24.904
Language Acquisition
Class 5: Word Segmentation, continued
Last time

• Tools in infants’ segmentation toolkit:
  ▶ Distributional information (transitional probabilities)
  ▶ Knowledge about prosodic structure
  ▶ one constrains the other
Today

- more on the relevance of prosody
- other helpful elements
Shukla et al. 2011

- Can infants extract a statistically defined, novel auditory word form from running speech and simultaneously map it onto a visual referent?

- How, if at all, does this process interact with structural properties such as prosodic constituency?
Familiarization with two utterance-types, as the target object moved along the table, of the form $x\text{AB}yz$, where AB is the target nonce word, whereas the syllables x, y, and z vary.

Fig. 1. Screen shot from the experiment, showing the setup of the objects. The three observation windows are overlaid as black outline rectangles.
Shukla et al. 2011

- Familiarization with utterances of the form $xAByz$ as the target object moved along the table, where $AB$ is the target nonce word, whereas the syllables $x$, $y$, and $z$ vary.
Shukla et al. 2011

- 2 between-subjects conditions:
  - AB either was within a phonological phrase (one pitch accent; [ʒe-muː-raː]-[lei-sə]) or straddled two phonological phrases ([ʒe-muː]-[raː]-[lei-sə])
Shukla et al. 2011

• Test

  ▶ **AB** (mu:ra, the statistical “word”) vs. **By** (ra:lei, the part-word)

    - NB: prosodically the test word had the same intonation-patterns as the boundary-straddling sequence

  ▶ Measure: looks to target (the object that moved in fam)
Shukla et al. 2011

• Results:

  ▶ more looks to target upon word vs. part-word…

  ▶ …but only for the prosodically-aligned group!
Infants in the prosodic-phrase-internal word group associated the high-TP test word to the target object, but infants in the prosodic-phrase-straddling group did not

- even though the test items were more perceptually similar to the boundary-straddling sequence
"Our findings lend support to arguments that prosodic cues, which signal constituent edges, are critical for acquiring word forms and grammatical patterns in infants and adults."

“Cognitive capacities of infants are appropriately constrained… language acquisition is most rapid when the structure of the linguistic input is well matched to these constraints."

"Prosodically organized input may be an essential feature for optimal word learning."
“Function words”

- the, a(n), some, my...
- be, have, to...
- that, if, for...
Characteristics

• Small in number, but each with very high frequency
  ▶ In contrast, “content” words are large in number, each with low frequency

• Phonologically and prosodically reduced
  ▶ fewer syllables per word
  ▶ fewer consonants per syllable
  ▶ weak prosody (e.g. short duration, weak pitch)
• 8-month-olds use familiar function words to segment adjacent lexical words.
• **Familiarization**: “novel” content words preceded by (i) a high-frequency functional morpheme or (ii) a low-frequency functional morpheme or (iii) a nonsense morpheme with the shape/prosody of functors
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• **Test**: content words presented in isolation
• **Familiarization:** “novel” content words preceded by (i) a high-frequency functional morpheme or (ii) a low-frequency functional morpheme or (iii) a nonsense morpheme with the shape/prosody of functors

  ▶ *des preuves, des sangles, mes preuves, mes sangles* (between)

  ▶ *kes preuves, kes sangles*

• **Test:** content words presented in isolation

  ▶ *preuves, sangles*
32 infants
16 per group

Figure 1  Total looking time during the Test phase (with SE). Eight-month-old infants listened significantly longer to the isolated productions of the noun that had been previously familiarized with a frequent functor des or mes, than to the isolated noun previously familiarized with the nonsense functor kes.
frequency matters?

- **Experiment 2**: an even less frequent function word *vos* (vs. nonce functor *kos*)

Figure 2  Total looking time during the Test phase (with SE). Eight-month-old infants’ listening times to the isolated productions of the noun that had been previously familiarized with an infrequent functor *vos* and to the isolated noun previously familiarized with the nonsense functor *kos*. No significant difference was found.
why should frequency matter?

• “...this indicates that functional morphemes can indeed assist infants in the earliest step of lexical learning. Moreover, frequency was shown to be the determinant for this effect.”
why should frequency matter?

• “…this indicates that functional morphemes can indeed assist infants in the earliest step of lexical learning. Moreover, frequency was shown to be the determinant for this effect.”

• but why should the child not assume that e.g. French has a lot of des-initial content words?
Function words are structure-builders

- Function words are grammatical formatives; they are essential and immutable in ways that content words aren’t

‘Twas brillig, and the slithy toves
Did gyre and gimble in the wabe...’
Function words are structure-builders

- Function words are grammatical formatives; they are essential and immutable in ways that content words aren’t

1. Colorless green ideas sleep furiously

2. Colorless green idea-ed sleeper furiously
Function words are structure-builders

- Function words are grammatical formatives; they are essential and immutable in ways that content words aren’t

1. I went on a crazy devour. [verb —> noun]
2. I lamped the room. [noun —> verb]
3. Cat is barking. [predicate —> proper name]
4. *A lot of wine is too many.
Function words are structure-builders

- Consequences:
  - frequent
  - prosodic alignment: syntactic phrases are headed by functional elements, so they will correspond to the beginnings or ends of prosodic constituents
    - infants sensitive to this — functor at the beginning for Italian and at the end for Japanese; Gervain et al., 2008
next class

• Bloom Ch.1

• Read one of:
  {Smith & Yu, Trueswell et al., Woodard et al., Aravind et al.}