Semantics, Syntax, and Grammar

Language 2

Transformational Grammar

- Syntax vs. semantics
  - Syntax: The Rules
  - Semantics: The Meaning

- Broca’s Aphasia
- Wernicke’s Aphasia

Understanding Sentences

- Garden path sentences
  - Sentences that begin by appearing to mean one thing, but then end up meaning something else
  - Examples:
    - “We painted the wall with cracks.”
    - “The horse raced past the barn fell.”

- Temporary ambiguity
  - When the initial words are ambiguous, but the meaning is made clear by the end of the sentence
  - Examples:
    - “Republicans Grill IRS Chief Over Lost Emails.”
    - “He fed her cat food…”
Understanding Sentences
- Syntax-first approach to parsing:
  - Grammatical structure of sentence determines parsing
  - Late closure: parser assumes new word is part of the current phrase
- Interactionist approach to parsing
  - Semantics and syntax both influence processing as one reads a sentence

Transformational Grammar
- Noam Chomsky (1957): Syntactic Structures
  - Human language coded in the genes
  - Underlying basis of all language is similar
- Universal grammar is a set of innate syntactic rules
- Phrase structure
  - We [should] have knowledge for sentence construction

Transformational Grammar
- More to it than phrase structure:
  - They are flying planes.
Transformational Grammar

- Application of phrase structure rules cannot explain the ability to overcome ambiguity
  - Deep structure of sentences
  - Surface structure of sentences

Generate idea (deep structure)  
transformational rules

Develop sentence (surface structure)
  
convey meaning!

Transformational Grammar

- Transformational grammar explains:
  - Changing active statements into passive statements
    - “The boy hit the ball.”
    - “The ball was hit by the boy.”
  - Changing positive statements into negative statements
    - “The boy hit the ball.”
    - “The boy did not hit the ball.”
  - Changing assertions into questions
    - “The boy hit the ball.”
    - “Did the boy hit the ball?”
- We think in terms of the ways we could say something

Transformational Grammar

- Colorless green ideas sleep furiously.
  - Separation of surface structure (syntax) from deep structure (semantics)
  - Explains creation of semantically correct, meaningless sentences
    - The ham sandwich ate Dr. Burnham.
- Explains the creation of ambiguous sentences
  - They are flying planes.
  - Resolving ambiguity requires knowledge of deep structure
Ambiguity and Comprehension

- Effects of ambiguity on language comprehension
  - Disambiguation region
  - They are flying planes
- McKay (1966)
  - Sentence completion task
  - Ambiguous vs. non-ambiguous phrases

<table>
<thead>
<tr>
<th>Type of Ambiguity</th>
<th>Ambiguous Sentence</th>
<th>Non-Ambiguous Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical</td>
<td>Although he was continually bothered by the cold...</td>
<td>Although he was continually bothered by the headache...</td>
</tr>
<tr>
<td>Surface</td>
<td>Although Hannibal sent troops over a week ago...</td>
<td>Although Hannibal sent troops almost a week ago...</td>
</tr>
<tr>
<td>Underlying</td>
<td>Knowing that visiting relatives could be bothersome...</td>
<td>Knowing that visiting some relatives could be bothersome...</td>
</tr>
</tbody>
</table>

McKay (1966) Results

<table>
<thead>
<tr>
<th>Type</th>
<th>Median Completion Time (seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lexical</td>
<td>6</td>
</tr>
<tr>
<td>Surface</td>
<td>7</td>
</tr>
<tr>
<td>Underlying</td>
<td>8</td>
</tr>
<tr>
<td>Multiple</td>
<td>9</td>
</tr>
</tbody>
</table>

Reading and Word Recognition

- Direct access view
- Indirect access view

Orthographic level

Phonological level

Direct access view

Indirect access view
Reading and Word Recognition

- Homophones (reed / read...red / read...rows / rose)
  - Van Orden (1987)
  - Category Exemplar classification task

<table>
<thead>
<tr>
<th>Category</th>
<th>Homophone Foils</th>
<th>Spelling Controls</th>
</tr>
</thead>
<tbody>
<tr>
<td>TYPE OF FOOD</td>
<td>MEET</td>
<td>MELT</td>
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- Looked at false positives

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<tbody>
<tr>
<td>TYPE OF FOOD</td>
<td>MEET</td>
<td>MELT</td>
</tr>
<tr>
<td>% False Positives</td>
<td>18.5%</td>
<td>3.0%</td>
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</tbody>
</table>

Reading and Word Recognition

- Pseudohomophones (brane / brain...rose / roz)
  - Luo et al. (1998)
  - Semantic relatedness judgment task
  - Unrelated word-pseudohomophone pairs (DOCTOR-NERSE)
  - Unrelated word-nonword pairs (DOCTOR-DERSE)

<table>
<thead>
<tr>
<th>Condition</th>
<th>Example</th>
<th>RT</th>
<th>% Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pseudohomophone</td>
<td>DOCTOR-NERSE</td>
<td>876</td>
<td>16.3</td>
</tr>
<tr>
<td>Nonword-Control</td>
<td>DOCTOR-DERSE</td>
<td>841</td>
<td>7.9</td>
</tr>
</tbody>
</table>

Reading and Word Recognition

- Wht abt txtng?
  - Orthographic abbreviations (wk / week)
  - Phonological respellings (c u / see you)
  - Acronym (lol)
  - Perea et al. (2009)
  - Subjects read actual sentences (controls) or txt sentences with
  - Orthographic abbreviations
  - Phonological respellings
  - Recorded reading time and eye movements
Reading and Word Recognition

- Perea et al. (2009) Results…
- …generally, reading text is much more difficult and results in a loss of semantics

<table>
<thead>
<tr>
<th>Global measures</th>
<th>Orthographic</th>
<th>Control</th>
<th>Filter</th>
<th>Phonological</th>
<th>Control</th>
<th>Elliptic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total reading time (s)</td>
<td>2.17±0.22</td>
<td>1.27±0.55</td>
<td>-0.05±0.00</td>
<td>2.51±0.10</td>
<td>1.48±0.16</td>
<td>-1.34±0.16</td>
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<tr>
<td>Words per second</td>
<td>5.2±1.5</td>
<td>3.8±1.5</td>
<td>-1.0±0.1</td>
<td>4.0±1.0</td>
<td>3.6±1.0</td>
<td>-1.1±0.8</td>
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<tr>
<td>Task duration (s)</td>
<td>6.8±3.9</td>
<td>8.9±4.9</td>
<td>0.6±0.4</td>
<td>7.6±4.9</td>
<td>6.8±4.9</td>
<td>-0.6±0.4</td>
</tr>
<tr>
<td>Reaction time (ms)</td>
<td>19±12</td>
<td>19±12</td>
<td>0.0±0.0</td>
<td>19±12</td>
<td>19±12</td>
<td>0.0±0.0</td>
</tr>
</tbody>
</table>

*p<0.05, **p<0.01