Cue-Based, Co-Regulated Approach to Feeding

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Objectives

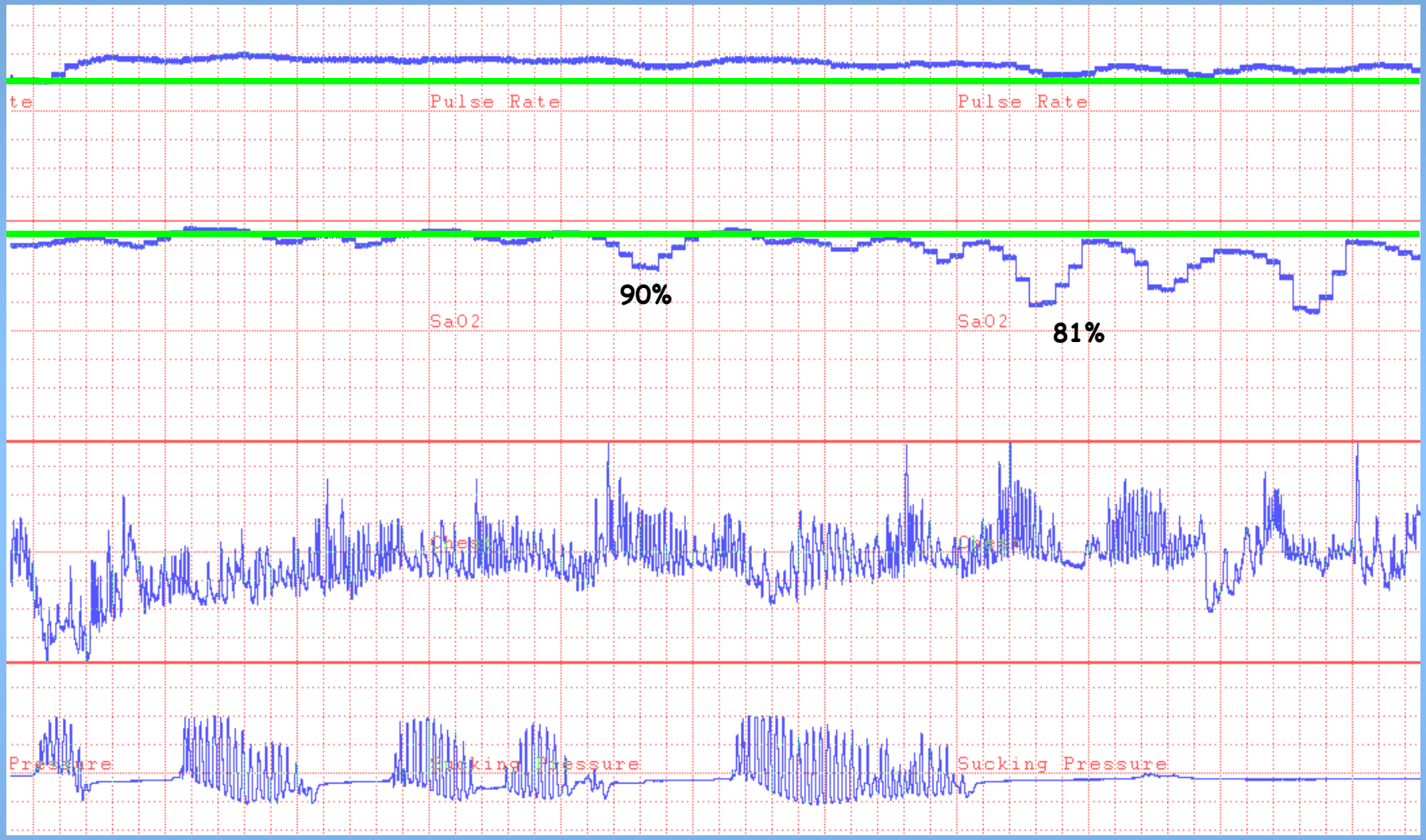
1. Describe the significance of focused feeding assessment.

