VOLTAIRE WAS MORE EASILY DUPED THAN FORGED:

STRUCTURAL CUES IN PROCESSING POLYSEMY

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Our Research

- Polysemous words may initially activate a semantically vague meaning, consistent with all of its senses
- Processor selects a specific sense when prompted by context or grammatical necessity
- Propose that the processor may also use structural defaults to select a more specific meaning
- Provide evidence for a specific structural default in three experiments probing the effect of syntactic voice and general context on metonymy processing

Homophones and Polysemes

Homophones
- Multiple unrelated meanings, e.g., bank
  - Location by river
  - Location/institution
- Low level activation immediately
- Dominant meaning reaches activation first, especially if supported by context

Polysemes
- Multiple related senses, e.g., school
  - Building
  - Institution
  - Group
- Evidence that the processor may delay selecting a specific sense until required

Polysemy

- Senses typically related by regular/productive rules
  - Vietnam (place-for-event, e.g. Frisson and Pickering 1999)
  - academy (place-for-institution, e.g. Frisson and Pickering 1999)
  - newspaper (concrete-to-abstract, e.g. Frazier and Rayner 1990)
  - lamb (count-to-mass, e.g. Kleposniotou, 2002)
  - Dickens (producer-for-product, e.g. Frisson and Pickering 1999; Kleposniotou, 2002)

Literal first model

- Literal: My great-grandmother met Dickens
  - vs.
  - Figurative: My great-grandmother read Dickens

Access literal meaning
Evaluate meaning in context
Revise as necessary

Underspecification model
Frisson & Pickering (1999)

- Literal: My great-grandmother met Dickens vs.
- Figurative: My great-grandmother read Dickens

Activation stage: Initially activate underspecified representation
Selection stage: Use context to home-in on a specific sense
Underspecification model
Frisson & Pickering (1999)

- No processing differences between literal (met Dickens) and figurative (read Dickens)
- Supports the Underspecification model over the literal first model
  - Frisson & Pickering (2007) follow up
    - Penalty when the name was an unknown author, e.g., Needham
    - Penalty nearly eliminated by informative context
- Processor settles on sense by the end of clause.
  - See also Foraker and Murphy (2012) for a different interpretation.

Homing-in stage

- Multiple sources of information used in sense-selection:
  - Requirements and demands of the task
  - Importance of word in sentence
  - Amount of contextual evidence/constraints
- Flexibility of processor: Context facilitates selection of a more specific sense when required

Contextual strength

- General context
  - Strength of constraining contexts may determine when specific sense is selected
- Structural
  - Stronger constraints may result in immediate decisions
- Lexical
  - Grammatically based decisions likely to be immediate
    - Immediate Partial Interpretation (Frazier, 1999)

Subject as Agent Principle (SAP)

- Provisionally assign the subject of a clause an agent thematic role, all else being equal.
  - Evidence from aphasics (Grozdinsky, 1986)
  - May only hold for languages lacking strong morphosyntactic markers for case
- Claim: Assuming that thematic processing is obligatory and grammatical, the processor uses this default to home-in on a particular sense despite other contextual evidence

Present Research Project

Passive: Voltaire was forged by a petty criminal
Active: A petty criminal forged Voltaire

Predictions:
- Processor uses SAP to provisionally assign agent theta role to Voltaire when in subject position
- Agent role only plausibly consistent with literal sense
- Processor commits to literal sense in Passive sentences, but not Active sentences

Plot

Experiment 1: Active vs. passives in self-paced reading
Experiment 2: Active vs. passives in fill-in-the-blanks
Experiment 3: Passives in context in self-paced reading
Experiment 1: Passive vs. Active sentence polysemes in self-paced reading
Results: Penalty for figurative sense when polyseme was Subject, but not Object

Experiment 2: Passive vs. Active sentence polysemes in fill-in-the-blanks
Results: Subject polysemes yielded more literal supporting contexts than Object polysemes did

Experiment 3: Passive polysemes in context in self-paced reading
Results: Contexts supporting the figurative sense reduced, but did not eliminate, the cost found in E1.

Exp 1 – Overview
- Testing predictions of SAP with self-paced reading
- Manipulation of:
  1. **Voice** (Active vs. Passive)
  2. **Verb-Type** (Literal vs. Metonymic-Selecting)

Active: Regrettably, a criminal {harassed/forged} Voltaire while illegal books were still being made.

Passive: Regrettably, Voltaire was {harassed/forged} by a criminal while illegal books were still being made.

