Increased spectral variability in the vowels of infant-directed speech is not universal.

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Screen capture from www.native-land.ca
1. Project background
   a. Pitch
   b. Hyperarticulation
   c. "Hyper-variation"

2. Methodology & Results

3. Discussion & Conclusions
Road map

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Infant-Directed Speech (IDS) vs. Adult-Directed Speech (ADS)

We speak differently to babies and adults:
- Why? Does IDS help?
Infant-Directed Speech (IDS) vs. Adult-Directed Speech (ADS)

We speak differently to babies and adults:
- Why? Does IDS help?

Prosodically:
- Slower, higher-pitched, more pronounced changes in pitch

Segmentally:
- More extreme and variable versions of speech segments

Photo taken by Senay Cebioglu, July 2017
Languages:

- West Tanna dialects closely related to Lenakel
  - Spelled varyingly: Nauhal, Nahuel, Naual, Natuhar, Nathuar, Natuar.
- English
Sites: Vanuatu & Canada

12 villages in Vanuatu, on Tanna  
(5 Kastom, 7 non-Kastom)  
Lenakel-speakers

1 Vancouver site, on SFU campus  
English-speakers

Photo taken by Senay Cebioglu, July 2017

Photo taken by Clif Ng, Summer 2017
Are these characteristics of IDS vowels universal?

1 - Pitch
2 - Hyperarticulation
3 - (Spectral) Variability
1 - Pitch: higher, more variable

Acoustic analysis for pitch (aka f0): Cross-culturally, higher and more variable in IDS...
1 - Pitch: higher, more variable

Acoustic analysis for pitch (aka f0): Cross-culturally, higher and more variable in IDS...

Fig.s from Broesch & Bryant (2015). Photo from members.psyc.sfu.ca/broesch
2 - Hyperarticulation

Kuhl et al (1997)

- For English, Swedish, and Russian, IDS has
  - higher f0,
  - exaggerated f0 contours,
  - expanded vowel space (for triangle /i-a-u/)
2 - Hyperarticulation

Kuhl et al (1997)
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Further studies have found mixed results: hyper, hypo, Ø
- Cantonese (Rattanasone et al 2013)
- Mandarin (Tang et al 2017)
- Japanese (Andruski et al 1999)
- Dutch (Benders 2013)
- Norwegian (Englund & Behne 2005)
- ...
3 - Vowel variability in IDS (and why?)

Regardless of hyper-/hypo-articulation, cross-linguistic "hyper-variation" in IDS

Fig. from McMurray et al (2013: 373, Fig. 7); result also found in Kuhl et al (1997)
Road map

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Language:
Lenakel dialect chain (Austronesian)

Lenakel only somewhat documented.

According to Lynch's (1978) A grammar of Lenakel:

- 6 vowels: /i e a o u i/
- 15 consonants, including /p t k s/
- Penultimate stress in 3-syllable words
Language: (Vancouver) English

English extensively documented

- 10 vowels, including /i a u/ (u is fronted)
- 24 consonants, including /p t k s/
- Possible penultimate stress in 3-syllable words
Methodology: Materials and task

Linguistic materials: nonce words /tiˈsisi/ /kuˈsusu/ /paˈsasa/

Physical materials: 4 soft toys. 1 familiar (banana), for context; 3 nonce-named

Language & demographic questionnaire

Task: speak about toys to baby, then to adult; Uttered each word 8+ times in each condition.
Results: Data

Vanuatu: 37 mother-child-peer triads
- Children aged 6-18 months
- 25 analysed here (12 excluded for noise)
- /i/ = 732, /a/ = 661, /u/ = 609

Canada: 15 mother-child-peer triads (still recruiting)
- Children aged 6-22 months
- 13 analysed here (2 excluded for noise)
- /i/ = 400, /a/ = 425, /u/ = 436
Results: Pitch, hyperarticulation, variability
Results: Pitch higher, ...