2. Describe the skill of infant oral feeding using feeding dynamics theory.

3. Identify short-term effectiveness of using a co-regulated feeding approach with enhanced auditory assessment.

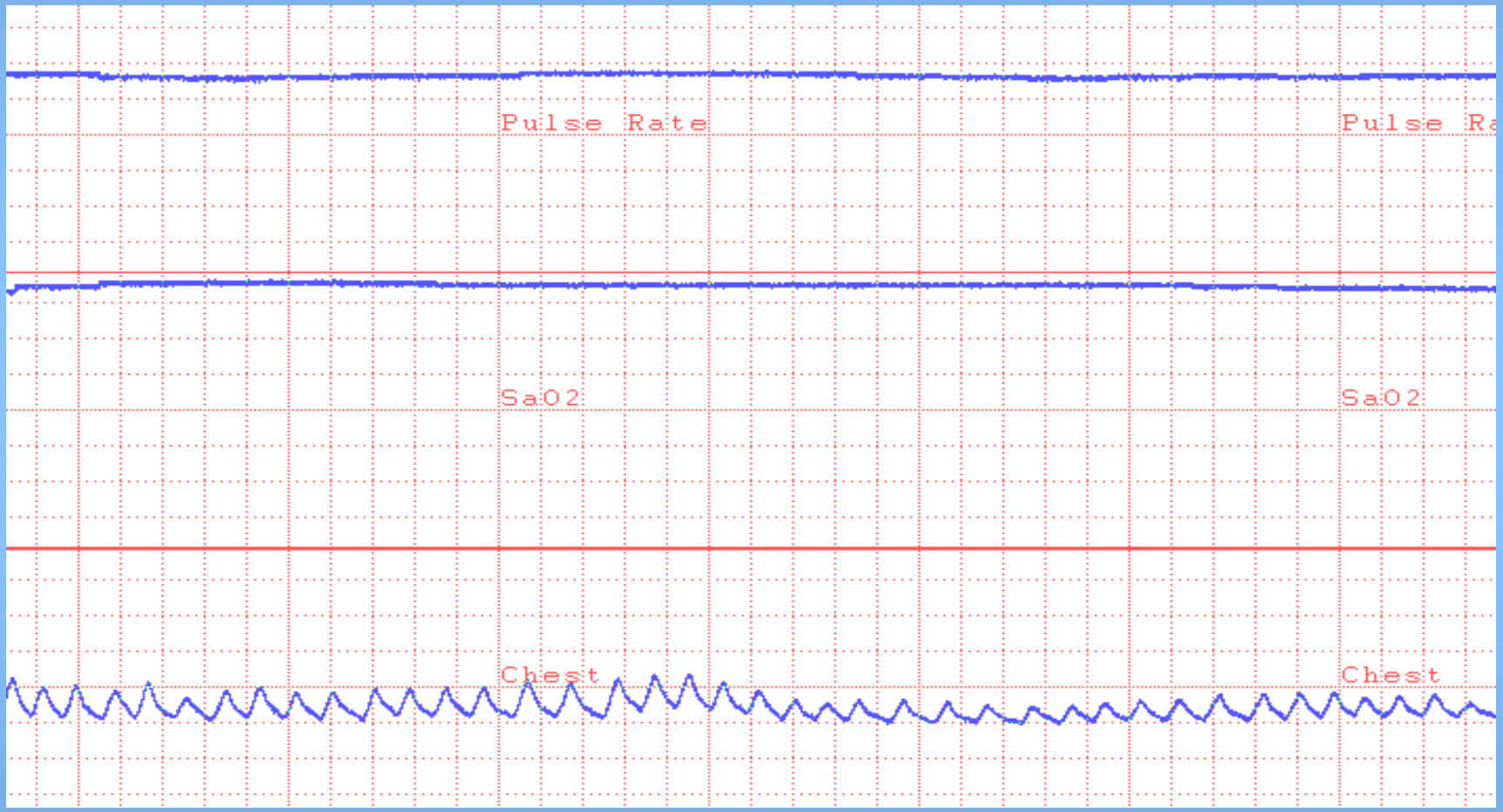
Our Research Has Been Focusing On How To Support Infants During Bottle Feeding

- Aiming to minimize…
  - Breathing disruptions
  - Swallowing disorganization
  - Oxygen desaturation
  - Behavioral distress
  - Energy consumption

