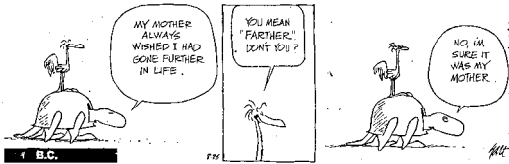# Learning about Words

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Announcements

- No section on Monday, April 21st

- Alex's office hours can be extended on Thursday (the 24th) if necessary (contact him)

- Lila Gleitman today at 4 pm in CSB 003!

  Title: "Hard Words: Why word learning is hard (and why it's easy all the same)"

Infant Speech Production

Stage	Typical Age	Description
Cooing	2-3 months	Interactional but non-linguistic vocalizations
Marginal Babbling	4-6 months	Transition between cooing and babbling
Canonical Babbling	7-12 months	Repeated syllable strings
Words	12+ months	Babbling and words initially co-exist

First 2 Months

- Babies produce sounds that are by-products of breathing, feeding, coughing, and general discomfort:
  - cries, grunts, sighs, clicks, stops, and pops
  - also, some nasal sounds

Cooing

- Non-linguistic sounds; baby learns what her voice can do

- At first, cooing sounds are produced briefly, and in isolation.

- Laughter appears about 4 months

Marginal Babbling

- Infants manipulate pitch (to produce "squeals" and "growls"), loudness (producing "yells"), and also manipulate vocal tract shape to produce friction noises, nasal murmurs, "raspberries" and "snorts"

- Clicks, hums, glides, trills, hisses, and smacks start to sound like consonants and vowels

Canonical Babbling

Infants begin making real syllables:

- Includes sounds that <u>are</u> & <u>are not</u> in the language they hear

- Starts out w/ reduplicated syllables
  - tends to have back consonants *kikiki, gagaga*

- Gradually changes to variegated syllables
  - more front consonants come in *mabagadaba*

- Intonational patterns start to sound like sentences

Baby's First Words

- Especially likely to be names of things they can manipulate or interact with (*ball* or *doggie* more likely than *tree*)

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Baby's First Words

- Around the 1 year mark, infants start to utter recognizable words

- More words are recognized than produced

- Content words predominate
  - mostly nouns at first
  - but some verbs, too
  - and a few function words (*up, more*)

- Words and babbling co-exist for a while (and may be difficult to differentiate)

What is a word?

We know lots of words

- How many words do you know?
  - 5-6 year olds: 2,500-5,000
  - Adults (high-school seniors)
    - 5000?
    - 17000?
    - 45000?

- How many words are there?
  - English – Oxford English Dictionary (OED) has more than 600,000 words
  - French – less than 100,000
  - German – about 185,000 words

- Open class words
  - "content words" (nouns, verbs, adjectives, adverbs)

- Closed class words
  - "function words" (articles, prepositions, etc.)
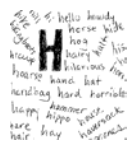
"Atoms" of language

- Listemes (entries in a "mental lexicon")
  - Arbitrary pairings of sound and meaning
  - Unpredictable forms

/kæt/ ⬌

- Morphological objects
  - Morphemes (roots, stems, affixes)
  - Rules of morphological combination
  - Predictable (non-arbitrary) sound-meaning pairs

Morphology yields words with predictable meanings

- Inflectional morphology
  - Changes words to fit specific context
    - English (regular) past tense (stem + -ed)
      - walked, walks, walking

- Derivational morphology
  - Forms new words
    - walker
      - "one who walks"
      - "thing to help you walk"
    - What do fingers "fing"?

Productivity

- Some morphological affixes are productive
  - Apply to new forms entering the language
    - -ed: faxed, emailed, blick-?
    - -ness: bleakness, openness, wug-ness

- Others are less productive
  - Certain irregular past tenses
    - sing → sang; ring → rang; spring → sprang; bring → brought (brang); spling → ?
  - -ity: solemnity, *wug-ity

Are morphological objects listed?

