Generalized Event Knowledge in Logical Metonymy Resolution

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1. Logical Metonymy (LM)

(1) John began the book ⇨ John began **reading** the book
(2) John is a famous wrestler. He really enjoys a good fight
⇨ He enjoys **fighting** a good fight
(3) John is a wrestling fan. He really enjoys a good fight
⇨ He enjoys **watching** a good fight

- the interpretation of LMs involves the integration of a covert event
- how is this implicit knowledge retrieved?

2. Lexicon vs. world knowledge

The lexical hypothesis
(Pustejovsky 1995, McElree et al. 2001):

- type-mismatch (event-subcategorizing verb + entity-denoting object)
- qualia structure in the lexicon (book: reading OR writing)
- plausible, but not dynamic enough

The pragmatic hypothesis
(Fodor and Lepore 1998, De Almeida and Dwivedi 2008):

- dynamic inferences based on context and world knowledge
- not specified enough: what constraints apply?

3. An alternative hypothesis

Generalized event knowledge (GEK)
(McRae and Matsuki 2009):

knowledge of typical events, first and second-hand experience, available in our memory

- ***wash hair*** ⇨ shampoo, sink, bathroom, indoor
- ***wash car*** ⇨ hose, outdoor

- words in isolation immediately activate GEK
- words can rapidly combine in sentences to cue specific concepts that are relevant to GEK scenarios
- syntactic cues modulate expectations for certain aspects of GEK
- GEK can immediately modulate expectations for syntactic structure

Matsuki et al. (in press):

(1) Dana used the *hose* to wash her filthy **car.**	typical
(2) Dana used the *shampoo* to wash her filthy **car.**	atypical
(3) Dana used the *shampoo* to wash her filthy **hair.**	typical
(4) Dana used the *hose* to wash her filthy **hair.**	atypical

- (1) and (3) show shorter reading times and eye fixations at the patient position than in (2) and (4):
facilitation effect when expectations about "typical" washing scenarios are met
- different linguistic contexts tap into different GEK scenarios
- dynamic model

Research question:
can GEK account for covert event retrieval in Logical Metonymy?

4. Hypothesis: LM resolution is based on GEK

Expectations in LM resolution:

- Expectations in language processing (e.g. Altmann and Kamide 1999)
- *"the student began the book"* ⇨ building expectations about typical actions which students do with books (GEK)
- [typical ≠ plausible]

Arguments modulate expectations:

- dynamic model: influence of agent in LM resolution (Lapata et al. 2003)
- the arguments tap into the typical GEK scenario, leading expectations about the covert event (shorter RTs)
- verb-final dependent verb word order in German subordinate clauses

(1) *Der Konditor* begann die Glasur **aufzutragen**. The baker began the icing to spread.	typical
(2) *Das Kind* begann die Glasur **aufzutragen**. The child began the icing to spread.	atypical
(3) *Das Kind* begann die Glasur zu **essen**. The child began the icing to eat.	typical
(4) *Der Konditor* begann die Glasur zu **essen**. The baker began the icing to eat.	atypical

5. Experiment

Participants: 30 native German students

Materials: 24 sets of 4 sentences
(2 typical, 2 atypical)

materials retrieved with web norming studies
1. *"what do you typically do with X?"*
2. "*who does typically Y with X?*"

Task: self-paced reading with Yes/No comprehension questions

Design: 2-level factor
(typical vs. atypical condition)

6. Results and discussion

- RTs were recorded one word before and three words after the target
- no significant differences at patient (sentences identical across conditions to this point)
- main effect of typicality at the verb position
- no significant differences after the event

- manipulation of agent and patient ⇨ RTs at the sentence-final target verb position
- GEK can predict highly typical covert events in metonymy interpretation
- typical ≠ plausible (Matsuki et al. in press)

GEK	plausible, not typical	sel. restr. violations
production norms	not elicited	not elicited
expectations in comprehensions	not expected, but not anomalous	not expected, anomalous
not always easy to find in a corpus (Maxim of Quantity)	attested	not attested

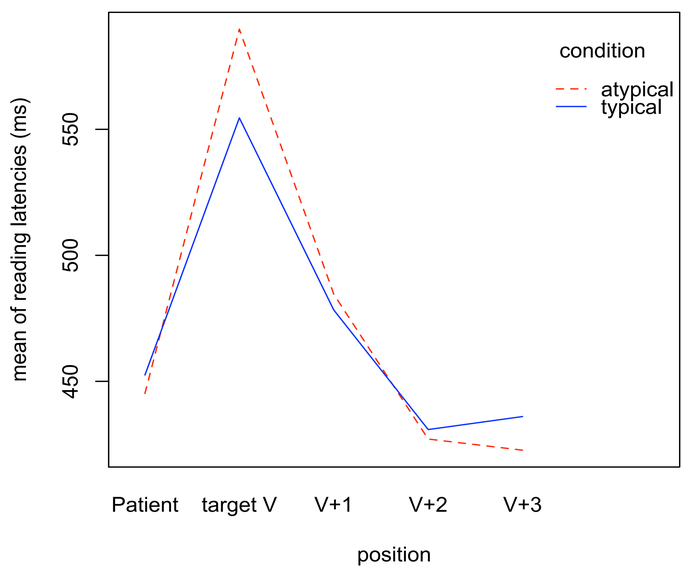
7. Conclusions

GEK model:
- broader than qualia-based theories
- dynamic - overcomes the rigidity of qualia-based account

LM:
- falls into a broader frame of phenomena of incremental interpretation
- to what extent is it "just another" instance of "normal", incremental sentence comprehension?

8. Future work

- repetition of experiment with eye-tracking
- tackling the problem of coercion: how can GEK predict coercion ("begin the book") vs. non-coercion ("begin the war")?
- distributional modelling of GEK-based experimental data (see also Lapata et al. 2003)



	Position	Patient	target V	V+1	V+2	V+3
	Example	Glasur icing	aufzutragen spread	und and	fing began	mit with
Latency (ms)	atypical	445	590	485	427	423
	typical	452	555	478	431	436
Difference (ms)		-7	35	7	-4	-13
F-test	$F_1(1,29)$	<1	4.65	<1	<1	1.17
	$F_2(1,47)$	<1	4.15	<1	<1	1.74
	p_1	0.60	0.039	0.56	0.80	0.29
	p_2	0.45	0.047	0.67	0.82	19

Bibliography

Altmann, G. T. M., & Kamide, Y. (1999). Incremental interpretation at verbs: Restricting the domain of subsequent reference. *Cognition*, 73, 247–264.

de Almeida, R. D., & Dwivedi, V. D. (2008). Coercion without lexical decomposition: Type-shifting effects revisited. *Canadian Journal of Linguistics*, 53(2/3), 301–326.

Fodor, J. A., & Lepore, E. (1998). The emptiness of the lexicon: Reflections on James Pustejovsky's The Generative Lexicon. *Linguistic Inquiry*, 29(2), 269–288.

Lapata, M., Keller, F., & Scheepers, C. (2003). Intra-sentential context effects on the interpretation of logical metonymy. *Cognitive Science*, 27(4), 649–668.

Matsuki, K., et al. (in press). Event-based plausibility immediately influences on-line language comprehension. *Journal of Experimental Psychology: Learning, Memory, & Cognition*.

McElree, B. et al. (2001). Reading time evidence for enriched composition. *Cognition*, 78, B17-B25.

McRae, K., & Matsuki, K. (2009). People use their knowledge of common events to understand language, and do so as quickly as possible. *Language and Linguistics Compass*, 3/6, 1417–1429.

Pustejovsky, J. (1995). *The generative lexicon*. MIT Press.