Presentation roadmap

- Context and scope of research
  - The theories and their predictions
  - Empirical approach
- The evidence
  - Developmental order of verbal forms
  - U-shaped performance curve at a critical moment
- Discussion

Context

- Competing linguistic theories offer radically different outlooks on the nature of the lexicon
  - Generative approach: Set of morphemes dynamically combined through grammatical rules or constraints
  - Constructivist approach: No rules needed. All ‘used’ forms are memorized as separate entries in the lexicon

Context (cont’d)

- These views have implications for theories of language acquisition
- Today’s aim: Testing the different predictions made by these models
Grammatical (generative) approach

- Acquisition as grammatical generalizations across the memorized lexicon
- Potential (over-)generalizations of the most transparent aspects of the system during the developmental period
- Driving factor: grammatical transparency
  - Basic/transparent units acquired first
  - Abstract properties acquired progressively
  - Idiosyncrasies must be memorized
  - Frequency: a potential influence, but does not drive the developmental sequence

Constructivist (exemplar) approach

- Acquisition from stacking of memory traces
  - “Storage is processing” (Bybee 2001)
  - Every used form (in perception or production) leaves a trace in the lexicon
  - No generalizations beyond semantic and/or phonological similarity (analogy)
- Repetition/frequency = determining
  - Early word productions reflect salient/frequent properties of the memorized forms
  - Low-level production issues may hinder initial pronunciations

Pitting the approaches

- The two approaches differ significantly with regard to the roles of frequency versus grammatical transparency
- We compare these approaches based on acquisition data from Northern East Cree
  - We suggest that an analysis based on input frequency fails to account for our acquisition data
  - We show that a grammatical approach enables a straightforward account of many of the facts observed in the data

The empirical base: CCLAS

- Longitudinal naturalistic study of L1 acquisition of Cree
  - Memorial University
  - Cree School Board of Québec
  - Chisasibi, Québec, approx. 4,000 Cree
  - Mostly Cree L1 (dominant)
  - English (L2)
- 2004-07: video recording at 2-3 week intervals, 45 minute sessions
  - Cohort A (3), 1;09 – 4;06 yrs
  - Cohort B (3), 3;08 – 6;06 yrs
  - Today: 10 regularly spaced sessions for Child A1 (‘Ani’), age 2;01 to 3;08 (basis for Terry 2010)
Today’s focus: Ani’s development of verbal morphology

- **Focus: Animate Intransitive (AI) verbs**
  - Cree verbs are traditionally classified along lines of transitivity and animacy, intransitive subjects, transitive objects
  - AI verbs are the most frequently occurring form in the 10 sessions (and in target language, 41% for NE Cree)
  - We consider two of the three verbal inflectional “orders”, Independent, Conjunct, and Imperative

### Independent vs. Conjunct orders

<table>
<thead>
<tr>
<th></th>
<th>Independent</th>
<th>Conjunct</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Syntax</strong></td>
<td>Restricted to a subset of main clause contexts, and is posited to be the elsewhere inflection (Brittain 2001)</td>
<td>Required in: • subordinate clauses • wh-clauses • focus constructions</td>
</tr>
<tr>
<td><strong>Morphology</strong></td>
<td>Less fusional</td>
<td>• More fusional • Initial change (IC)</td>
</tr>
</tbody>
</table>

### Representative examples

<table>
<thead>
<tr>
<th>Independent</th>
<th>Conjunct</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aakusiu.</td>
<td>Awaan iyaakusit?</td>
</tr>
<tr>
<td>aakusi-u</td>
<td>awaan iyaakusi-t</td>
</tr>
<tr>
<td>be.sick-3</td>
<td>who (IC)be.sick-3.s</td>
</tr>
<tr>
<td>“S/he’s sick.”</td>
<td>“Who’s sick?”</td>
</tr>
</tbody>
</table>

### Input frequency: Independent versus Conjunct

- (Woods) Cree, inflection types in main clauses (Starks 1994)
  [Recall: Conjunct is required in subordinate clauses]

<table>
<thead>
<tr>
<th></th>
<th>Conversation</th>
<th>Narrative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td><strong>Independent</strong></td>
<td>89</td>
<td>45%</td>
</tr>
<tr>
<td><strong>Conjunct</strong></td>
<td>95</td>
<td>48%</td>
</tr>
<tr>
<td><strong>Imperative</strong></td>
<td>14</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>198</td>
<td>100%</td>
</tr>
</tbody>
</table>
Predictions from frequency data

• The Conjunct order is arguably the most frequent order used in Cree
  • We are in the process of verifying this claim for child-directed speech
• Usage-based approaches predict the early emergence of this order over the Independent order
  • This is not the case in our case study

Working hypothesis

• Memorization of amalgams (unanalyzed chunks) involved in building an initial lexicon, with the onset of creative rule use at around age 3;04
• Pre-3;04: implicit grammatical analysis during the amalgam-storing stage
• From 3;04 onward: productive use of grammatical rules

