The Correlation of Family Responsiveness with Language and Cognitive Development in Infants and Toddlers

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BACKGROUND

Factors influence child language and cognitive development

- Home environment (Family Responsiveness)
- Socioeconomic status
- Birth defects
- Prenatal and perinatal factors
- Traumatic brain injury
- Gene
- ......

BACKGROUND

- Main evaluations for language and cognition
  - Scales
    - unnatural
  - Observation
    - Time-consuming
  - Transcription
  - Language Environment Analysis (LENA)
    - natural
    - efficient

OBJECTIVE

• To investigate the characteristics of family responsiveness in infants and toddlers in China

• To test the correlation of family responsiveness with language and cognitive development in infants and toddlers whose native language is Chinese

• To explore LENA feasibility in evaluating child language and cognitive development in China
METHODS

The source and the selection of the sample
- Shanghai Children’s Medical Center
- Shanghai Luwan Early Childhood Education Consulting &Service Center

Selected participants
- children and their families signed up for the study (n=72)

Excluded participants
- Development Snapshot scale scores were more than 1.5 SD below the mean (n=4)
- Development Snapshot scale scores were more than 2.0 SD above the mean (n=9)
- older than 30 months at the time of their first recording session (n=11)

From the remaining 48 participants randomly excluded to balance an even age distribution from 4-30 months (n=26)

children and their families enrolled into the study (n=22)

Fig 1 Flow chart of samples selection process
METHODS

- Collection of language samples
  - 3 days recordings (16h/day)
    - LENA clothes
    - Digital Language Processor (DLP)

- Major components of language samples
  - Adult word counts
  - Child vocalization counts
  - Adult-child conversational turns
    (includes Adult-initiated and Child-initiated)
METHODS

➢ Language Developmental Screening Scales for Infants and toddlers
  ✓ Language expression
  ✓ Language comprehension
  ✓ Nonverbal expression

➢ Bayley Scales of Infant Development
  ✓ Mental Developmental Index (MDI)
  ✓ Psychomotor Development Index (PDI)

RESULTS

.children

- Age group
  - 4 ~ 12months : 7
  - ~ 24months : 9
  - ~ 30months : 6

- Sex
  - Male: 10
  - Female: 12

.Parenthood’s education

- Maternal
  - college: 14
  - master: 7
  - doctor: 1

- Paternal
  - college: 15
  - master: 7
RESULTS

Table 1 recording results & child language and cognitive development

<table>
<thead>
<tr>
<th>Measure</th>
<th>range</th>
<th>Mean($\overline{x} \pm s$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language expression score/</td>
<td>22</td>
<td>13.9 ± 7.5/18.0 ± 9.7</td>
</tr>
<tr>
<td>equivalent age</td>
<td>7–26/10 – 36</td>
<td></td>
</tr>
<tr>
<td>Language comprehension score/</td>
<td>6–20/5–36</td>
<td>12.6 ± 5.0/18.4 ± 10.4</td>
</tr>
<tr>
<td>equivalent age</td>
<td>8–13/8–20</td>
<td></td>
</tr>
<tr>
<td>Nonverbal expression score/</td>
<td>8–13/8–20</td>
<td>11.6 ± 1.8/14.8 ± 5.0</td>
</tr>
<tr>
<td>equivalent age</td>
<td>6–20/8–20</td>
<td></td>
</tr>
<tr>
<td>Bayley MDI</td>
<td>72–150</td>
<td>101.5 ± 17.0</td>
</tr>
<tr>
<td>Bayley PDI</td>
<td>67–117</td>
<td>92.59 ± 12.8</td>
</tr>
<tr>
<td>Adult word counts ×3</td>
<td>9097.0–43067.0</td>
<td>21044.3 ± 7665.8</td>
</tr>
<tr>
<td>Adult-Child conversational turns ×3</td>
<td>390.0–1259.0</td>
<td>748.3 ± 285.3</td>
</tr>
<tr>
<td>Child vocalization counts ×3</td>
<td>892.0–4710.0</td>
<td>2147.4 ± 883.0</td>
</tr>
<tr>
<td>Adult_initiated conversational turns ×3</td>
<td>145.7–704.3</td>
<td>346.4 ± 145.0</td>
</tr>
<tr>
<td>Child_initiated conversational turns ×3</td>
<td>207.7–802.7</td>
<td>401.9 ± 163.0</td>
</tr>
</tbody>
</table>