Mothers spoke with higher pitch...
Results: Pitch higher, more variable

Mothers spoke with **higher** and **more variable** pitch in IDS than ADS.
Results: Hyperarticulation (or not)

Vanuatuan mothers did not alter vowel triangle in IDS compared to ADS
Vanuatuan mothers **did not alter vowel triangle** in IDS compared to ADS; Canadian mothers (so far) **also don't**.
Results: Hyperarticulation (or not)

Vanuatuan mothers did not alter vowel triangle in IDS compared to ADS; Canadian mothers (so far) also don't.
Results: Vowel "hyper-variability" (dispersion)

Vanuatuian mothers did not alter vowel variability in IDS compared to ADS
Results: Vowel "hyper-variability" (dispersion)

Vanuatuan mothers did not alter vowel variability in IDS compared to ADS; Canadian mothers (so far) increase variability in ID vowels.
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Vanuatuan mothers did not alter vowel variability in IDS compared to ADS; Canadian mothers (so far) increase variability in ID vowels.
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Are IDS-ADS differences universal?

Prosodically:
- Slower, higher-pitched, more pronounced changes in pitch ✓

Segmentally:
- More extreme and variable versions of speech segments X

Photo taken by Senay Cebioglu, July 2017
Discussion: No **Hyperarticulation** in Lenakel or English

- No hyperarticulation (but English data still being collected...)
  - Not replicating some results from English

- Nonce words
  - Most previous studies of English IDS hyperarticulation have used real words
  - Downsides: maybe more careful speech even in ADS
  - Upsides: lowers barriers to selecting languages

- One future direction is to find words in both Lenakel and English (or another WEIRD language) that controls for phonetic context
Discussion: No **Hypervariability** in Lenakel

- First evidence of lack of segmental hypervariability in IDS (in any language)
  - Using the same method, we *did* find hypervariability in English

- Differences in vowel inventory
  - 10 vowels in English > 6 vowels in Lenakel
  - But would expect *more* variability in *smaller* system--probably not a factor

- Differences in cultural appropriateness of task
  - Mothers may just not talk this way to their infants in Vanuatu (but prosody!)
  - Experimenter was native Lenakel speaker, but from outside village
  - Unclear how cultural strangeness related to outcome (more or less variability?)
Conclusions

We speak differently to babies and adults:

- Why? Does IDS help?

Explanatory work towards "why" IDS != ADS might be best off starting with prosody

- Segmental properties of IDS less consistent (hyperarticulation, and now, in Lenakel, variability)
Conclusions

We speak differently to babies and adults:
  ● Why? Does IDS help?

Explanatory work towards "why" IDS != ADS might be best off starting with prosody
  ● Segmental properties of IDS less consistent (hyperarticulation, and now, in Lenakel, variability)

To get to the bottom of "why," we still need to know "what" (and "who")
Thank you for your attention


Analysis

Annotation (human, then Montreal Forced Aligner)

Extraction (Praat)

Visualisation (R, phonR)
Analysis

Annotation (human, then Montreal Forced Aligner)

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Analysis

Annotation (human, then Montreal Forced Aligner)
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Hyperarticulation and formal education?

No difference in degree of hyperarticulation by education of mother (VU)...

Degree of hyperarticulation by maternal formal education (VU only)

Village
- Kastom
- NonKastom

Area difference (ID-AD)

Years of maternal education

0.0 2.5 5.0 7.5 10.0

0.0 2.5 5.0

-2.5 0.0 2.5 5.0
Hyperarticulation and formal education?

No difference in degree of hyperarticulation by education of mother (VU).

And this model isn't significant for CA moms.
Hyperarticulation and age?

No difference in degree of hyperarticulation by age of child in either group
Dispersion and formal education? (both)

Slight negative trends, but not significant!
Dispersion and formal education? (VU)

No clear pattern (neither significant)
Dispersion and age?

Negative trend in CA data, but not significant in either CA nor VU
Is dispersion the same across vowels? (both)

Lots to unpack!
Is dispersion the same across vowels? (CA)

ADS a ~ IDS a, ADS i < IDS i, ADS u < IDS u
Is dispersion the same across vowels? (VU)

IDS i = ADS i, ADS a < IDS a, ADS u < IDS u...