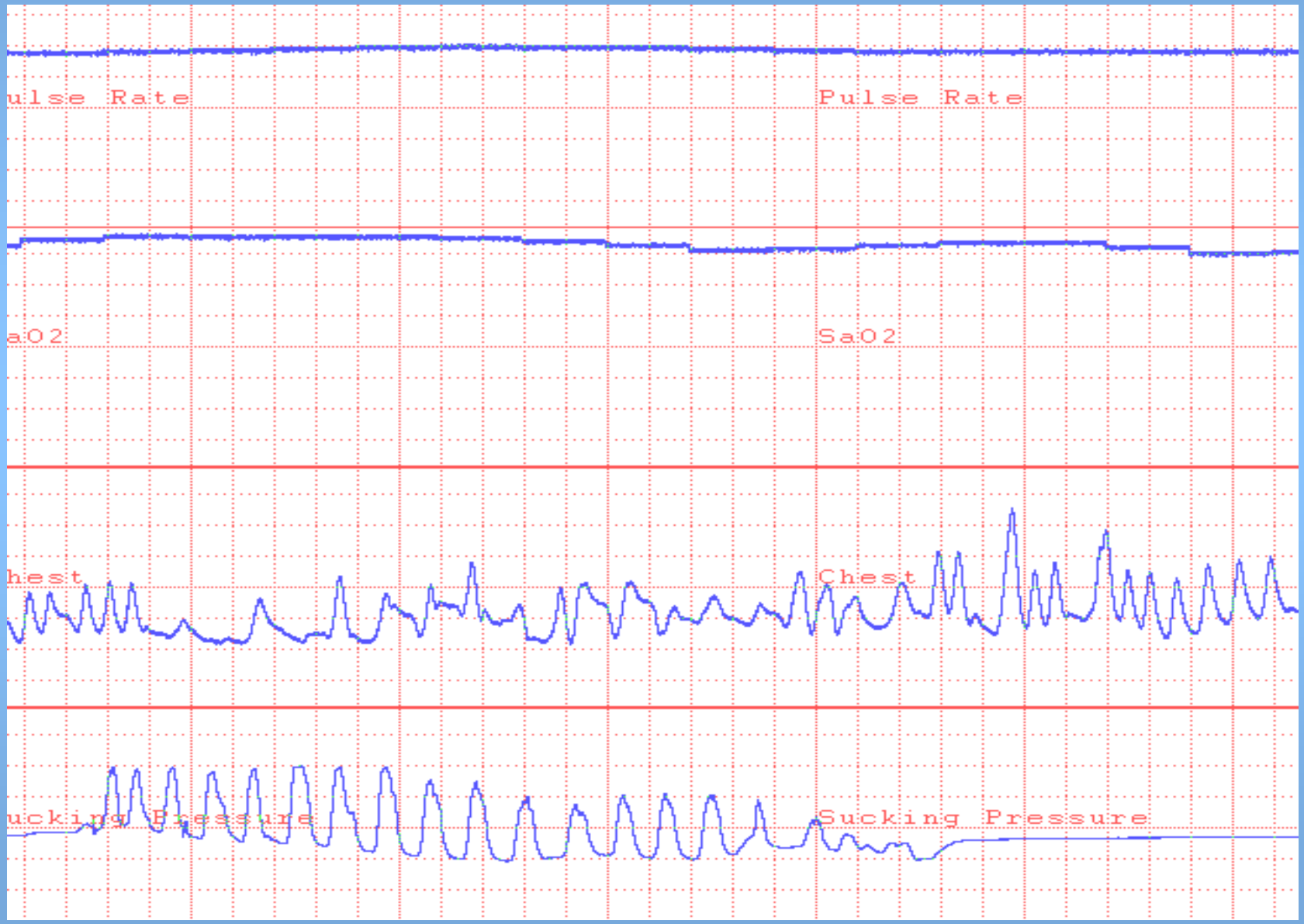

Pulse Rate
Pulse Rate
90%
SaO2
SaO2
81%
Sucking Pressure
Sucking Pressure

← 2 min 35 sec ⟶

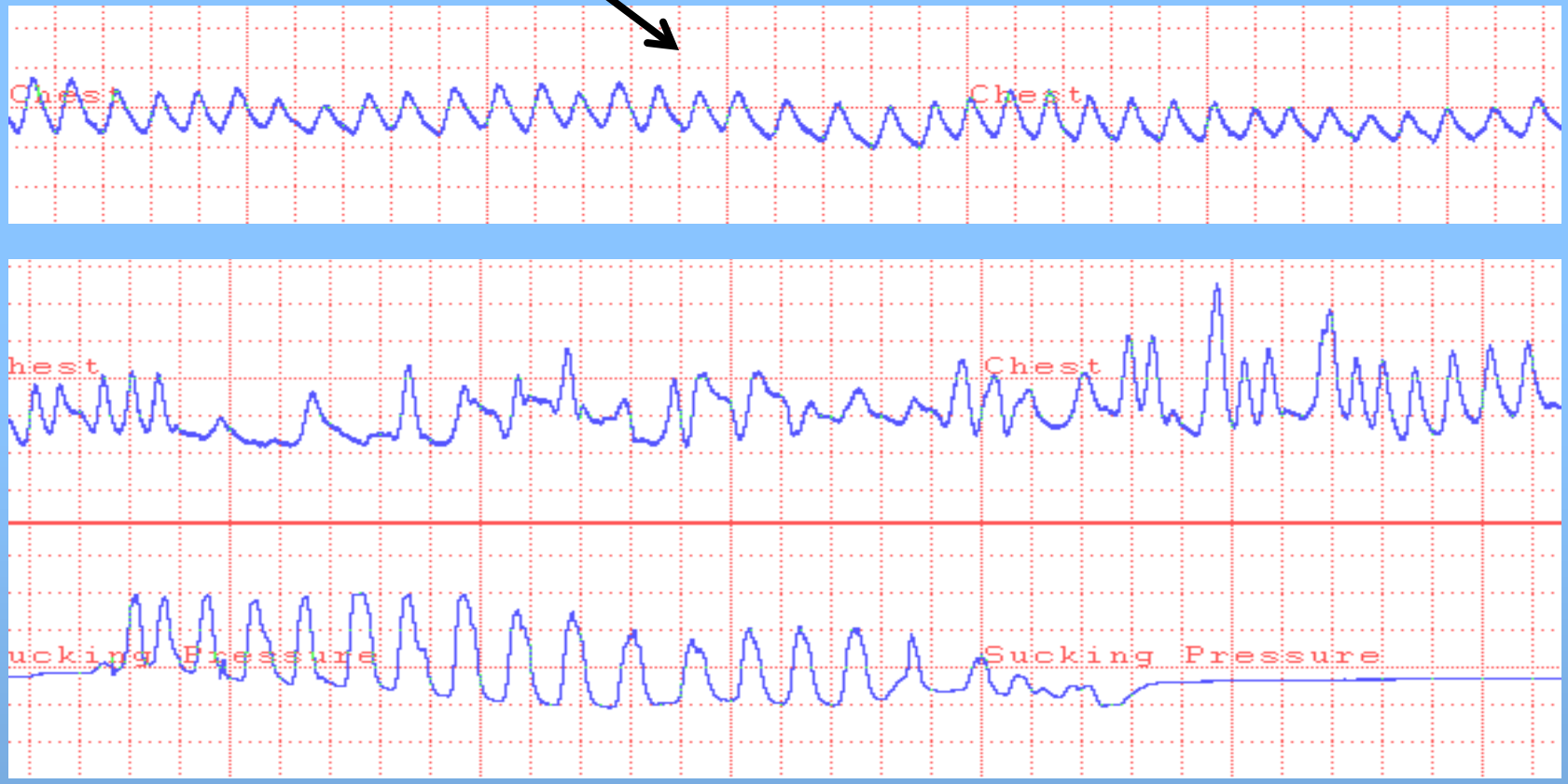
Baseline



During Feeding



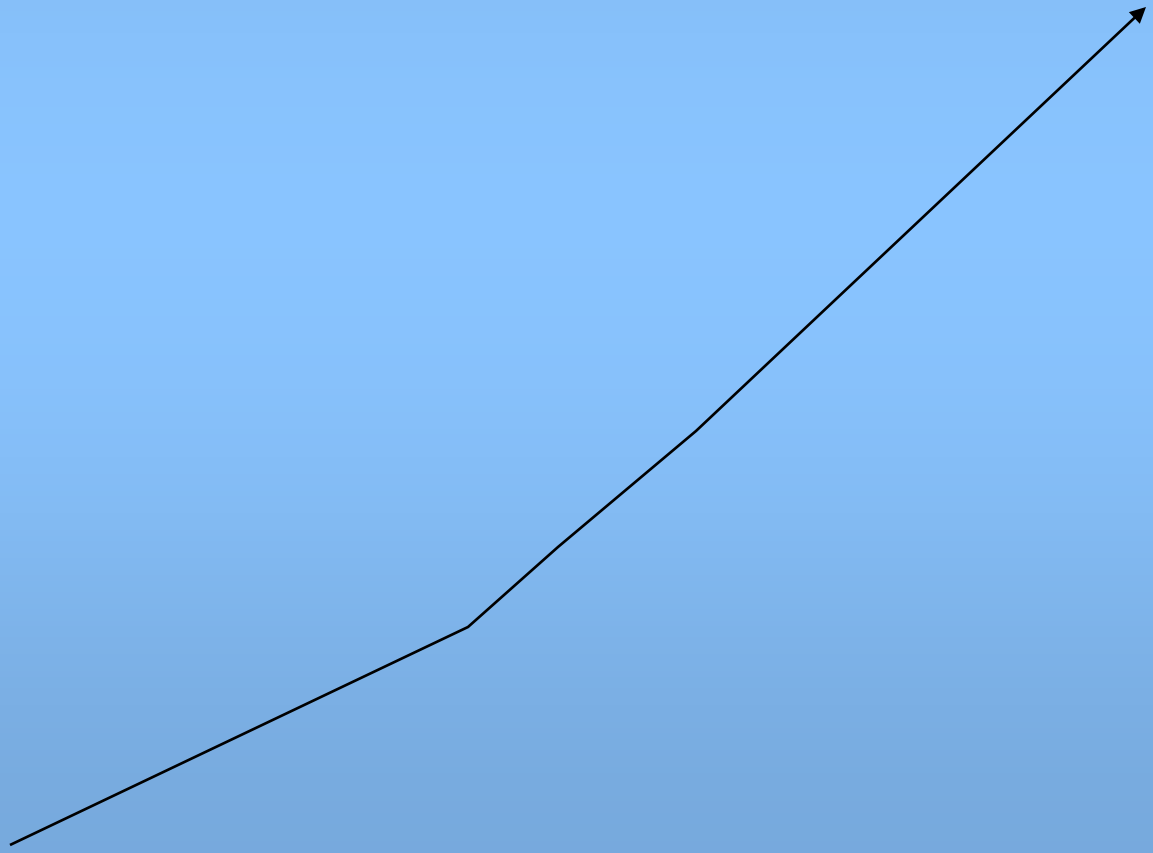
Baseline Respiratory Regularity



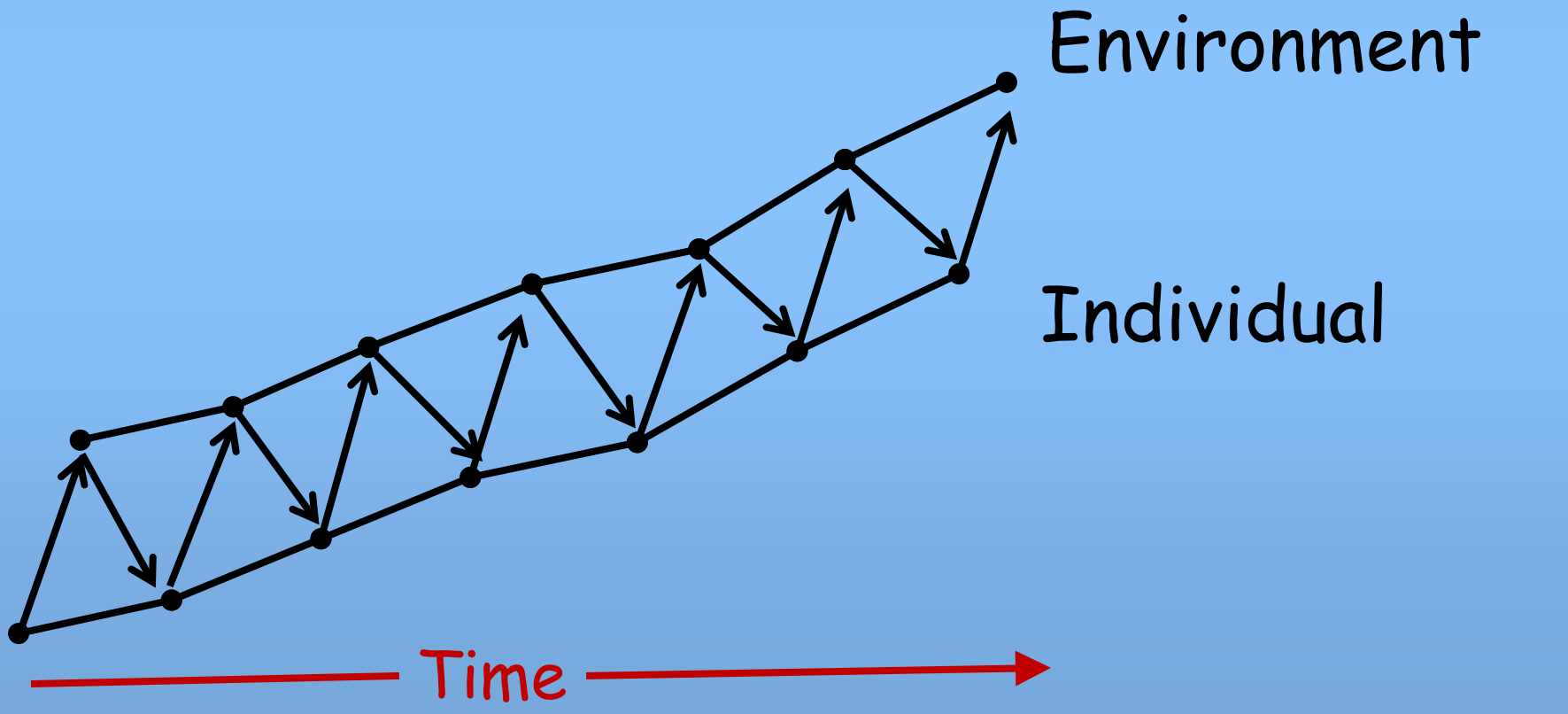
Feeding dynamics theory

- The basis for our understanding of feeding performance and skill development
