Simulating infants' recognition of their own name

The role of past experience

Christina Bergmann,[1,2*] Louis ten Bosch,[1] Lou Boves,[1] & Paula Fikkert[1]

1 Centre for Language Studies, Radboud University Nijmegen, The Netherlands
2 International Max Planck Research School for Language Sciences

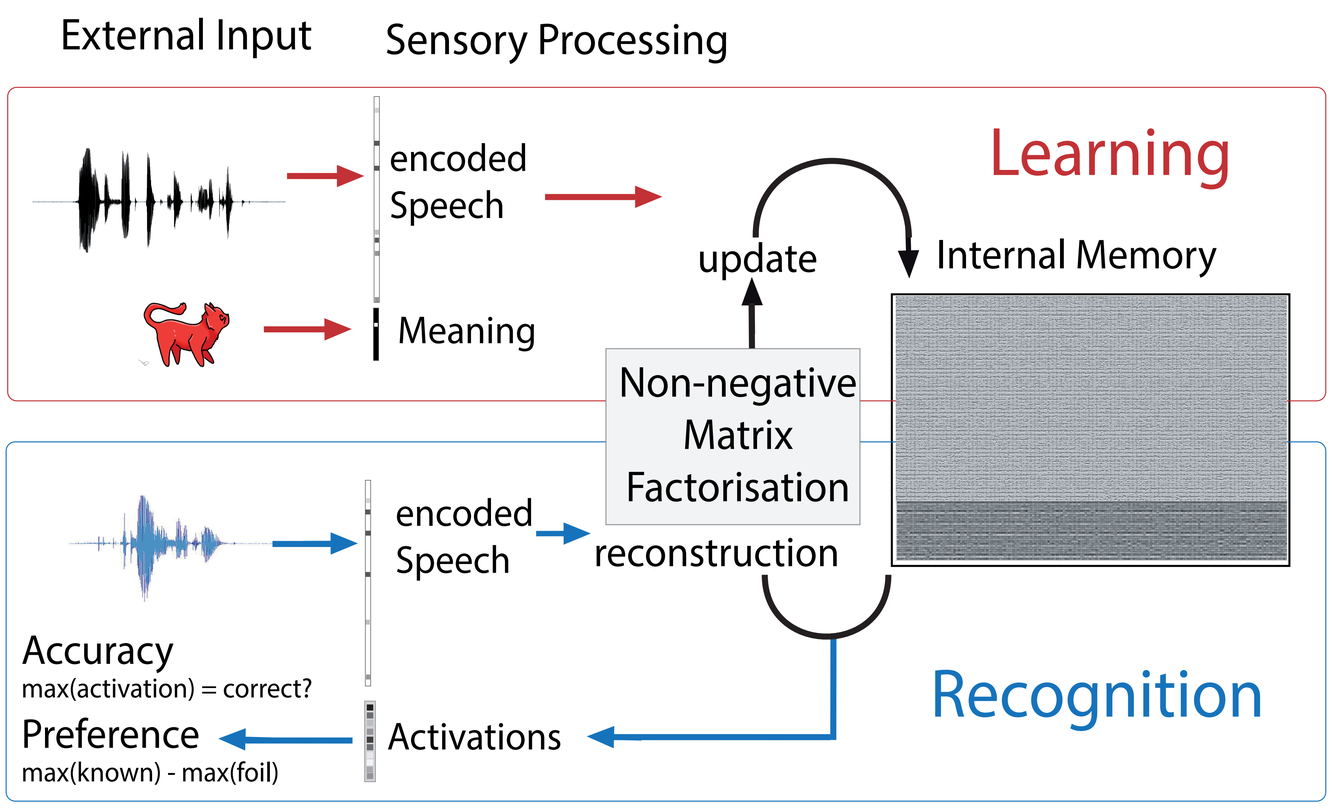
Radboud University Nijmegen

Research Questions

- What influences early learning of acoustic word forms?
  - Frequency
  - Variability in voices (non-critical variation)
- Can we model infants' behaviour using
  - only episodic representations?
  - no higher-level linguistic knowledge?

