

## Morphology

### Morphology yields words with predictable meanings

- Inflectional morphology
  - Changes words to fit specific context
    - English (regular) past tense (stem + -ed)
      - walked, walks, walking
- Some morphological affixes are productive
  - Apply to new forms entering the language
    - -ed: faxed, emailed, blick-?
- Others are less productive
  - Certain irregular past tenses
    - sing → sang; ring → rang; spring → sprang; bring → brought (brang); spling →

### Are morphological objects listed?

- Are predictable forms listed?
  - NO (only unpredictable words are listed)
    - Bloomfield 1931
    - Chomsky 1965
- Predictable forms are created by RULES
- Only unpredictable forms are listed

### Blocking

- Rules apply by “default” unless “blocked”
  - walk → walked
  - play → played
  - go → go-ed?
- 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 “fled”
    - \*The pinch hitter flew out to center field

### Alternative Regulars

- Doublet forms
  - dive - dove or dived
  - Both forms need to be in the lexicon
- Phonologically similar to real irregulars
  - squeeze - squeezed or squoze?
    - cf. freeze - froze
  - glide -glided or glid? or glod?
    - cf. hide - hid or ride - rode
- Certain regular forms need to be stored, otherwise irregulars would be produced

### Redundancy

- 2 mechanisms for language
  - Production by rule/grammar
  - Memorization in lexicon
- How do you know what was used?
  - If the forms are different, it's not too hard
  - If the forms are the same, it can be difficult
- Individual differences
  - For different words
  - For different people

## Compensation

- Redundancy provides easy means for compensation
  - Damage to grammar -
    - Could compensate by memorizing in lexicon
  - Damage to lexicon -
    - Could compensate with grammar
- Great if forms are the same (output is the same)
- Problematic if forms are different
  - Regulars might be lost following damage to grammar
  - Irregulars might be lost following damage to lexicon
  - What would you produce instead?

## Lexicon vs grammar

- |                           |                          |
|---------------------------|--------------------------|
| ■ Irregular past tense    | ■ Regular past tense     |
| ■ dive - dove             | ■ live - lived           |
| ■ teach - taught          | ■ teach - taught         |
| ■ Idiom                   | ■ Literal meaning        |
| ■ 'kick the bucket' = die | ■ kick the bucket        |
| ■ Some regulars           | ■ If produced by grammar |
| ■ dive - dived            | ■ dive - dived           |
| ■ squeeze - squeezed      | ■ squeeze - squeezed     |

## Development of Past Tense

- One possibility:
  - children's past tense errors (i.e. overregularizations; *goed*) are most frequent at earliest stages of learning
  - Errors become gradually less frequent over time
- What really happens (U-shaped learning curve):
  - stage 1: perfection (almost)
  - stage 2: over-regularization (not all the time, but a good deal more frequent than before)
  - stage 3: perfection (gradual transition from stage 2 to stage 3)

## Development of Rules

- Initially, children treat **all** verbs as if they are irregular verbs, whose past tense forms must be memorized.
  - They memorize the forms of the small number of verbs that they use well, and so they make few errors.
- Later, they learn that there is a regular past tense form, which is supplied by a rule
  - at this point, there is a tendency for this rule to be overapplied, leading to over-regularizations.
- Subsequently, the correct division of labor between regular and irregular past tense forms is established.

## English Plural Marking

- "Regular" Plurals: stem + -s (default)
  - Dog → dogs; horse → horses; cat → cats
- "Irregular" Plurals: unpredictable
  - ox → oxen; child → children
  - knife → knives
  - goose → geese
  - deer → deer; fish → fish

## An alternative to rules: Prototypes

- Emphasis on characteristic features
  - Frequent features
  - Easily accessible features
    - Perceptual features
    - Common facts
  - No sets of necessary and sufficient conditions
  - Graded structure – best example is 'prototype'
  - Fuzzy boundaries
    - Where do 'fruits' end and 'vegetables' begin?



## Schemas in language

- Morphological representations and lexical forms are not separate
- Simple and complex forms comprise Schemata
  - Probabilistic, prototype structure



## Prototypical Nouns

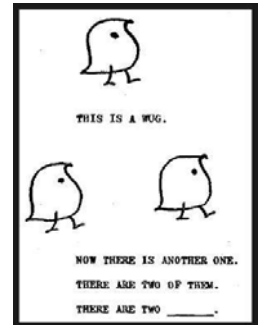
- A prototypical singular noun has no features compatible with a plural form
- Plural features include stems ending in
  - /s/, /z/, /ɪz/
  - /z/ is very rare in singular forms (lens)
  - /ɪz/ is even more rare (kermes)
  - /s/ is fairly common (fox, box, boss, etc.)

