How Children Develop

Chapter 6

Development of Language
What is language?

- Creative or generative
- Structured
- Referential
- Species-Specific

Units of Language

- Phonemes – elementary units of sound (ba, ga, /t/, /l/)
- Morphemes – smallest unit of meaning (dog, I)
- Semantics – the system for expressing meaning
- Syntax – the rules that define the structure of a language
- Pragmatics – cultural rules for language application

Language Milestones

<table>
<thead>
<tr>
<th>Phoneme perception</th>
<th>Understand words</th>
<th>1st word</th>
<th>50 words Combining words</th>
<th>300 words</th>
<th>➤ 2000 words</th>
</tr>
</thead>
</table>
Precursors to language

Before birth

• Respond to auditory stimulation in 2nd month before birth.
• Prefer familiar sound patterns (Cat in the Hat)

First months

• Newborns less sensitive than adults (need louder sound)
• 2-3 months: better at high frequencies (15-25 dB).

Sound localization

• 4 months: deliberately search for sounds; Before 6 months: large location differences need to detect a change (12-20 degrees).
What is the problem space with respect to speech?

Speech sounds are highly variable:

- different speakers
- different rates
- different genders
- accents
- different intonation patterns

Speech stream is continuous: the “segmentation problem’

- When people write there are clear gaps between words
- When people speak these gaps are less obvious or non-existent

What are some of the child’s strategies?

1. Sensitivity to prosody:

   Includes sensitivity to spoken language characteristic: rhythm, tempo, cadence, melody, intonation patterns

   - discriminate French and Russian

2. Sensitivity to the sounds of languages

   1 month: hear many more sounds than adults

   Sensitivity modified in 1st year:

   - ignore phonemic distinctions that are no longer important.
The Process of Language Acquisition: Speech Perception

- **Categorical perception of speech sounds**
  - Possessed by adults and infants
  - Involves perception of speech sounds as belonging to discrete categories

- **Studying the perception of VOT**
  - Recordings of two phonemes (/b/ and /p/) occurring along VOT continuum presented
  - Adult and infant categorizations of new and old speech sounds measured

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**Categorical Perception of Speech by Adults**

When adults listen to a tape of artificial speech sounds that gradually change from one sound to another, such as /ba/ to /pa/ or vice versa, they suddenly switch from perceiving one sound to perceiving the other.
Developmental Changes in Speech Perception

- Infants' ability to discriminate between speech sounds not in their native language declines between 6 and 12 months of age.
- Six-month-olds from English-speaking families readily discriminate between syllables in Hindi (blue bars) and Nthlakapmx (green bars), but 10- to 12-month-olds do not.
- Perceptual narrowing was not limited to speech.

Word Detection

- How quickly could you pick out a word from a stream of speech like the one shown here?
- It takes 8-month-old infants only 2 minutes
Prelinguistic Communication

**Crying**  First communication:
- desire for food, comfort, stimulation, distress.

2-3 weeks: unique vocal signature – parents recognize it

**Adult responses to crying**

**Cooing**
Starts at 1-2 months

**Babbling**
Start around 6 months

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**Silent Babbling**

- Babies who are exposed to the sign language of their deaf parents engage in “silent babbling”
- A subset of their hand movements differ from those of infants exposed to spoken language in that their slower rhythm corresponds to the rhythmic patterning of adult sign
Gesture

- Develops prior to language
- Initially gestures are iconic – arbitrary gestures added later

What’s so amazing about word learning?

1 year: 1 word
2 years: 300 words
3 years: 1000 words
4 years: 5000 words
5 years: 10000 words
18 years: 60000 words
Milestones in the Acquisition of Semantics:

Comprehension: 8-10 months
Production: 10-12

Why?

- Production requires recall of label and concept.
- Comprehension requires recognition.

Must look at words understood, not just produced.

Methodology

Train infants on the names of novel objects for 3 months.

Test children's comprehension & production weekly.
First words

Often important people: Mama, dada
Objects that move or can be acted on: Ball, car, cat
Familiar actions: Bye-bye, more, up
Outcomes of actions: Hot, wet, dirty.