Supporting evidence

• Favouring the Independent
  • Grammatically transparent
  • Not the most frequent in the input
• Productive (innovative) inflection of child forms
  • From age 3;04, Ani inflects ‘child’ forms (AI verbs)
  • Child forms are inconsistently, if at all, inflected in the input
• Performance drop
  • The onset of productive grammatical analysis (3;04) coincides with a drop in performance, suggesting a move from use of stored amalgams to creative use of rules

Ani’s verbal productions (Terry 2010)

• Predominance of Independent forms
• At around 3;04:
  • Emergence of productive inflection
  • Dip in overall performance
Verbal productions: numbers

- Between 2;01 and 3;01
  - 67% of Ani’s attempted verbs are Independent
  - 7% are Conjunct
- Between 3;04 and 3;08
  - 55% of Ani’s attempted verbs are Independent
  - 26% are Conjunct
- This preference runs counter to expectations if input frequency is a significant force in the acquisition of these forms

Ani’s production of child forms for all 10 sessions (Terry 2010)

- Virtually no inflection of child forms until 3;04
- Spontaneous appearance of inflections
  - Suggests grammatical over-generalization

Ani’s child forms at ages 2;06 and 3;08

<table>
<thead>
<tr>
<th>Orthography</th>
<th>Age 2;06</th>
<th>Age 3;08</th>
<th>IPA target</th>
<th>IPA actual</th>
<th>Morpheme type</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>mими</td>
<td>mими</td>
<td>-u</td>
<td>['mimi']</td>
<td>[mimij]</td>
<td>Child form</td>
<td>‘s/he’s asleep’</td>
</tr>
<tr>
<td>sleep</td>
<td>sleep</td>
<td>-3</td>
<td>[mimi]</td>
<td>[mimij]</td>
<td>Child form</td>
<td>-IN</td>
</tr>
<tr>
<td>kiki</td>
<td>ni-</td>
<td>-n</td>
<td>['gigi']</td>
<td>[n-&gt;'gigi']</td>
<td>-IN</td>
<td></td>
</tr>
<tr>
<td>hurt</td>
<td>1-</td>
<td>-non.3</td>
<td>[digi]</td>
<td>[q-&gt;'gigis']</td>
<td>-jld</td>
<td></td>
</tr>
<tr>
<td>Ch.form</td>
<td>1-</td>
<td>-IN</td>
<td>be.hurt.dim</td>
<td>be.hurt.dim</td>
<td>-non.3</td>
<td></td>
</tr>
<tr>
<td>Ch.form.dim</td>
<td>-IN</td>
<td></td>
<td>-IN</td>
<td>-IN</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

≈ 3;04: A drop in performance

- As Ani begins to inflect child forms, she starts making errors on forms previously produced close to target
- Focus: 1st person (Independent) forms, which require prefix and suffix
  - Gradual emergence of the prefix; performance drop at 3;04
  - Suffix: performance decreases at 3;04
Inflection of 1st person singular (on AI Independent verbs)

<table>
<thead>
<tr>
<th>Age</th>
<th>Prefix (ni-)</th>
<th>Suffix (-n)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Target</td>
<td>Actual</td>
</tr>
<tr>
<td>2:01.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:03.24</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:06.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:07.19</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>2:09.28</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td>2:11.15</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>3:01.18</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>3:04.09</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>3:06.23</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>3:08.24</td>
<td>14</td>
<td>7</td>
</tr>
</tbody>
</table>

Summary of observations

- Prior to 3:04, Ani generalized her use of the language's default inflectional system
  - Default order easier to interpret, acquired faster (despite unfavourable input frequency)
- At around 3:04: emergence of a productive grammatical system
  - Grammatical innovation (inflected child forms)
  - Dip in performance on produced inflections
  - Both prefixes and suffixes are affected

Discussion

- We cannot build a receptive lexicon for polysynthetic languages without rules
  - A single verbal root can yield over a million forms (Hankamer 1989, on Turkish; Sadock 1980, on West Greenlandic)
- This claim holds true of Cree
  - Most (NE) Cree words (80%) are verbs
  - Verbs encode varied and complex semantic (and, we assume, structural) relationships
  - Form-meaning associations within the verb complex logically require some degree of decomposition into smaller units

Discussion

- Initial productions are stress-driven
  - Segmentation driven by prosodic salience (Mithun 1989, Slobin 1985)
- Ani’s initial word forms: (W)S foot (Swain 2009)
  - Prefix deletion: falls outside the foot
  - Suffix production: part of the foot
- The emerging morphological system over-rides these phonological constraints
Discussion

- Emergence of morphology enables larger-domain analysis
  - Gradual revisions of the lexicon incorporate units matching morphological analysis
- Memorization remains an important component of the story
  - Early generalizations arise from phonologically-conditioned, memorized amalgams
- But exemplar storage is **not** processing!