Neurocognitive development and nutrition through the life-cycle

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Outline

- Neurodevelopment through the lifecycle
- How we measure neurodevelopment
- Opportunities for intervention
Children living in poverty have high risk of failing to reach developmental potential

Brain development begins at conception and continues through adulthood.

It is never too early or too late.

Early childhood and adolescence are key windows for intervention.

Dramatic physiological changes in size and structure.

Key competencies develop (Socio-emotional, language, cognition, motor).
Early childhood and early adolescence are key windows for intervention.

- Dramatic physiological changes in size and structure
- Key competencies develop (Socio-emotional, language, cognition, motor)
- High neuroplasticity
- Capacities become more complex

# Approaches for measuring infant developmental functioning

<table>
<thead>
<tr>
<th>Bayley Scales of Infant Development (BSID)</th>
<th>Malawi Developmental Assessment Tool (MDAT)</th>
<th>Assessment of milestones</th>
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</thead>
<tbody>
<tr>
<td><img src="image" alt="Bayley Scales of Infant Development" /></td>
<td><img src="image" alt="Malawi Developmental Assessment Tool" /></td>
<td><img src="image" alt="Assessment of milestones" /></td>
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<td><strong>Copyright</strong></td>
<td>Yes</td>
<td>No</td>
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<tr>
<td><strong>Skill level</strong></td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>30-90 minutes</td>
<td>10-60 minutes</td>
</tr>
<tr>
<td><strong>Readout</strong></td>
<td>Gross and fine motor, Language, Cognitive</td>
<td>Gross and fine motor, Social, Language</td>
</tr>
<tr>
<td><strong>Norm</strong></td>
<td>US</td>
<td>Malawi</td>
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<tr>
<td><strong>Uses</strong></td>
<td>Diagnosis</td>
<td>Screening Population differences</td>
</tr>
</tbody>
</table>

Measuring neurocognitive ability in older children

- Play-like tasks are used to measure cognitive ability, memory, learning, planning, attention

- Intensive training and quality control
- Comprehensive battery involves several tests, 4-6 hours
- No in-country norms
- Some validation in sub-Saharan Africa

INK Study; PI, Sarah Benki-Nugent; NINDS K01NS080637; CFAR NIA, P30 AI027757
Infant, early childhood assessments in Kenya

Two studies in Kenya

- Routine vaccination clinics
- Nairobi hospital wards
- Kisumu hospital wards

Study 1

- Age 0-5 yrs
- M6
- MDAT
- MDAT

Two studies in Kenya

- OPH03 RCT and PUSH RCT; PIs, Grace John-Stewart and Dalton Wamalwa; NICHD 2 R01 HD023412

- HIV-infected, starting treatment
- Extreme poverty
Children with better nutrition status had higher scores before and after HIV

- Better nutrition status before HIV treatment (WAZ ≥ -2)
- Underweight before HIV treatment (WAZ < -2)

Need for synergy between HIV care and nutrition interventions

Infant, early childhood assessments in Kenya

Two studies in Kenya

- HIV-infected, starting treatment
- HIV-uninfected comparison group
- Extreme poverty

Study 1
- Age 0-5 yrs
- M6
- MDAT

Study 2
- Age 4 mos
- M 24
- MDAT
- Kisumu hospital wards

Milestones at monthly visits

OPH03 RCT and PUSH RCT; PIs, Grace John-Stewart and Dalton Wamalwa; NICHD 2 R01 HD023412
HIV-infected infants with poor response to HIV treatment had later speech and walking

Need for HIV care, nutrition, and additional support

Benki-Nugent S et al. Robust response to ART provides a partial benefit for developmental milestone attainment in HIV-infected infants compared with HIV-unexposed infants. In preparation.
Approaches for optimizing HIV care for development

Mediational Intervention for the Sensitization of Caregivers (MISC)
Professor Pnina Klein, Bar-Ilan University

- Provides caregiver with strategies for using everyday tasks to enhance child development
- Culturally adaptable
- Caregiver interprets the environment for the child
- Caregiver is sensitive to cognitive and emotional needs and interests
- Proper nutrition for the caregiver and the child are key
Conclusions
• Integrated interventions are key

• Infancy, early childhood, and early adolescence are critical windows

Next Steps
• Determine best practices for scale-up of interventions to promote early child development

• Develop tools for older children that identify gaps in their development and that can be scaled up

• Identify and implement interventions to address these gaps and help older children ‘catch-up’
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