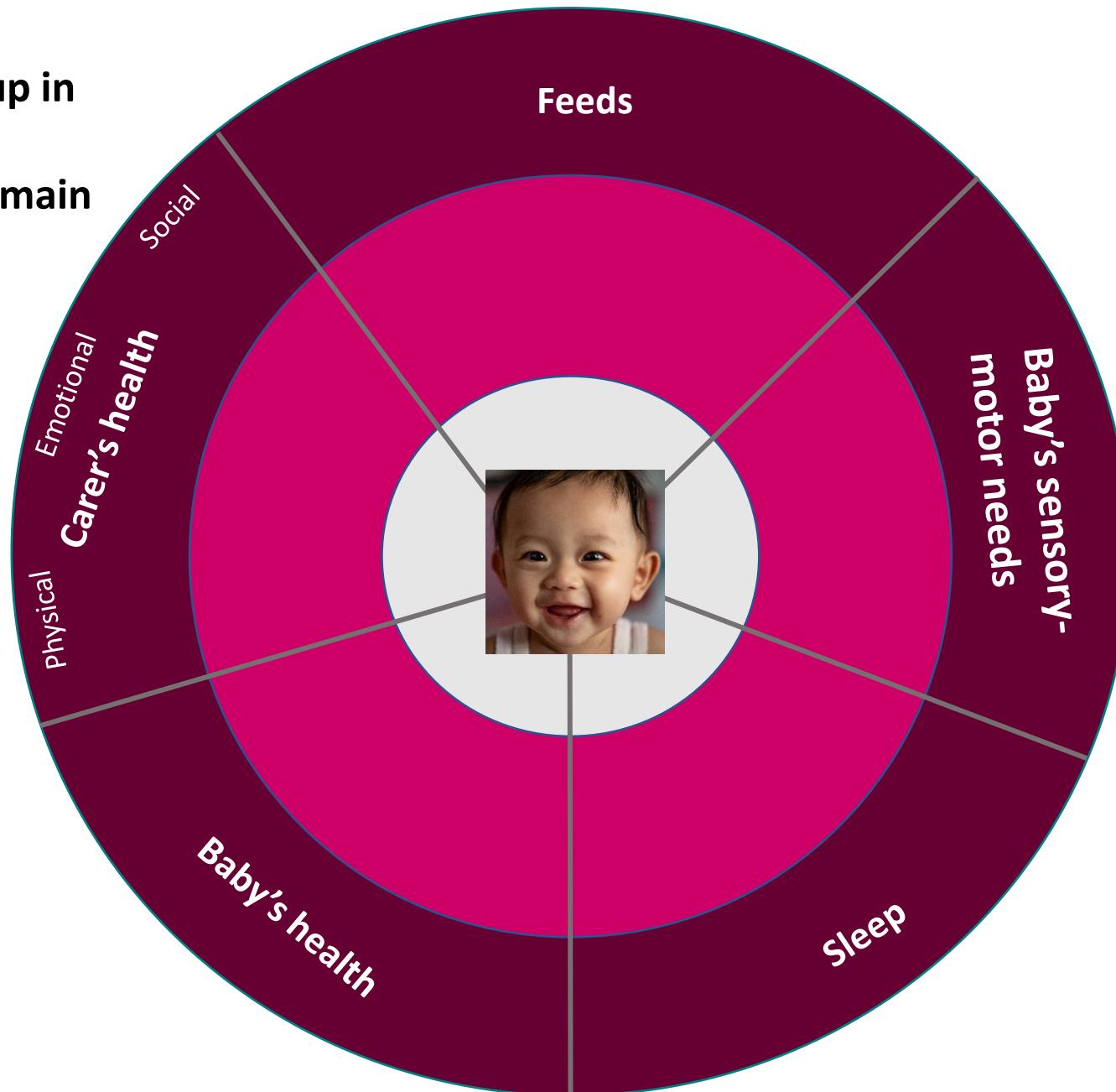
Repeated experiences of high levels of SNS arousal

- 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



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A close-up photograph of a man with blonde hair, wearing a blue and red striped baby wrap, carrying a baby in a forest. The man is looking down at the baby, who is looking up at him. The background is filled with green trees and foliage.

