Adults’ Interpretation of Meaningful Infant-Directed Facial Speech: Implications for Infants’ Categorization Abilities

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Introduction
This study explored the visual component of infant-directed (ID) speech, or the facial movements portrayed by adults while speaking to infants, also called the infant-directed face (ID face).

Background
ID speech is used by adults to modulate infants’ affect, attention, and to facilitate language learning (Fernald, 1992).

Different melodic properties characterize adults’ messages (Fernald, 1989); six-month-olds categorize the acoustic signal (Spence & Moore, 2003).

Approving ID speech: “Good girl!”
Comforting ID speech: “Don’t cry, baby.”

Less is known about the visual signal provided by the ID face.
Mothers portray specific facial expressions when communicating with their infants (Chong et al., 2003).

But, what were the mothers communicating to their infants?
And, how did their facial movements vary as a function of the message?

Research Question
How do adults’ facial movements vary as a function of the message communicated by infant-directed speech (e.g., approving, comforting)?

Hypotheses
Approving ID facial speech will portray head nodding; raised eyebrows; wide, smiling eyes; smiling lips; greater teeth visibility.

Comforting ID facial speech will portray head shaking side-to-side; furrowed eyebrows; sad eyes; rounded or frowning lips.

Method
3 adult raters coded silent facial speech videos:
- 20 Approving ID speech (M = 2.07 s, SD = 0.53)
- 20 Comforting ID speech (M = 2.05 s, SD = 0.52)
- 15 Neutral adult-directed (AD) speech (M = 3.11 s, SD = 0.64)

Facial Speech Coding Scale (FSCS):
- 6 facial regions; 35 characteristics
- Developed for coding video stimuli with facial speech

Example:

Discriminant Correspondence Analysis (DICA, Abdi, 2007)
- Analyzes group variability in qualitative data

Results

DiC of Facial Speech Ratings

<table>
<thead>
<tr>
<th>Neutral AD Speech</th>
<th>Approving ID Speech</th>
<th>Comforting ID Speech</th>
<th>AD Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1 (51.3%)</td>
<td>47.6%</td>
<td>41.3%</td>
<td>67.3%</td>
</tr>
<tr>
<td>F2 (48.7%)</td>
<td>52.4%</td>
<td>58.7%</td>
<td>32.7%</td>
</tr>
</tbody>
</table>

Factor 1: Emotional Factor
- Factor loadings (F1):
  - eyes.not.smile
  - eyes.smile
  - lips.not.smile
  - lips.smile
  - teeth.great
  - teeth.few
  - wide, smiling eyes
  - smiling lips
  - greater teeth visibility

Factor 2: Movement Factor
- Factor loadings (F2):
  - eye.great.blink
  - eye.slt.blink
  - lips.smile
  - lips.not.smile
  - teeth.some
  - teeth.few
  - brow.slt.furrow
  - brow.moving
  - hdmv.not.tilt
  - hdmv.tilt
  - hdmv.not.up
  - hdmv.up
  - hdmv.not.slt.updn
  - hdmv.slt.updn

Random Effect Model: DICA assignment of videos to the sample of the a priori groups

<table>
<thead>
<tr>
<th>Assigned Group</th>
<th>Approving ID</th>
<th>Comforting ID</th>
<th>AD Speech</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approving ID</td>
<td>0</td>
<td>0</td>
<td>14</td>
</tr>
<tr>
<td>Comforting ID</td>
<td>0</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>AD Speech</td>
<td>1</td>
<td>1</td>
<td>11</td>
</tr>
</tbody>
</table>

Difference in DiC of Facial Speech Ratings
- 13.1%
- 4.8%
- 21.5%
- 0.52

Discussion
Emotional factor differentiated Approving ID from Comforting ID speech.
- Approving: smiling eyes, smiling lips
- Comforting: sad eyes, frowning lips

Movement factor differentiated AD speech from ID speech videos.
- AD videos: greater eye and head movement
- ID videos: less eye and head movement

Live vs. video stimulus collection.
- AD speakers spoke during live adult interaction.
- ID speakers spoke to a video of infants.

Positive correlation between speech rate and head movement (Hadar, 1991).
- AD speech is faster than ID speech (e.g., Fernald, 1989).

Hypotheses supported for brows, eyes, lips, teeth.
- But not for head movement.

Conclusions
Adults’ approving and comforting ID speech messages are differentiated by specific facial movements.
- Supports previous findings that naïve adults perceived the intended recipient and speech message in the silent videos.
- Suggests there are visual cues available during speech to support infants’ prelinguistic perception of caregivers’ communicative messages.

References

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