We see remarkable between- and within-family differences in Adult word counts, Child vocalization counts and Adult-child conversational turns.
RESULTS

Fig 2  The correlation between Adult word counts and Adult-Child conversational turns

![Graph of Fig 2](image)

$r = 0.728$

$P < 0.001$

Fig 3  The correlation between Child vocalization counts and Adult-Child conversational turns

![Graph of Fig 3](image)

$r = 0.788$

$P < 0.001$

Adult-Child conversational turns is correlated with Adult word counts and Child vocalization counts
RESULTS

Child vocalization counts and Child-initiated conversational turns were different between the three age groups and increased with age.
Adult-child conversational turns and adult-initiated conversational turns demonstrate a growth trend with age.

RESULTS

\[ F = 1.487 \quad P = 0.251 \]

\[ F = 0.309 \quad P = 0.738 \]
RESULTS

Child vocalization counts and child-initiated conversational turns increase with age.

Child vocalization counts

- $F=6.587$, $P=0.007$

- $F=4.231$, $P=0.030$

![Graph showing Child vocalization counts and Child-initiated conversational turns with age](image)
Before 24 months adult-initiated conversational turns is higher than children’s, the trend is reversed after 24 months.
RESULTS

Table 3 The correlation of recording results with child language and cognitive development

<table>
<thead>
<tr>
<th>Measure</th>
<th>Adult word counts</th>
<th>Adult-Child conversational turns</th>
<th>Controlling for child age</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Child vocalization counts</td>
</tr>
<tr>
<td>Language expression score/</td>
<td>0.128/</td>
<td>0.480*/</td>
<td>0.658**/</td>
</tr>
<tr>
<td>equivalent age</td>
<td>0.153</td>
<td>0.529*</td>
<td>0.707**</td>
</tr>
<tr>
<td>Language comprehension score/</td>
<td>0.051/</td>
<td>0.418/</td>
<td>0.523**/</td>
</tr>
<tr>
<td>equivalent age</td>
<td>0.064</td>
<td>0.424*</td>
<td>0.560**</td>
</tr>
<tr>
<td>Nonverbal expression score/</td>
<td>0.161/</td>
<td>0.224/</td>
<td>-0.201/</td>
</tr>
<tr>
<td>equivalent age</td>
<td>0.163</td>
<td>0.278</td>
<td>0.039</td>
</tr>
<tr>
<td>Bayley MDI</td>
<td>0.013</td>
<td>0.322</td>
<td>0.525*</td>
</tr>
<tr>
<td>Bayley PDI</td>
<td>0.480*</td>
<td>0.431*</td>
<td>0.155</td>
</tr>
</tbody>
</table>

Notes:* means p<0.05  
** means p<0.01  
*** means p<0.001

Adult-Child conversational turns and Child vocalization counts are correlated with expressive language ability.
Families ranked the importance of intervention components for influencing their behavior

"0" means No~ "10" means the most
FAMILY’S REPORTS OF LENA PRACTICE

Affect family’s daily life

- 95.5%
- 4.5%

Worried about privacy

- 90.91%
- 9.09%
FAMILY’S REPORTS OF LENA PRACTICE

Inconvenient to wear LENA clothes

- 45.5%
- 36.4%
- 18.2%

Inconvenient to do recordings

- 90.9%
- 4.5%
- 4.5%
CONCLUSIONS

- We have described characteristics of family responsiveness for infants and toddlers whose native language is Chinese.

- Family responsiveness is correlated with language and cognitive development in infants and toddlers in China.

- LENA is feasible in evaluating child language and cognitive development in China, and is well accepted by Chinese families.
ACKNOWLEDGMENTS

• 22 children and their families