**Sensory nourishment  
(or environmental enrichment)**

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

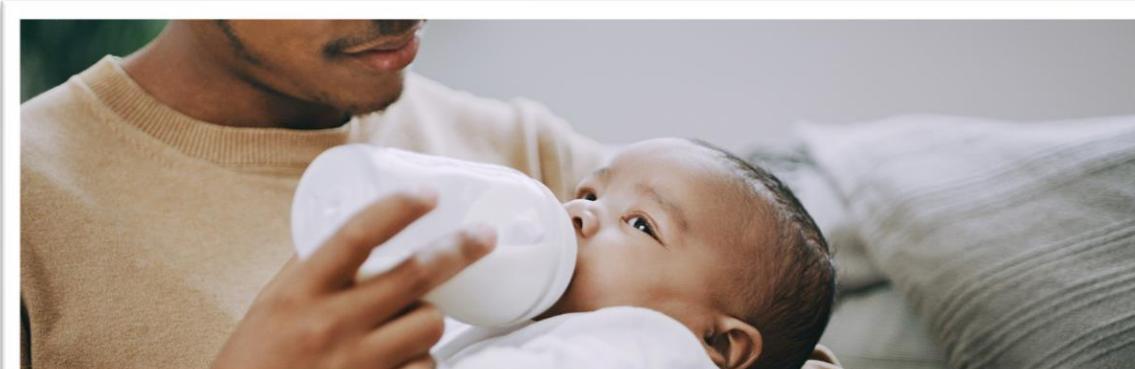
Repeated experiences of high levels of SNS arousal: negative association

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 close-up photograph of a man with blonde hair, wearing a blue and red striped baby wrap, carrying a baby in a forest setting. The man is looking down at the baby, who is looking towards the camera. The background is filled with green trees and foliage.

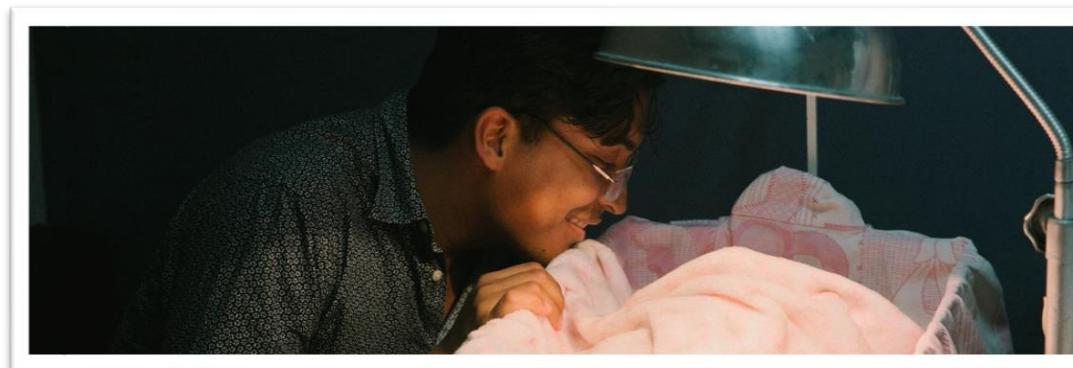
Requires rich sensory nourishment  
(or environmental enrichment)

## 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



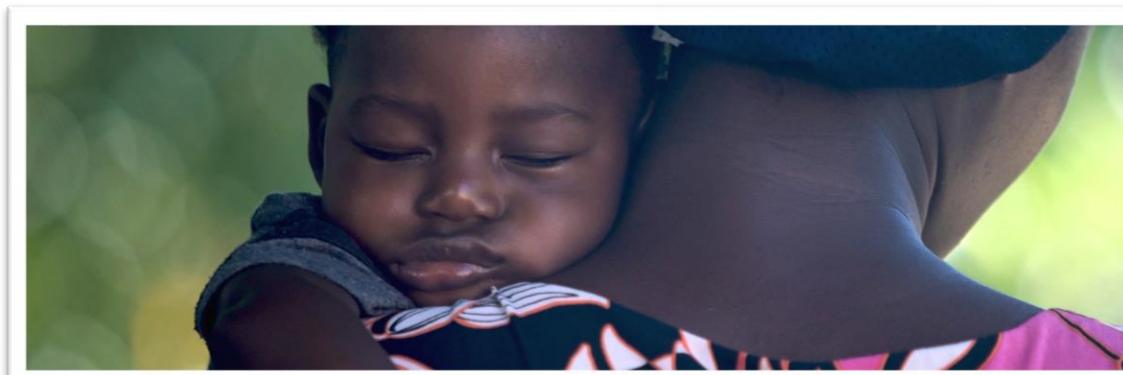
## 3B. What is conditioned dialling up with waking?

Negative association with waking

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

**Management:**

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



A close-up photograph of a man with blonde hair, wearing a blue and red striped baby wrap, carrying a baby in a forest setting. The man is looking down at the baby, who is looking towards the camera. The background is filled with green trees and foliage.

Requires rich sensory nourishment  
(or environmental enrichment)