Exp 1 – Results
- All effects observed on post-verbal region
- Comparison across Voice condition
  - Passives: Penalty for Figurative sense interpretation, $t = 2.09$, $p < 0.05$.
  - Actives: No difference
  - Immediately home in on literal sense in Passive

<table>
<thead>
<tr>
<th>Exp 1 - Results</th>
<th>Mean and SE RTs on Post-Verbal Region</th>
</tr>
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<tbody>
<tr>
<td></td>
<td><strong>Literal Selecting</strong></td>
</tr>
<tr>
<td><strong>Passives</strong></td>
<td>660 (37)</td>
</tr>
<tr>
<td><strong>Actives</strong></td>
<td>566 (20)</td>
</tr>
<tr>
<td></td>
<td>$d = 92$</td>
</tr>
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</table>
Exp 1 - Conclusions

- Active sentences results consistent with Frisson and Pickering (1999, et seq)
- Passive sentences results consistent with processor using SAP
  - Processor interprets subject polyseme as agent, homes in on literal sense
  - Cost for processing figurative sense in Passives, but not Actives

Plot spoiler

Experiment 1: Passive vs. Active sentence polysemes in self-paced reading
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Exp 2 – Overview

- Testing predictions of SAP, with fill-in-the-blanks task
- Results support processor using SAP
- Active and Passive sentences with verbs removed
  - PASSIVE
    - Regrettably, Voltaire was _______ by a criminal while illegal books were still being made.
  - ACTIVE
    - Regrettably, a criminal _______ Voltaire while illegal books were still being made.
- Subjects were instructed to fill in the blank

Exp 2 – Prediction

- Bias towards supplying literal verbs for Passive sentences, but not for Active sentences
  - If processor uses SAP, then it will interpret subject metonyms in Passive sentences as agents
  - Fill Passive sentence blanks with verbs that take agents as subjects (literal verbs)
  - No such bias for Active sentence blanks

Exp 2- Methods, Participants, and Items

- N = 32, recruited with Amazon Mechanical Turk
  - All unique U.S. IP addresses
  - All Turkers had 98% acceptance on 50 previous tasks
- Experiment presented on Ibex Farm
- Task: read sentence frame and supply the first verb that comes to mind
- Included a few catch items to control for participant cooperation and native fluency in English
- 24 items

Exp 2 - Annotation

- Annotation performed by the authors
- Coded participant-supplied verbs by whether they were
  - Figurative-Selecting
  - Literal-Selecting
  - Ambiguous (consistent with both senses)
- Three analyses:
  1. Ambiguous removed
  2. Ambiguous counted as metonymic
  3. Ambiguous counted as literal
Exp 2 - Results

- Under each analysis, same effects were observed
- Significantly fewer Figurative-Selecting verbs supplied for Passive as compared to Active

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<td>32% (3)</td>
<td>59% (3)</td>
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Exp 2 - Conclusions

- Bias against supplying Figurative-Selecting Verb in Passive sentences
- Consistent with predictions of SAP
  - Processor interpreted Passive sentence metonym as agent, supplied literal verbs
  - No such effect for Active sentence polysemes

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Contextual Strength

- Grammatical constraints lead to immediate homing in
  - Lexical constraints
  - Thematic role assignment
- General context is weaker form of constraint
- When is general context info utilized?

Exp 3 – Overview

- Investigating whether effects of general context are delayed
- Manipulation of
  1. Context Bias (Metonymic-Biasing vs. Neutral)
  2. Verb-Type (Literal- vs. Metonymic-Selecting)

Exp 3 – Conditions

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<th>Neutral</th>
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<td>In Renaissance Era France, handwritten editions of books were illegally copied and sold.</td>
<td>In Renaissance Era France, illegal activities often went completely unpunished.</td>
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Voltaire was {duped/forged} by a petty criminal who was never brought to justice.
Exp 3 – Participants, Methods and Items

- Self-paced reading task (N = 48)
  - Context sentence as one block
  - Target sentence containing Subject-initial polyseme, 5 moving windows
- 24 items
  - Critical verbs matched for frequency and length
- Items normed for naturalness (N = 16)

Exp 3 - Results

- All effects observed on post-verbal region
- Main effect of Verb-Type
  - Penalty for literal sentences
- Metonymic context mitigated cost of processing figurative sense
- Main effect of Context
  - Penalty for Neutral Context

Exp 3 - Conclusions

- Metonymic biasing context mitigated cost of processing figurative sense
- Evidence that general context information has delayed effect
- Stronger constraints dominate weaker constraints

Subject As Agent Principle (SAP)

Provisionally assign the subject of a clause an agent thematic role, all else being equal.

Consistent with Partial Commitment (Frazier, 1999):
- Grammatically required to assign theta-roles
- Constrains the interpretation of the metonym
- Processor commits to literal sense only in subject position

General conclusions

- Processor uses SAP
  - SPR: penalty for processing Figurative sense when metonym is subject
  - Fill-in-the-blanks: fewer Figurative-selecting verbs when metonym is subject
- Weaker context information has delayed effect
  - SPR: cost for processing figurative sense reduced when general context supports figurative interpretation
General conclusions – homing in stage

- Grammatical constraints cause immediate homing in
  - Lexical (forge Voltaire)
  - Structural (SAP)
- Less constraining context info has delayed effect
- Strength of constraint determines immediacy of use

Future Directions

- Further exploration of SAP:
  - Does processor only make this assumption when literal sense is agentive?
  - Nouns not preferentially interpreted as subjects, e.g.
    - Spain was toured by the famous orchestra.
    - Spain was impressed by the famous orchestra.
- Further probing of General Context effect
  - Can more constraining contexts lead to more immediate homing in?

References


Questions?

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- Main effect of Context
  - Penalty for Neutral Context

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Underspecification model

Frisson & Pickering (1999)

**Literal:** My great-grandmother *met* Dickens

**Figurative:** My great-grandmother *read* Dickens