- Developmental science framework (Cairns, 2000), in particular, dynamic systems theory (Goldfield, 2007; Lewis, 2000; Thelen & Smith, 1994),

Early theories viewed development as occurring in a straight path and typically describe "stages of development"



Individuals develop in dynamic, continuous interaction with the environment; there is variability within the time scales we observe



During transitions in skill development there is great variability in skill expression

- Becoming an oral feeder is a prime example
- Early on, one feeding to the next can look very different

Intra-individual variation

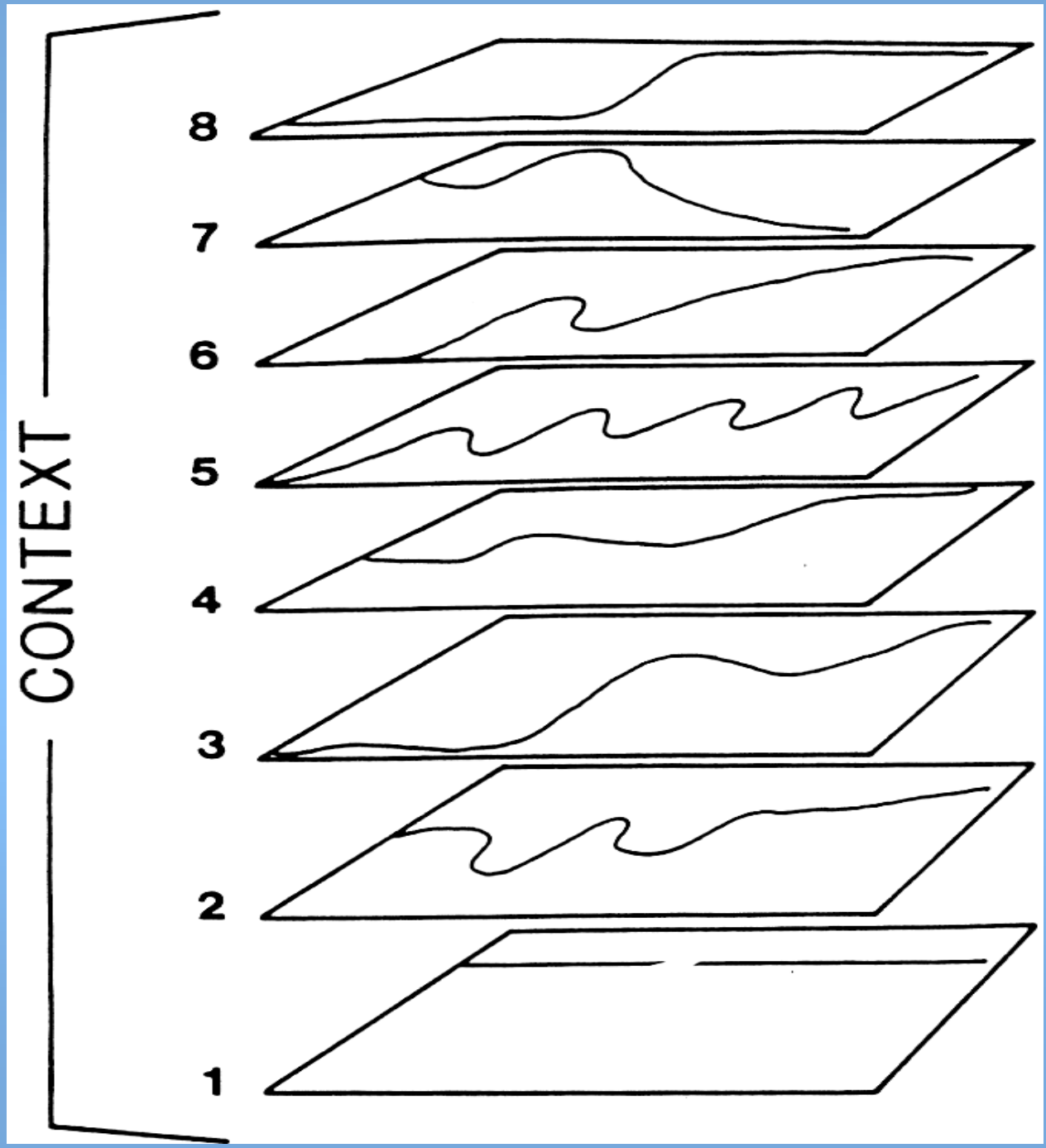
- Omnipresent and unavoidable
- The goal is to recognize patterns of stability and order (coordination) within the variation and points of instability where constraints may be adjusted (co-regulation)