## Degrees of similarity to plural

- High cue strength: interpret singular form as already plural
- Cue strength = sum effect of four cues (each vaguely divided into high, mid, low strength)
- Salience
  - How acoustically prominent is the marker
  - /s/, /z/, /ɪz/ all highly salient
- Type frequency
  - Number of nouns that take a particular form
  - /s/: mid; /z/: high; /ɪz/: low
- Cue validity
  - How reliably does the sound indicate plurality?
  - /z/: mid; /ɪz/: high; /s/: low
- Iconicity
  - Additive morphemes (especially syllabic) are highly identifiable
  - /ɪz/: high; /s/: mid; /z/: mid

## What about a novel noun?

- Symbolic rules
  - Phonology of stem is irrelevant – rule applies
- Schema
  - Phonology of stem is relevant – rule may not apply?
- 6-7 year olds
  - Produced “wugs” 97% of the time



## Really Rules?

| Word  | Expected   | Correct % | -0 % |
|-------|------------|-----------|------|
| wug   | /-z/       | 97        | 3    |
| lun   | /-z/       | 92        | 8    |
| tor   | /-z/       | 90        | 10   |
| heaf  | /-z/, /-s/ | 80        | 16   |
| cra   | /-z/       | 86        | 14   |
| tass  | /-ɪz/      | 39        | 61   |
| gutch | /-ɪz/      | 38        | 52   |
| kazh  | /-ɪz/      | 36        | 59   |
| niz   | /-ɪz/      | 33        | 67   |

## Rule Interpretation of /-0/ forms

- Performance was worse when /ɪz/ was expected because /ɪz/ is harder than /s/ or /z/
- Rule: “a final sibilant makes a word plural”
- Repeated Morph Constraint
  - Languages do not repeat morphemes
  - \*dogses; \*horseses; \*catses
- Novel forms that appear to already be plural (yes or no) won't add the affix

## Schema Interpretation

- The greater the degree of similarity to a plural form, the more likely it will be left unchanged
- /z/ = plural allomorph with highest cue strength
- /s/ = plural allomorph with lower cue strength
- {ch}, {zh} similar to plural allomorphs: fricative, continuant, sibilant ("hissing")
- /f/ is a fricative, and continuant, but not a sibilant
- /a/ and /r/ are continuant, but not fricative or sibilant
- /n/ and /g/ negative on all three counts

| Word  | -0 % |
|-------|------|
| wug   | 3    |
| lun   | 8    |
| tor   | 10   |
| cra   | 14   |
| heaf  | 16   |
| gutch | 52   |
| kazh  | 59   |
| tass  | 61   |
| niz   | 67   |

## Rules and Schemas?

- WHEN the regular plural affix is added
  - It is added by rule
- Degree of similarity to plural determines
  - Whether or not affix is added
  - (avoid violating repeated morph constraint)
- Rules and schemas may both be needed

- German has many ways to form a plural
  - Stem + -e
    - Fisch → Fische (fish)
  - Stem + -(e)n
    - Bauer → Bauern (farmer); Tür → Türen (door)
  - Stem + -er
    - Geist → Geister (ghost)
  - Stem + -s (claimed default – "minority" default)
    - Park → Parks (park)
  - Stem + -0
    - Adler → Adler (eagle)
  - Stem Umlaut
    - Vater → Väter (father); Tochter → Töchter (daughter)
  - Stem Umlaut + -e; stem umlaut + -er
    - Kuh → Kühe (cow); Wald → Wälder (wood)
  - Articles also signal plurality
    - Der SING → Die PLURAL (masc)
    - Die SING → Die PLURAL (fem)
    - Das SING → Die PLURAL (neuter)

## Cue Strength of plural markers

| Marker | Salience | (Type) Frequency | Cue Validity | Iconicity |
|--------|----------|------------------|--------------|-----------|
| -(e)n  | h        | h                | h            | h         |
| -s     | h        | l                | h            | m         |
| -e     | h        | m                | l            | h         |
| -er    | h        | l                | l            | h         |
| Umlaut | l        | l                | m            | l         |

## German Nonsense words

- The *wug* test in German (Mugdan, 1977)
- 6-7 year olds
- Predictions
  - If similar to existing plural, add -0, else
    - Add default /-s/ marker to all forms?
    - Add appropriate marker depending on stem form?

