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RESONANCE: Resilience and Early Brain Development

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Resilience and Early Brain Development

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Why RESONANCE?

- **What makes a healthy brain?** From conception and throughout childhood, our brains undergo remarkable change.
- Early development underlies cognition and behavior, is responsive to diverse biological and environmental factors, and may be associated with differences in later outcomes
- **The goal of RESONANCE is to determine how various factors modulate brain and child development.**
- **Children in foster care and adopted children demonstrate a remarkable degree of resilience.**
- **Limited information about the influences of the environment on their growth and neurodevelopmental trajectories.**
- This study will
 1. Characterize trajectories of brain development from early childhood to pre-adolescence;
 2. Determine how factors including the benefits of foster care and adoption (diet/nutrition, sleep, activity, etc.), influence cognition and behavior.

What is RESONANCE?

- The first longitudinal brain & cognition study following children from early childhood to pre-adolescence.
- An extensive suite of neurodevelopment measures to examine functional trends & associations.
- Unique sub-cohorts that include
 - **Adoptees and foster children (STARK)**
 - Late and moderate pre-term children (PEBBLES)
 - Full-term children exposed to environmental lead (PUMBA)
 - Children born small for gestational age or with growth restriction (SIMBA)
 - Previously enrolled, healthy full-term children (BAMBAM)
- Brain development under diverse pre- and post-natal environmental conditions.
- Anticipated ~850 children.
- Common study design, with visits every 3-6 months until 2.5 years of age, and yearly thereafter.

Growth & Environment

- **Neurocognition**
 - Cognitive assessments
 - Expressive/receptive language
 - visuospatial/fine motor coordination
 - attention and executive function
 - academic learning
 - social-emotional and behavioral function.
- **Brain growth**
 - MRI (magnetic resonance imaging) scans
 - non-sedated conditions (child is asleep or awake, watching a movie)
 - brain morphology, white matter architecture, microstructure and functional connectivity.
- **Environment**
 - child sleep quality,
 - air quality
 - nutrition (ASA24) and eating/feeding habits
 - child physical growth and body composition (PeaPod, BodPod)
 - directed language (LENA).
- **Biological sampling**
 - saliva, stool, urine (microbiome)
 - shed deciduous teeth (pre- and post-natal heavy metal exposure)

Key Findings

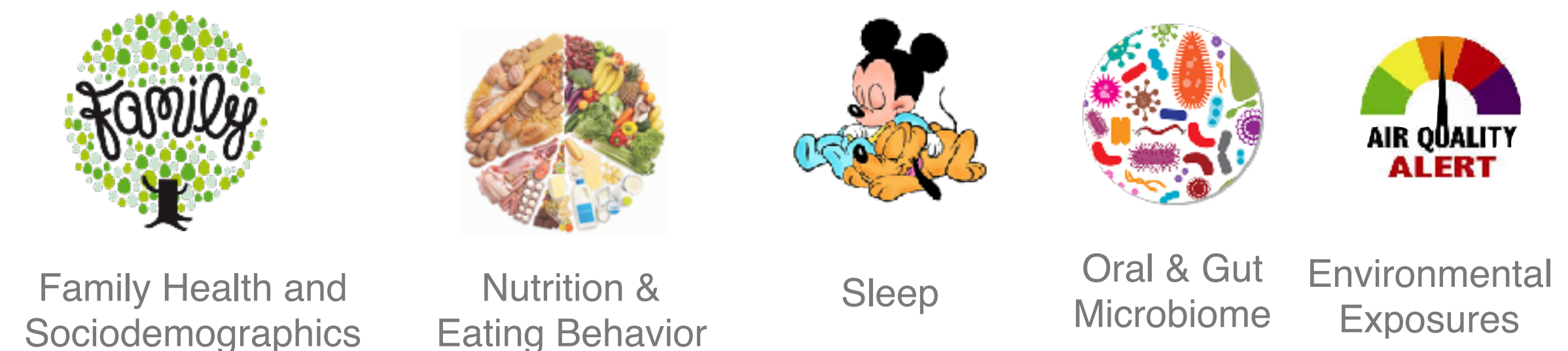
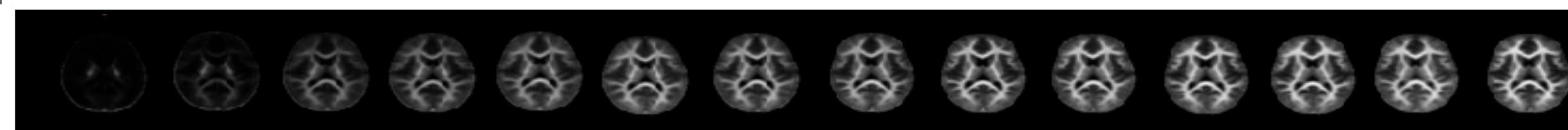
- Early preliminary findings suggest differential brain development associated with language development, phonological processing, emerging executive function, prematurity, lead exposure, home air quality, and genetic APOE status.
- Differences in brain growth are mirrored by differences in cognitive development.

KEY WORDS

Neurodevelopment, Brain, Infant, Childhood Growth, Myelination, Connectivity, Environmental Influences on Brain

Successes & Challenges

- Primary successes of RESONANCE to date include:
 - The acquisition of more than 2500 fetal, infant, and child MRI and cognitive datasets;
 - Development of novel functional analysis methods that handle complex data;
 - Utilization of measures of activity, sleep and air quality to gather data on some environmental influences.
- Some of the challenges we anticipate include the identification of individual and cumulative effects of the multitude of factors that influence child health.
- **This study aims to acquire data on a valuable and often under-studied population of children with a focus on the factors that contribute to the emergence and expression of resilience.**



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