Rate of Acquisition

From 12 months: infants add 1-3 words a month (50 words)
Between 18 and 24 months:
the language spurt or naming explosion.
Rate of Acquisition

From 12 months: infants add 1-3 words a month (50 words)

Between 18 and 24 months:

the language spurt or naming explosion.

Why so quick to add words? What changes?

1. Concept acquisition?
2. Fast mapping?
Fast Mapping

Note: Girls develop language before boys. Why?

Critical Period

- To learn language, children must also be exposed to other people using language—spoken or signed

Sometime between age 5 and puberty, language acquisition becomes much more difficult
  - Difficulties feral children (such as Genie) have in acquiring language in adolescence
  - Comparisons of the effects of brain damage suffered at different ages on language
  - Language capabilities of bilingual adults who acquired their second language at different ages
Bilingual Children
- More than half of the world’s children are exposed to more than one language
- Children who are acquiring two languages do not seem to confuse them
  - They initially lag but course and rate are similar
- Bilingual children outperform monolingual children on a variety of cognitive tests
  - The advantages of acquiring two languages outweigh disadvantages

Hemispheric Differences in Language Processing
- Adults who learned a second language at 1 to 3 years of age show the normal pattern of greater left-hemisphere activity in a test of grammatical knowledge (darker colors indicate greater activation)
- Those who learned the language later show increased right-hemisphere activity
Test of the Critical-Period Hypothesis

- Performance on a test of English grammar by adults originally from Korea and China was directly related to the age at which they came to the United States and were exposed to English.
- The scores of adults who emigrated before the age of 7 are indistinguishable from those of native English speakers.

What kinds of words and how?

Children learn object words (nouns) before action words (verbs).

Why? Objects tend to be distinct, bounded wholes.

Thus, children need only match label to object.
**Overextension and Underextension of word meaning**

**Underextension:** using words to refer to a smaller set of objects, actions and events.

For example: “doggie” refers only to personal pet

**Overextension:** the use of specific words to refer to a broader set of objects.

For example: “daddy” refers to father, mailman, doctor

<table>
<thead>
<tr>
<th>Word</th>
<th>Referents</th>
</tr>
</thead>
<tbody>
<tr>
<td>ball</td>
<td>ball, balloon, marble, apple, egg, spherical water tank (Rescorla, 1980)</td>
</tr>
<tr>
<td>cat</td>
<td>cat, cat’s usual location on top of TV when absent (Rescorla, 1980)</td>
</tr>
<tr>
<td>moon</td>
<td>moon, half-moon-shaped lemon slice, circular chrome dial on dishwasher, half a Cheerio, hangnail (Bowerman, 1978)</td>
</tr>
<tr>
<td>snow</td>
<td>snow, white flannel bed pad, white puddle of milk on floor (Bowerman, 1978)</td>
</tr>
<tr>
<td>baby</td>
<td>own reflection in mirror, framed photograph of self, framed photographs of others (Hoff, 2001)</td>
</tr>
</tbody>
</table>

**Question:** can point to a “cat”, “bear” and “dog”. Why?
Strategies of Word Learning: The Problem of Induction (Quine)

Constraints: guiding children’s inferences about word meanings:

Whole Object Assumption:
- Word refers to entire object rather than features, parts, or substance.

Taxonomic Assumption:
- Names or words label kinds of things (e.g., dogs, cars, animals, vehicles).
Mutual Exclusivity:

- Things have only one label/name.

Children accept only one name for things.
Syntactic Bootstrapping

Use of grammar to infer word meaning.

Children notice where words fall in a sentence.

When children in Naigles's (1990) study heard an adult describe this scene as “The duck is kradding the rabbit,” they used the syntactic structure of the sentence to infer that kradding is what the duck was doing to the rabbit.
Extending nouns

Nouns typically refer to a whole category of objects.

What objects should be named with the same label?

- Texture?
- Color?
- Shape?

Methodology

Wug

Get me another wug.
Whole Object Assumption: Revisited

- Word refers to entire object rather than features, parts, or substance.