Research questions

Infant-directed speech (IDS) involves various phonetic changes, including:
- Expansion of the voicelapse [Akhk96, Baa02]
- Stop VOT manipulation [SLB99, S01]
- Overall pitch increase [Gkk99, M92, Fk99]

Infants are sensitive to patterns in speech rhythm [K97] and pitch [RO2].

...so how do those patterns change in IDS?

We consider the following in Bengali:

1. Speech rhythm
   - Regular alternation of C&V = “sylable-timed”
   - Irregular alternation of C&V = “stress-timed”

2. Intonation
   - Various phonetic changes, including:
     - C & V intervals
     - Voiced & Voiceless intervals (automated)

Methods: rhythm analysis

Labeling
- Recordings were labeled using Praat text grids:
  - Phonetic transcription
  - Syllable boundaries
  - C & V intervals
  - Voiced & Voiceless intervals (automated)

Analysis
- Segmental rhythm metrics
  - %V (% of speech that is vocable)
  - ΔC [K99]: standard deviation of C-intervals
  - C/PVI & V/PVI [GL02]: pairwise comparisons of C- & V-intervals, respectively
  - RM 1-way ANOVAs compared these metrics by speech style: read vs. IDS

Results: rhythm analysis

Read speech
- %V: mixed results
  - between “syl-timed” Sp., It., Fr., Cat. and “mora-timed” Jpn., farthest from “stress-timed” Eng., Dut. following [K99]
  - within “stress-timed” range following [A09]
  - ΔC, C-PVI: within “syl-timed” range
  - V-PVI: below range, closest to “syl-timed”

Modifications in IDS
- %V: not significant
  - ΔC, C-re H: higher, towards “stress-timed”
  - V-PVI: higher, towards “stress-timed”, but still below overall range

Methods: intonational analysis

Labeling
- 1st author annotated text grids in B-ToBI [Kta]
- Based on intonational phonological model [K08]
- Summarized in left column

Analysis
- B-ToBI labels analyzed by automated scripts.

Results: intonational analysis

Pitch accents
- No change in number of PAs in IDS, but...
  - Fewer default PAs (L*)
  - Coincides with increase in number of:
    - Nuclear PAs: H* (new info.), L*+H (emph.)
    - Focus PAs: h+ (surprise), L+h+ (wh/conv.)
    - Post-focal PAs: * (prominence w/out tone)

Distribution of pitch accents in both speech styles, for PA types or at least 2% relative frequency within a speaker and style.

Prosodic phrases
- Increase in number of IPs in IDS:
  - HLH%, conveying continuation
  - HL%, conveying topicalization
  - H%, conveying either contin. or topic.

Many used HLH% in place of L% to convey continuation, adopting a more complex contour

Discussion

Bengali segmental rhythm and intonation reveal a high degree of regularity
- Bengali rhythm patterns with “sylable-timed” Prosodic patterns
- In intonational structure, Bengali has a repeating pitch pattern of rising APs

In IDS, segmental rhythm and intonation patterns become increasingly irregular:
- Increases in ΔC, C-PVI, V-PVI
- Increases in use of non-default pitch accents
- Increase in number of IPs ending in various boundary tones, many with complex contours

How can we reconcile this finding with claims that intonational prosodic patterns are important for word boundary recognition [BB86, KCO9, W84]?

Wouldn’t disruption in regularity reduce an infant’s ability to recognize words?

Three possible explanations:
1. Infants are exposed to non-IDIS styles
2. The goal of IDS is to engage the infant, and regularity will bore him/her [BB86]
3. The goal of IDS is to highlight particular words beyond normal intonation [BB94]

Explanations 2-3 are consistent with the decrease in rhythmic regularity and the increase in use of marked tonal patterns.

Bengali, IDS can be seen as a speech style used to encourage the listener and/or draw attention to certain words through reduction in rhythmic and intonational regularity.

Ongoing and future research

- Regularity in acoustic f0 variation and its connection to intonational prosodic patterns
- Machine classification: are units acoustically identifiable without specific training [L11]?
- Cross-linguistic comparison: other “syl-timed” lgs., “stress-timed” lgs., tone lgs., etc.

References

6. Cheng, V. 2007. The intonation of questions in Farsi – in questions, yes-no questions, yes-no questions, and shifts. UCLA 89.149.