Performance-limiting capacities place boundaries, constrain the possibilities

- Neurological Development
- Oral Motor Skills
- Motor Development
- Sensory integration
- Health
- Environment (e.g., Co-Regulatory Skill of the Feeder)
- Past Experience

Humphry, 2002

Development depends on many inter-related subsystems that are changing over time



The system with the least capacity is the rate-limiter of development

- Examples:
  - adaptive capacity of the cardiac and respiratory systems
  - CNS reactivity
  - attention regulation
  - GI development of afferent and efferent sensory pathways

Infants will seek to navigate the feeding, to solve the problem the task demands, and to develop patterns of action

- Behavioral adaptations to eating are viewed as functional
- Identifying and examining them can contribute to our understanding of the child's eating difficulties

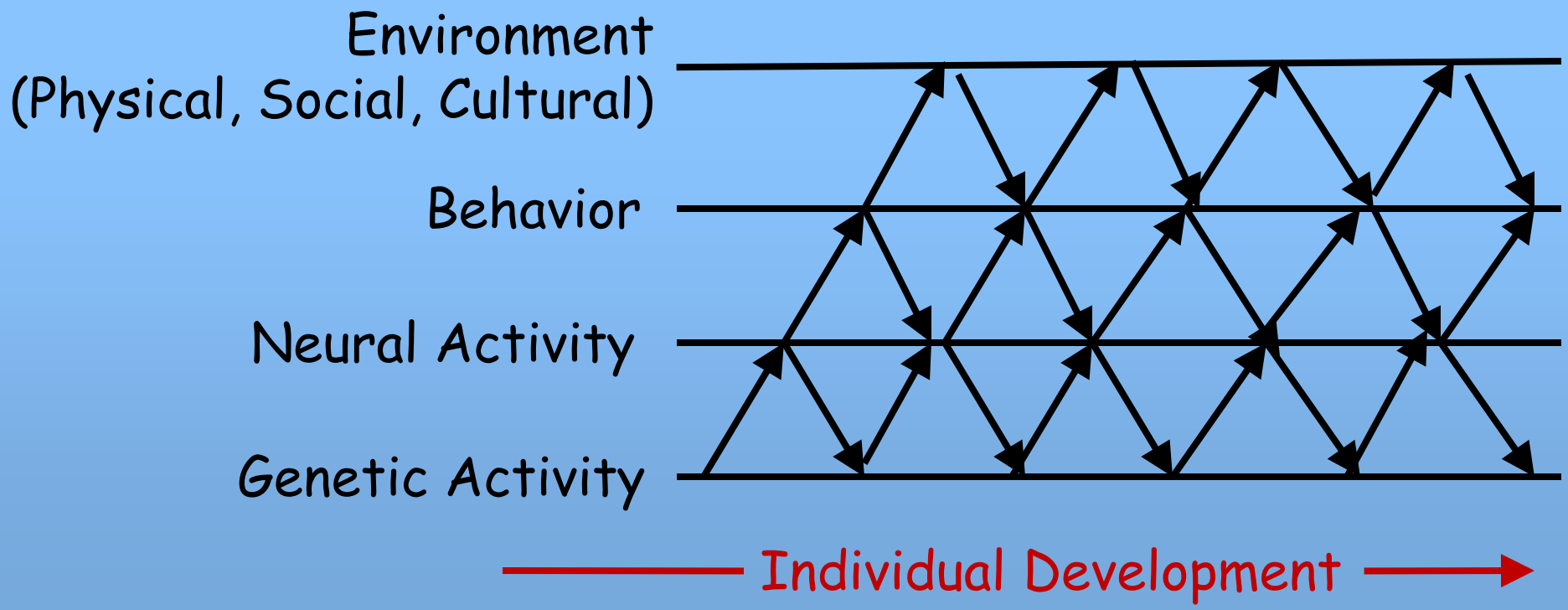
Behavioral solutions adopted by the infant can therefore inform us of the needs they are responding to, the capacities they have to solve them, and the patterns of behavioral organization that have become familiar and successful for them

Examining individual components separately will not explain the complexity of feeding

- We need to understand the dynamics of the system - through the *interactions* of the components involved
- And we need to look over time since variables in a dynamic system change over time, condition, health, etc.