- Are predictable forms listed?
  - NO (only unpredictable words are listed)
    - Bloomfield 1931
    - Chomsky 1965
  - YES (all words in a language are listed)
    - Bybee 1985, 2001
    - Jackendoff 1975
  - SOMETIMES (predictable forms can be listed after they are computed)
    - Aronoff 1976

Blocking

- Languages avoid true synonyms
  - Synonymous words diverge in meaning over time

- A listed form blocks creation of a new form with the same meaning
  - "went" blocks "go-ed"
    - Irregular form blocks new, regular form
  - "flew" does not block "flied"
    - *The pinch hitter flew out to center field

Structured Listemes

- Morphological objects
  - walked or walk+ed?

- Idioms
  - **The shit hit the fan**
  - **The shit** seemed **to hit the fan**

- Discontinuous morphemes
  - **look up** the number
  - **look** the number **up**
  - **take** NP **to task** ("rebuke NP")

Formulaic Speech

- *Formulas* are prefabricated sequences of words listed as complete utterances

  - Thank you
  - You're welcome
  - Hi. How are you?
  - Polly want a cracker?
  - I pledge allegiance…

What's in the lexicon?

- Anything not predictable **must** be *listed* in the lexicon

    - Arbitrary sound-meaning pairings (words)
    - Irregular past tenses (go → went)
    - Idioms "kick the bucket" = "die"

- Anything else might be listed

Meta-linguistic awareness of words

- Are children aware of their mental lexicon?
    Yara (age 4): What's that?
    Mother: It's a typewriter
    Yara (frowning): No, you're the typewriter, that's a typewrite.
    Words are being analyzed into their parts!

- Is X a word?
    - Is "table" a word? Is "silence" a word? Is "the" a word?
    - 5 year olds think only concrete nouns are words
    - 7 year olds accept abstract nouns as words
    - 10 year olds accept articles (a, the) as words

What if you asked them differently?

- Count the number of words in the sentence:

    - "six boys are playing"

- 4-5 year olds:
    - six
        - Confuse protagonists with words
        - Don't fully grasp arbitrary relation between language and what it represents
- 6-7 year olds:
    - two
        - Confuse word boundaries with phrase boundaries
        - "six boys" "are playing"
    - Three
        - Count only content words

- Function words are not counted as words until age 9 (or so)

Conscious vs unconscious

- Even very young infants can segment words out of a sentence ("pot" example)

- Maybe conscious decision-making is difficult for a young child?

    - They may "know" that *the* is a word, but respond incorrectly when asked

"repeat the last word I said"

- Gives a window into what a child thinks a word is
    - (on-the-floor vs. floor; lence vs. silence; open vs. closed class)

This is the story of a little girl called Jenny who lives in a lovely […] who lives in a lovely house in the country. Jenny has a big […] Jenny has a big dog who likes to sit under Jenny's bed when she's sleeping. Whenever Jenny tries to go to sleep, the naughty […] the naughty dog starts to bark and keeps her awake. One day Jenny decides to have some silence […] she must have some silence at night. So she puts the dog in […] she puts the dog in the kitchen. But the dog is so naughty that he sits at the door whining and […] he sits at the door whining and barking and scratching the floor. Jenny is not at all pleased. At night she tries to think of some way to keep the dog quiet. Suddenly she has a […] she has a good idea […]

Using this less conscious task

- 54% of 4 year olds and 96% of 5 year olds correctly recalled both content (lovely, silence) and function (and, the) words
- On this task, 5 year olds perform about as well as 7 year olds do on more explicit tasks (5 year olds know more than they think they know)
- 4 year olds did better on more meaningful function words (under) than less meaningful ones (the)
- Suggests a transition between ages 4-5 in unconscious understanding of what a word is
- Predates a child learning to read, so is NOT related to reading (words separated by spaces)

What do words mean?

Communicative intent of young children

Word Functions

- What functions do words have for young children?
- Proto-imperatives
  - Earliest words
  - Don't have same syntactic form as adult imperatives
  - Demands for something the child wants
    - "juice", "bottle", "door" (I want to go outside)
- Proto-declaratives
  - Establish joint attention
  - Make statement about world
  - Used to share information
    - "bird" (there's a bird over there)

What do words mean?

What do words refer to?

The "Gavagai" problem

- How do we learn new words?

Is the speaker naming:
some whole object?
some property of an object?
some action?
some relationship?

Under- vs. over- extensions

- Word "definitions" may be too narrow or too broad:
  - "bottle" used only for plastic bottles
  - "dog" used for all 4-legged animals
- These semantic *underextensions* and *overextensions* develop and change over time in an individual child's usage.

