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Background & Motivation

Pronoun interpretation depends heavily on world knowledge (Winograd, 1972):

1. The city council denied the protesters a permit because they feared violence [they = city council]
2. The city council denied the protesters a permit because they advocated violence [they = protesters]

What about when the semantic context after the pronoun is bleached?

3. The city council denied the protesters a permit because they
 - a. were daxes.
 - b. blicketed.
 - c. gorped. permit because they gorped [they = protesters]

These bleached contexts are used to study pronoun biases such as implicit causality (Hartshorne & Snedeker, 2013).

- Assumption: this bleached material has no effect on interpretation.
- But: Hartshorne & colleagues (2015) using sentences like (3b) got more object interpretations than Hartshorne & Snedeker (2013), who used contexts like (3a).

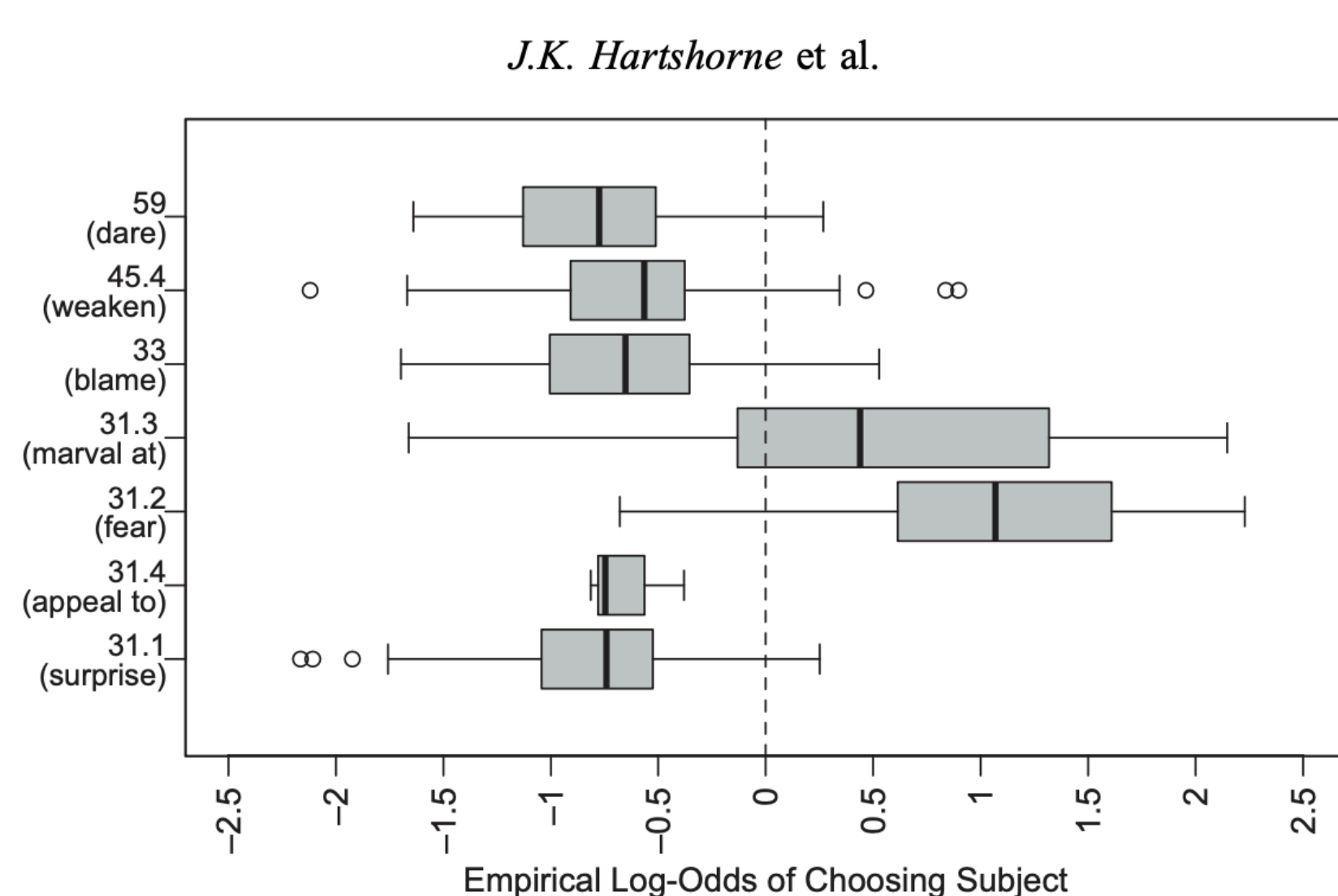
Why more investigation is needed

- Unexpected finding across different studies
- Manipulations of pronoun biases often interact with syntactic (Levin) verb class

Example of verb class: Verbs on left can appear in syntactic frames on right (from VerbNet):

ATOMIZE	BREAK	BREAK_APART	BREAK_DOWN	BREAK_UP	CHIP	CLEAVE	CRACK	CRASH	CRUMBLE	CRUSH	NP VP
DISSOLVE	FISSURE	FRACTURE	FRAGMENT	GRANULATE	POP	REND	RIVE	RIP	RUPTURE	SHATTER	NP VP (Intransitive)
SHRED	SLIVER	SMASH	SNAP	SPLINTER	SPLIT	TATTER	TEAR				NP VP (Middle)
											NP VP (Adv Middle)
											NP VP (Resultative)
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											NP VP (Resultative)
											NP VP (Resultative)

Pronoun biases by verb class (Hartshorne et al., 2015):



Method

Task: choose continuation for sentence:

- Albert frightened Beatrice because...
 - option 1: he is a dax
 - option 2: she is a dax.

Four conditions:

- noun: *he is a dax vs she is a dax*
- intransitive verb: *he blicketed vs she blicketed*
- transitive verb: *he gorped her vs she gorped him*
- baseline:** *he... vs. she...*

503 verbs from 8 verb classes.

365 subjects each judged 32 items (chosen randomly)

- 62 additional subjects excluded for failing catch trials

Results and Discussion

Log-odds of choosing subject (averaged over verbs):

Levin Class	baseline	noun	intrans	transitive
30.1	-0.12	-0.03	-1.63	0.14
31.1	1.34	1.32	1.16	1.08
31.2	-0.78	-0.82	-0.77	-0.44
31.3	-0.28	-0.37	-0.91	-0.05
31.4	1.70	1.03	0.41	0.07
33	-0.45	-0.32	-0.95	-0.49
45.4	0.39	0.60	-0.02	0.42
59	0.94	0.80	0.46	0.70

+: subject bias
-: object bias

diff from baseline: 0.04 -0.36 -0.29

Compared with baseline:

- noun condition is maybe subject-biased (p=.07)
- intransitive condition is object-biased (p=.02)
- transitive condition is object-biased (p=.05)

No interaction with verb class.

Even semantically-bleached sentence endings show Winograd effects.

- does not require reinterpreting prior results (mostly focused on comparison of verbs)
- Raises questions about theories where pronoun interpretation is based on event representations (bleached event representations??)

Bibliography

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Future Directions

- Confirm similar effects for other pronoun biases (e.g., implicit consequentiality)
- Test potential theories
 - ex: could participants be averaging over (marginalizing out) possible events consistent with continuation?