**Table 13.7** Distribution of responses of 25 children to 16 German nonce words in absolute numbers

| Stimuli       | Expected plural morpheme | -0 | -e               | -(e)n | -er | -s | Neologism |
|---------------|--------------------------|----|------------------|-------|-----|----|-----------|
| der /smirl/   | -e/-(e)n                 | 13 | 9                | -     | 1   | -  | 2         |
| das /getryda/ | -0                       | 24 | -                | 1     | -   | -  | -         |
| die /albær/   | -(e)n                    | 23 | -                | 1     | -   | 1  | -         |
| das /tinda/   | -(e)n                    | 23 | 1                | -     | -   | 1  | -         |
| die /zari/    | -s                       | 18 | -                | 1     | -   | 5  | 1         |
| das /gglek/   | -e                       | 18 | 7                | -     | -   | -  | -         |
| der /ne:bar/  | -0                       | 25 | -                | -     | -   | -  | -         |
| die /rondats/ | -(e)n                    | 22 | 3                | -     | -   | -  | -         |
| das /bros/    | -e/-er                   | 17 | <sup>2/3</sup> * | -     | -   | -  | -         |
| die /arl/     | -e/-(e)n                 | 19 | 5                | -     | -   | 1  | -         |
| der /ha:gan/  | -0                       | 25 | -                | -     | -   | -  | -         |
| die /ne:ba/   | -(e)n                    | 17 | -                | 7     | -   | -  | 1         |
| das /heklain/ | -0                       | 21 | 3                | -     | -   | 1  | -         |
| der /fenda/   | -(e)n                    | 24 | -                | 1     | -   | -  | -         |
| das /kunda/   | -0                       | 25 | -                | -     | -   | -  | -         |
| der /fars/    | -e                       | 22 | 1                | 2     | -   | -  | -         |

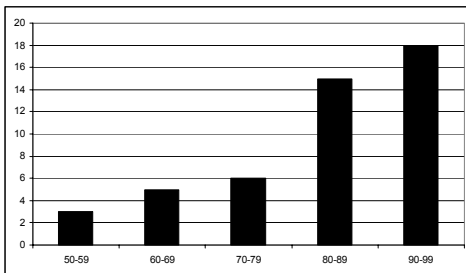
\* In 3 out of 8 cases -e was combined with *umlaut*. These are the only cases where the children made use of *umlaut*. This is in accordance with the predictions based on the cue strength of the German plural markers.

## Conclusions

- Children are sensitive to the form of a stem – if it looks plural, it's left unchanged
- This is not an all or nothing decision
  - Graded effects consistent with schema/prototypes in both English and German
- If made plural, rules may apply (at least in English)

## Midterm Info

## Distribution of Scores (n=47)



Mean: 82

Standard deviation: 11.6

## Hard Questions

11. If I take the nonsense words "bidaku", "padoti", and "tupiro" – which of the following sequences of syllables has the highest transitional probability within the string: "bidakupadotitupirobidakutupiropadoti"?
- a. bi-da
  - b. ku-pa
  - c. ro-pa
  - d. both b) and c)
12. If word learning depends on a dedicated system, which of the following should be true?
- a. fast-mapping should not apply to facts or words
  - b. fast-mapping should apply to words and facts, but not dance routines
  - c. fast-mapping should apply only to facts, not words
  - d. fast-mapping should apply only to words, not facts
13. The assumption that children can't understand relational terms until they understand the things being related is made by proponents of:
- a. perceptual bootstrapping
  - b. logical bootstrapping
  - c. syntactic bootstrapping
  - d. phonetic bootstrapping

## Hard Questions

14. Syntactic bootstrapping contends that:
- a. children exploit sentential information to learn about the meaning of a novel word
  - b. grammatical function words are difficult to perceive
  - c. lexical and grammatical development displays a non-linear growth curve
  - d. both a) and b)
15. In a language for which verbs are very salient, measurements with the CDI have shown that:
- a. verbs are acquired in that language earlier than nouns
  - b. verbs are acquired in that language earlier than function words
  - c. development of nouns grows faster than development of verbs (for the first 50 words)
  - d. both b) and c)

## Hard Questions

1. What is the key difference between the claim that a native language "develops" in children and the claim that children "acquire" their native language (define each claim)?
2. What are four types of lexical constraints that can help the child arrive at the correct meaning of a word (state and define each one)?

## Acquisition vs Development

### ■ Acquisition

- Language learning is just like learning anything else – it depends on intelligence and an ability to solve problems



### ■ Development

- The brain is programmed for language, just like learning to walk – it is like a form of physical growth



Compromise? How much is learned and how much built in?

## Lexical Constraints on Word Meaning

### ■ Lexical Constraints Hypothesis

- Cognitive processes that constrain meaning
  - 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
  - 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