Development depends on reciprocal interactions among subsystems within the individual and in the environment

Bidirectional Influences



- The system as a whole is adaptive, self-regulating, and self-organizing
- Subsystems co-regulate the whole through cross system feedback and a process of homeokinesis
- Homeokinesis = achievement of equilibrium in body functions by dynamic processes

The feedback the feeder responds to is commonly referred to as "cues"

- Behavioral response to feeding, including sucking patterns
- Capacity to hold their body
- Adaptive capacity of the cardiac and respiratory systems

Infant System

Physiology
Medical stability
Oral Feeding- Readiness
State Regulation
Suck-Swallow-Breathe

Caregiver System

Ability to read cues
Expectations /
Working model of feeding
Ability to take perspective of infant

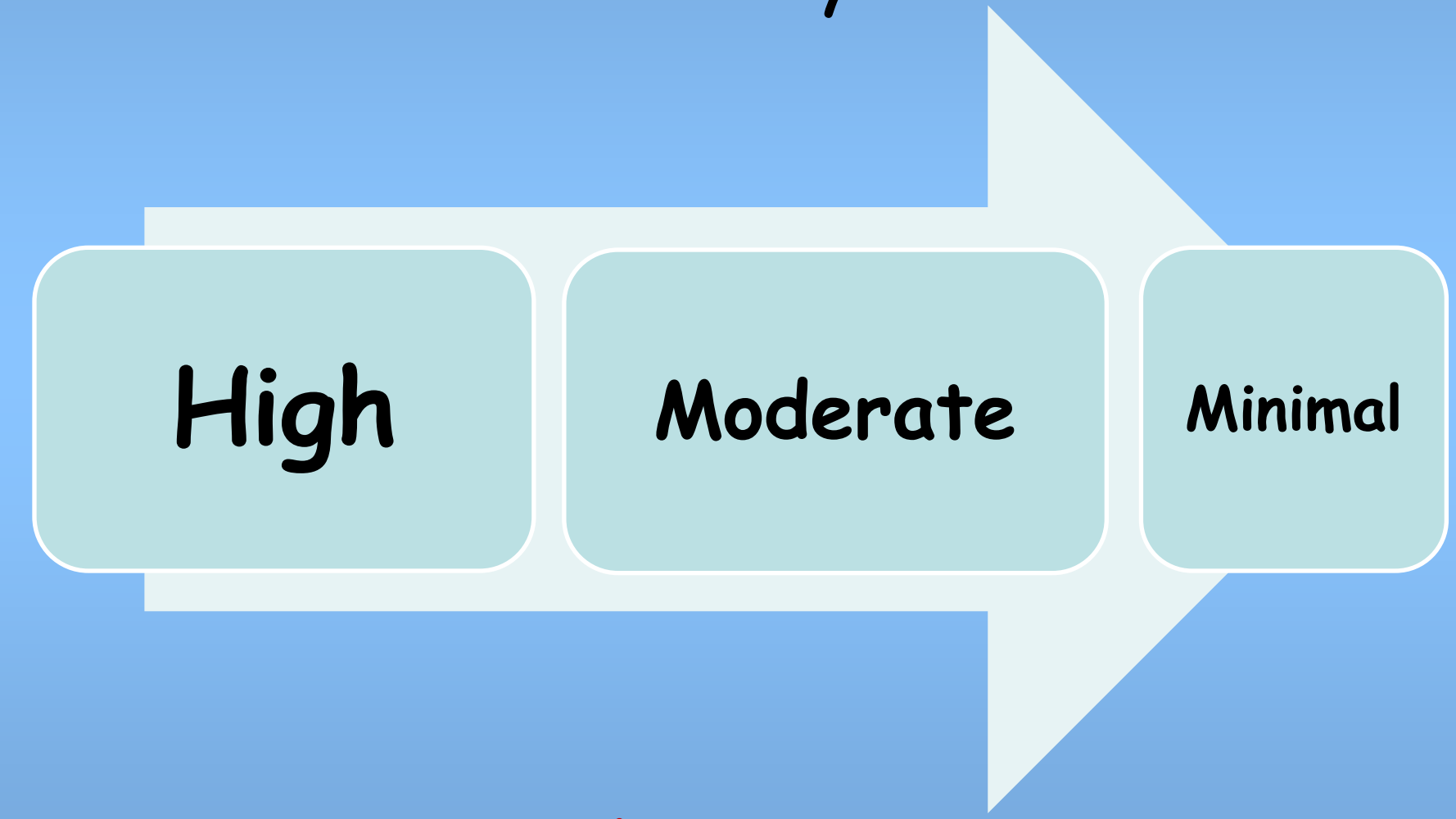
Feeding System

Reciprocal Interactions
Bi-Directional Feedback

Using Feeding Dynamics Theory

- Assess infant cues of capacity
- Assess the range of skill the child brings to the feeding
- Realize that the feeder is part of the feeding system who, through cue interpretation and behavioral strategies, learns how to partner with the infant during feeding (i.e., co-regulates)

Co-Regulation Required by the Feeder is Dynamic



Cue-Based Feeding

- Using cues available to join with the infant to co-regulate the feeding

"Cue-Based" is applied along multiple timelines

Moment to moment within a feeding → *Across the feeding transition weeks*

- When to initiate oral feedings
- Once initiated, how to support progression
- During an oral feeding, how to use cue-based principles to co-regulate the feeding

Across all timelines "cue-based" means …

- Infant acts as the central participant who is learning
  - Skill level will vary across the feeding, across the day, across days and weeks
  - Communicates limits and capacities ("cues")

Across all timelines "cue-based" means … (cont.)

- Caregiver acts as a guide – understands what oral feeding is like at its best and how it develops
  - Provides opportunities for communication
  - Listens and observes infant communication
  - Reflects upon the meaning of the "cues"
  - Supports effort, extends skills, respects limits

Feeding interventions optimally will focus on helping the infant coordinate the rhythms of sucking-swallowing and breathing

Can the feeder co-regulate the timing relationships of sucking, swallowing, and breathing?