Infant data

- Recognition of the own name from around 4 months [2]
- Proto-lexicon emerges at 6-9 months [1]
  - Linking of acoustic and extra-linguistic information
- Frequency very beneficial: Frequently heard words are recognised early
- Variability in voices aids detection of what part of the signal is relevant to a *word* [3]



The Model

- Multi-modal input (real speech and extra-linguistic labels)
- Incremental learning from one sentence at a time
  - Idea: Recognise new input by interpreting it in terms of fragments of previous experiences
- Episodic, language-general representations
  - Idea: Store information on short speech stretches
  - → No symbols, no phonetic/phonemic categories, no word boundaries

Experiments

Learning an episodic lexicon

- Adjust memory to optimally accomodate new information
  - → Sentence by sentence
- Short sentences containing 1 *keyword* (out of 15) with associated meaning (representing extra-linguistic information)
- Single keywords serve as name
  - (*Cat, Mummy, Banana*)

3 learning coditions:

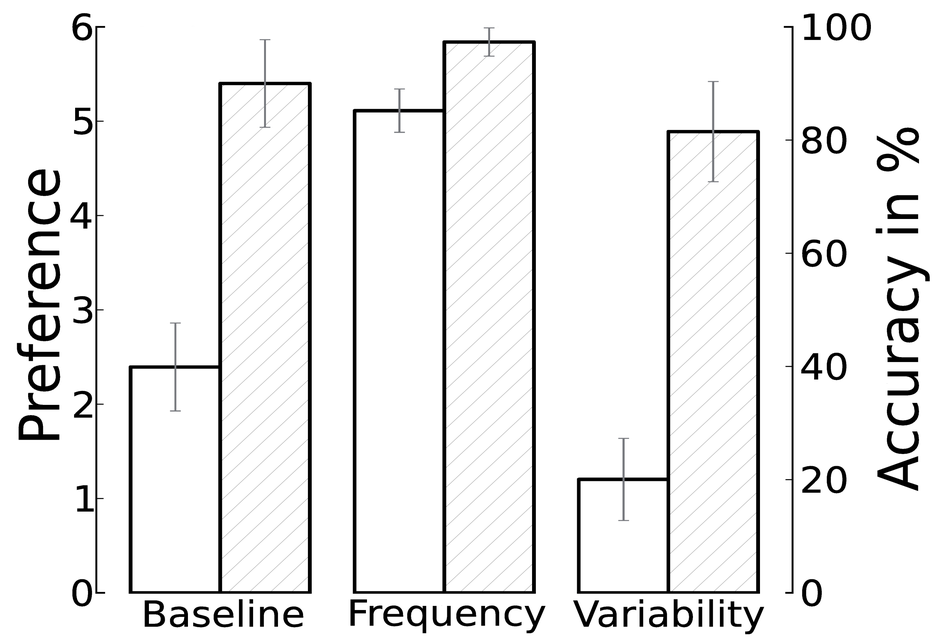
1. Baseline: 450 utterances, 30 per keyword
2. Increased frequency:
   60 utterances for a name (30 for all other words)
3. Variable voices:
   30 utterances spoken by 6 new speakers, 30 as before

Testing Word Recognition

- No learning during testing
- Unknown sentences, no meaning provided
- 2 measurements:
  - Accuracy (word recognition, model assessment)
  - Preference for name over foils (inspired by infant studies)

Results

- Accuracy shows: The added items make no difference in either learning condition
- Preference shows: Increased Frequency from the same speaker strengenths discrimination ability
- Preference shows: Added variability disturbs discrimination ability



Conclusion

- Frequency, but not occasional variability, determine
  (1) recognition accuracy and
  (2) preference of known words over foils
- A model using representations with minimal assumptions and no language-specific knowledge can model infant behaviour
- The assessment can influence results and interpretation

References

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* Contact: C.Bergmann@let.ru.nl, Radboud University, P.O. Box 9103, 6500 HD, Nijmegen, The Netherlands sites.google.com/site/chbergma