Identification of Developmental Risk in Infants with Medical Problems: A Program of Research

Diane Holditch-Davis
Duke University
Focus of My Research

- Identifying effects of parenting and parental psychological distress on developmental outcomes
- Using measures of biological risk to predict developmental outcomes
- Improving developmental outcomes
1985-88--Development of sleep-wake states in prematures
1988-94--Sleep-wake states of preterms and outcome at 3
1992-1998--Processes of parental role attainment in parents of medically fragile infants
1993-97--Parental caregiving of infants seropositive for HIV
1994-96--Pilot of a nursing support intervention
1996-2003--Assessment of biological & social risk in preterm infants
2001-2007--A nursing support intervention for mothers of preterm infants
2005-2011—Maternally administered interventions for preterm infants
2009-2016--Parenting of late preterm infants
Mother                Infant

Social Environment

Mother \(\leftrightarrow\) Infant

Physical Environment

Child Developmental Outcomes
Changes in Developmental Status in Infants of HIV-Positive Mothers
Identifying Effects of Parenting and Parental Psychological Distress
Changes in Maternal Depressive Symptoms Over Time
Number of Mothers Showing Specific PTSD Symptoms

- Intrusive Thoughts
- Avoidance
- Heightened Arousal

The bar chart shows the number of mothers showing specific PTSD symptoms, with 'Heightened Arousal' being the highest category.
Number of Mothers Experiencing Specific Numbers of PTSD Symptoms

<table>
<thead>
<tr>
<th>Symptoms</th>
<th>Number of Mothers Experiencing</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
Sub-Groups of Mothers at Enrollment

Sample 1

- Low Distress
- High NICU Stress
- High Anxiety & Depression
- Extreme Distress

Sample 2

- Low Distress
- Mod Distress
- High NICU Stress
- High Anxiety & Depression
- Extreme Distress
Depressive Symptoms over Time

Sample 1

Sample 2
Using Measures of Biological Risk to Predict Developmental Outcomes
## Correlation of Bayley MDI and HOME Scores at 12 Months

<table>
<thead>
<tr>
<th></th>
<th>Total Sample N = 55</th>
<th>Normal Infants N = 24</th>
<th>Neuro Infants N = 31</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal Responsivity</td>
<td>.38**</td>
<td>.20</td>
<td>.39*</td>
</tr>
<tr>
<td>Acceptance of Behavior</td>
<td>.13</td>
<td>.12</td>
<td>.11</td>
</tr>
<tr>
<td>Organization of Environment</td>
<td>.28*</td>
<td>.08</td>
<td>.40*</td>
</tr>
<tr>
<td>Provision of Play Materials</td>
<td>.39**</td>
<td>.32</td>
<td>.47**</td>
</tr>
<tr>
<td>Maternal Involvement</td>
<td>.05</td>
<td>.33</td>
<td>-.11</td>
</tr>
<tr>
<td>Variety of Stimulation</td>
<td>.36**</td>
<td>.53**</td>
<td>.35*</td>
</tr>
<tr>
<td>HOME Total Score</td>
<td>.40***</td>
<td>.39*</td>
<td>.42**</td>
</tr>
</tbody>
</table>
Method

- Weekly observations of each infant during the preterm hospitalization
- Sleep-wake states and behaviors coded every 10 seconds
- Respiration recorded concurrently
- Time period
  - Original study 7 to 11 pm
  - Second study 2-hour inter-feeding period in daytime
Sleep-Wake States

- Quiet Waking
- Active Waking
- Sleep-Wake Transition
- Active Sleep
- Quiet Sleep
One Subject in a General Linear Mixed Model
Active Sleep
Each subject’s developmental pattern for each variable can be expressed as two variables:

- Deviation in Slope from Group
- Deviation in Intercept from Group
Predictive Variables

- Active sleep
- Quiet sleep
- Percent REM in AS
- QS respiration regularity
- Sigh
- Negative Facial Expression
- Mean Length of Respiratory Pause in AS
- Mean Length of Respiratory Pause in QS
Effects of Developmental Problems on Interactions

Apnea and Negative Facial Exp

Quiet Sleep

Active Sleep
Developmental Domain - IQ

Clusters

1 2 3 4

IQ

100 110 120

* **
Predictors—Second Study

- Active Sleep
- Quiet Sleep
- Percent REM in AS
- QS Respiration Regularity
- AS Respiration Regularity
- Negative Facial Expression
- Number of Respiratory Pauses per Hour of AS
- Number of Respiratory Pauses per Hour of QS
Characteristics of Five Clusters
EEG Variables

- Percent of quiet sleep
- Cycle length
- REMs per minute
- Arousals per minute
- Spectral beta range EEG energies
- Hemispheric correlations
- Ratio of harmonics for respirations
Other Predictors

- Maternal Interactive Dimensions
  - Positive Involvement
  - Developmental Stimulation
  - Negative Control

- NBRS—potential neurological insults

- Fagan Test of Infant Intelligence—novelty preference at 6 and 9 months
## Prediction of 27-Month Outcomes

<table>
<thead>
<tr>
<th>Predictor</th>
<th>MDI</th>
<th>PDI</th>
<th>PLS-3</th>
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</thead>
<tbody>
<tr>
<td><strong>R² Overall</strong></td>
<td>.39**</td>
<td>.22**</td>
<td>.51***</td>
</tr>
<tr>
<td>Intercept</td>
<td>-174.3</td>
<td>-180.8</td>
<td>553.8*</td>
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<tr>
<td>Pos. Involve.</td>
<td>-14.5*</td>
<td>-7.1</td>
<td>-9.1</td>
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<tr>
<td>Dev. Stimul.</td>
<td>14.3**</td>
<td></td>
<td>10.7*</td>
</tr>
<tr>
<td>Cluster</td>
<td>(c1 -20.5)*</td>
<td></td>
<td>(c1 -31.3)**</td>
</tr>
<tr>
<td>EEG--QS</td>
<td>672.6*</td>
<td>673.1*</td>
<td></td>
</tr>
<tr>
<td>EEG--Correl.</td>
<td></td>
<td></td>
<td>-209.9*</td>
</tr>
<tr>
<td>EEG--Resp.</td>
<td></td>
<td></td>
<td>-561.3</td>
</tr>
<tr>
<td>NBRS</td>
<td></td>
<td>-1.6*</td>
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</table>
Improving Developmental Outcomes
2001-2007 Nursing Support Intervention for Mothers of Preterm Infants
State Anxiety

Graph showing the mean Sanxscore over months for control and intervention groups.
Stress due to Parenting a Prematurely Born Child
Worry about the Child

The graph shows the mean Worry Score against the contact (in months) for two groups: Control and Intervention. The score decreases over time for both groups, with the Intervention group showing a more rapid decrease compared to the Control group.
Mother Express Positive Affect

Mother Play with Child
Child Express Positive Affect

Child Vocalizations
2005-2010--Mother-Administered Interventions for VLBW Infants
Worry for the Intervention Groups

- Control
- ATTV
- Kangaroo

Weeks Past EDC
Mother-Infant Interaction Variables

Child Social

Postnatal age in weeks

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Control
Kangaroo Care
ATVV
Child Developmental Maturity

- +++ ATTV
- +++ Control
- +++ Kangaroo Care
Child Locomotion

- ATT
- Control
- Kangaroo Care