Constraints on Word Learning

- What helps children pinpoint precise meanings of words?

  - Lexical Constraints Hypothesis
    - Cognitive processes that constrain meaning
      - Mutual exclusivity
      - Fast mapping
      - Whole object constraint
      - Taxonomic constraint

  - Social Constraints

  - Linguistic Constraints
    - Provided by grammar of language

Lexical Constraints Hypothesis

- A general cognitive approach to word learning

- Cognitive processes constrain word meanings

- Learning the meaning of words does not develop in isolation from cognitive development (understanding of concepts)

Lexical Constraints

- Mutual Exclusivity –
  - In a given language an object cannot have more than one name
  - A child will not expect synonyms (car, auto)
- Fast Mapping –
  - Novel words map onto objects which do not already have a name

- Bilingual children
  - Apply these constraints to each language
  - 2 words for each referent (object), stored separately

Examples

- "Look! That's a *cushion*!"

- Which constraints help establish a referent for cushion?

- What if the child knows or doesn't know the word *chair*?

More lexical constraints

- Whole object constraint –
  - A novel word refers to a whole object, not its parts or features (color, shape, texture, etc.)

- Taxonomic constraint –
  - A word refers to a member of a category (e.g., the referent of *bus* is a member of the *vehicle* category, so *bus* might refer to other vehicles (car, truck), but not non-vehicles (banana)

More Examples

- "That's a *giraffe*!"

- What does the child think "giraffe" refers to?

- "look at the long *neck*!"

- What does the child think "neck" refers to?

Lexical Constraints…

- are not absolute: Child may ignore whole object in favor of part if (e.g.) part is emphasized (eyes of a teddy bear)

- develop and are used early!
  - 2-3 year olds
    - Fast mapping (the earlier the better for rate of vocabulary acquisition)
  - 3 year olds
    - Mutual exclusivity / whole object constraint (identify referent)
  - Not clear if all constraints always available
    - Interacting at all ages?
    - Stages of development?

Social Constraints

- Parents provide label (word) for object that child is attending to

- Attention is important!
  - Infants pay attention to where adults are looking and pointing
  - Joint attention
  - Child will map word parent speaks to object parent is focused on, not object of child focus

Linguistic Constraints

- Structure of language provides an important cue to word meaning
  - "that's a gorp" = gorp is a noun
  - "I'm going to gorp" = gorp is a verb

- Function words provide clues to word category, influence choice (type) of referent

Proper names vs nouns

- That's Zav

- Can you give me Zav?

- That's a Zav

- Can you give me a Zav?

Principle of Contrast

- Every difference of form (*run; runs; running*) signals a difference of meaning

- Using words with opposite meanings may make word meanings more transparent

  - That's not a BIG truck, it's a SMALL truck
  - The boy's not RUNNING, he's WALKING

Does contrast help?

- How quickly can 3 year olds learn a new word?

- Experimenter tells child :
  - *Don't take the red tray, take the chromium tray!*
  - e.g., if four trays – two red of different shapes, one chromium of one shape, one blue of the other shape
  - Contrast establishes that 'chromium' is a color adjective

- Novel words can be learned after even a single presentation

Influences on Vocabulary Development

Biology and Environment

- Developmental *sequence* roughly same for all children

- *Rate* of development differs considerably

- Variation in size and content of children's lexicons

Biological Influences

- Sex
  - Girls produce language earlier
  - NOT due to experience!
    - Boys and girls get about the same language input
  - Girls' brains mature somewhat faster
- Maternal Verbal IQ
  - Children of high IQ mothers more advanced
  - Not true for adopted children!
    - Genetics, not environment

Environmental Influences

- Direct influences on language environment
  - What the child hears
    - Affects word learning, but not babbling (child does not hear babbling)
  - Frequency (higher) and position within a sentence (more varied: "Where's Daddy *going*?" "Daddy's *going* to work") help children learn words
- Indirect influences on language environment
  - Maternal Socioeconomic Status (SES)
  - Parents' education, social competence, knowledge of child development, attitude
  - Parents on higher ends of these scales may interact with children more and in more different ways, increasing frequency and positional variety of words