Co-Regulated Approach to Feeding Preterm Infants with Lung Disease

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NINR NIH K01 NR07668
UNC-CH Center for Research on Chronic Illness P30 NR03962
UNC-Chapel Hill School of Nursing

Design

- Within-Subjects Cross-Over Design with Randomization
- 2 days, 3 feedings each day
  - First feeding randomized
  - Second day opposite condition began the day
  - Potential of 6 feedings per subject

Infant Demographics (N=20)

	Mean ± SD	Range
Birthweight (gms)	969.70 ± 270.84	557 - 1443
Gestational Age (wks)	28.10 ± 2.57	24.6 - 32.3
Days on Ventilator	13.05 ± 21	0 - 67
Days on CPAP	16.40 ± 20.02	0 - 55
Days on Oxygen	60.26 ± 31.25	16 - 120
Neurobiologic Risk Score	3.15 ± 3.03	0 - 10
PMA at First Oral Feeding (wks)	34.27 ± 1.48	31.1 - 36.7
PMA when Attained Full Oral Feeding (wks)	36.47 ± 2.41	31.6 - 41.1
Transition Time (Days to Full Oral Feeding)	18.17 ± 9.96	9 - 45

Infant Demographics (N=20)

	Frequencies
Lung Disease	Respiratory Distress Syndrome: 5 Chronic Lung Disease: 15
Intraventricular Hemorrhage	None: 14 Grade 1: 5 Grade 2: 0 Grade 3: 1
Gender	Female: 14 Male: 6
Race	Euro-American: 11 African American: 7 Asian: 2

Procedure – Both Conditions

- Videotaped with infant monitored - feeder had access to monitor information
- Same bottle nipple used for all study feedings

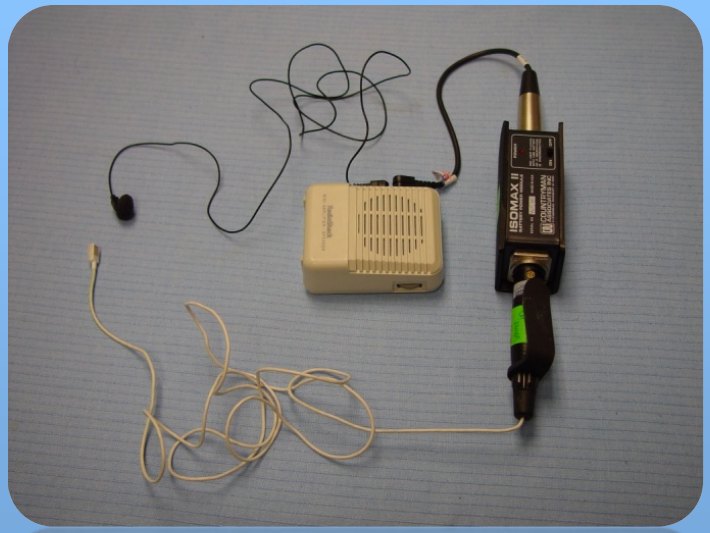
Usual Care Feedings

- Feeder encouraged to "feed as usually would"
- Feeder choose position, readiness, whether they offered a feeding, length of feeding
- No eye contact or conversation offered to feeder

Cue-Based, Co-Regulated Feedings

Enhanced auditory assessment of the coordination of sucking, swallowing, and breathing

Feeder uses this feedback to co-regulate the rhythms of sucking, breathing, and swallowing



Cue-Based, Co-Regulated Feedings

- Head elevated side-lying
- Flexed-body position
- Minimal movement of infant's body
- Avoidance of movements of the nipple that may stimulate sucking.
- Feeding offered contingent on readiness

Cue-Based, Co-Regulated Feedings

Infant given time and opportunity to organize before nipple placed

Nipple placed in infant's mouth contingent upon infant cues of readiness to proceed

- i.e., not rooting means "no-go"

Measures

- SaO_2, Heart Rate (Ohmeda 4700, Boulder, CO)
- Videotapes coded (Noldus Observer 5.0)

- Caregiver codes:
  - Onset preparation
  - Bottle in/out
  - Cue stop
  - Stimulate sucking
  - Infant positioning

- Infant codes:
  - Onset readiness
  - Engagement
  - Behavioral organization
  - Respiratory regulation
  - Swallowing regulation

Analysis

- 75 feedings, 20 infants
  - 40 Usual Care Observations
  - 35 Intervention Observations
- Repeated Measures via Mixed Model (PROC MIXED SAS 9.1 version)

Results

- Baseline SaO2, HR, and RR not different between feedings
- CoReg feeders (*(all at p<.01).*
  - provided more rest periods
  - began feedings more often with the infant in a state of readiness
  - stimulated the infant to suck less often
  - tipped the bottle back more often to cue the infant to re-regulate breathing

We concluded that we did follow our intervention protocol and that we do have two groups of feedings with different feeding approaches

Usual Care Approach

Cue-Based Co-Regulated Approach

Results

- More stable, less variability in SaO2 and HR ($p < 0.01$)
- A trend toward less severe SaO2 decline ($p = .089$)
- *Less time spent in a desaturated state* ($p = .023$)
- *Less severe heart rate decline* ($p = .002$)

Observationally, infants with co-regulated feedings had…

- Less behavioral disorganization ($p < .001$)
- Less effort to breathe ($p < .001$)
- Better swallowing organization ($p < .001$)

Conclusion

Enhancing the feeder's feedback of infant breathing and swallowing changed the feeder's responses to the infant and lead to more positive short-term feeding outcomes

Theoretically, this approach would be optimized by repeated exposure (i.e., positive and predicable experience)

References

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