Language 3: Learning Words

How does the child do it?

Three problems:
1. identifying phonemes & segmenting word.
2. focusing on the right part of the world.
3. determining what the speaker is naming.

The input:
Look, a bunny!

Speech Segmentation

How do we find the Words?
Maybe there are spaces between them.
Where are the silences between words?

Statistical- what sounds usually go together
“pretty baby” NOT “pre tyba” by

The information for speech

“This is an example of a sound spectrogram.”
Spectrograms for /ba/ and /pa/

Voice-Onset Time: simultaneous vs. late (b/p, d/t, g/k, z/s…)

Some other languages: prevoicing: simultaneous vs. early

Adults discriminate easily the sounds that their native language uses to mark distinctions in meaning. We are less good with sounds that our native language doesn’t use.

birth-4 months: Conditioned sucking and habituation

Each suck on a pacifier produces a speech sound.

As infants learn this, they suck more.

As they get bored hearing the same sound, they suck less.

(2-month-old)
Testing the Motor Theory

(1) discrimination of /ba/ vs. /pa/?

Shift: ba/pa
/or pa/ba
No shift: ba/ba
or pa/pa

Infants discriminate /ba/ vs. /pa/ before they can produce these sounds.

Non-native speech discrimination

The logic: Because languages vary in their sound patterns, there are sounds that (a) infants are capable of learning (if they lived in the appropriate speech community, but (b) infants have never heard (because they don’t live in that community).

If speech perception is innate, then infants should discriminate non-native contrasts.

If speech perception is learned by experience hearing one’s native language, then infants should not discriminate non-native contrasts.

Ex: Hindi da-dha contrast for U.S. infants (Werker)

Dental Retroflex

Method: Head orientation toward sound

Measure: How many infants/adults reach a criterion of detecting (= turning toward) the change in sound? (Werker)

Infants in an English-language environment are almost as good as Hindi adults and far better than English-speaking adults.
Developmental changes in non-native speech discrimination: Summary

Infants initially are sensitive to all the sound distinctions used by natural languages.

Since they have not heard the non-native contrasts, their ability to discriminate speech sounds is not learned by (pre- or post-natal) experience with those sounds.

With growth and experience, infants lose some sensitivity to distinctions that are not captured by their native language.

Loss of sensitivity (roughly) coincides with the onset of word learning, at about one year.

Are these innate sensitivities to speech contrasts unique to humans?
Two evolutionary scenarios:

1. A species-specific language faculty (articulatory apparatus, grammar, etc.) evolved in humans.

   This faculty placed demands on the human auditory system (requires sensitivity to the rapid acoustic transitions produced by the human articulatory system, etc.)

   Humans therefore evolved species-specific capacities to perceive the relevant auditory information.
   Articulation $\rightarrow$ perception.

   Prediction: only humans perceive speech sounds as we do.

2. Primate (vertebrate?) auditory systems are sensitive to rapid transitions.

   When humans evolved a species-specific language faculty, these sensitivities placed constraints on the evolution of our articulatory system (required a system that produces the kinds of sound distinctions that we & other animals can hear).
   perception $\Rightarrow$ articulation.

   Our species-specific language faculty therefore builds on perceptual abilities that we share with other animals.

   Predictions:
   (1) other animals will discriminate speech sounds, perceive invariances when the same sound appears in different contexts, and show categorical perception.
   (2) humans should show same discrimination abilities for non-speech sounds as for speech.
Humans solve remarkably hard problems, effortlessly, when we perceive the sounds of our native language.

The mechanisms that accomplish this task are present in human infants and are independent of language experience.

The mechanisms also are present in non-human animals (primates, birds) and therefore preceded the evolution of language.

The effects of experience are largely negative: decline in sensitivity to speech contrasts that are not used by one’s native language (but are used in other human languages). NB the possible parallel with Whorf effects, Losing innate conceptual distinctions like Tight/Loose, not building them from scratch!

Conjecture: innate perceptual abilities may be especially likely in domains where young children need to learn a lot.

Space perception: learning the layout of the environment
Object perception: learning object categories & functions
Speech perception: learning the words and rules of one’s native language.

How does the child do it?

The input: Look, a bunny!

Three problems:
(1) identifying phonemes & segmenting word.
(2) focusing on the right part of the world.
(3) determining what the speaker is naming.
2) The Focusing Problem: reading intentions

The input:

Look, a bunny!

The input:

eat your peas!

Gaze direction:
People tend to look at the things they are naming. By 9 months (maybe earlier), infants follow other people’s gaze and look at the things they are looking at.

By 9 months, infants also follow pointing. Do these patterns foster word learning?

Baldwin’s experiments

Only when child looks at object (A), experimenter looks at and names object (B): “Look, a blicket!”

Then A & B are placed side by side: “Can you give me the blicket?”

Findings:

- When the speaker first says “blicket,” children at 18 months look at speaker and then follow gaze to B.
- At test, children map “blicket” to object B.