

Processing Explains Superiority Effects

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In a nutshell

The existence of Superiority violations and the inability of grammar-based accounts to accommodate them leads us to suggest a processing-based model, in which Superiority effects as well as Superiority violations arise from the interaction of several processing preferences. These preferences are well-motivated from previous work on other unbounded dependencies (e.g. Gibson, 2000).

Superiority Effects

• It has been observed that (1) is better than (2). In fact, (2) has been labeled ungrammatical in the Linguistics literature.

(1) *Who* ___ saw what?

(2) **What did who* see ___?

Grammar-based Accounts

Researchers in Linguistics have suggested that Superiority Effects result from innate principles of human grammar. These grammar-based accounts argue:

A dependency between a filler and its gap may not be interrupted by a *wh*-phrase syntactically superior to the gap.

(Chomsky 1973, 1995; Pesetsky 2000)

D-linking

Pesetsky (1987) proposes a non-scopal analysis of *which*-NPs in order to allow for exceptions like:

(3) *Which book did which man read* ___ ?

(4) *To which organization did which people give money* ___ ?

This account preserves Superiority as an inviolable constraint on movement by stipulating:

• *which*-phrases are not scope-taking operators and hence do not undergo movement and are immune to Superiority; rather, *which*-phrases are interpreted via unselective binding (just as indefinite NPs).

• Discourse-linking is somehow correlated with the non-scopal *wh*-semantics.

Problems with D-linking

• *which*-NPs do not consistently have a range of associated answers that is more salient than for other *wh*-phrases. For example, the range of books in (5) is not any more salient than in (6).

(5) *There are so many books in this library! I wonder which book I should read.*

(6) *There are so many books in this library! I wonder what I should read.*

• No explanation of the fact that *which*-NPs exhibit exactly the same range of possible interpretations as other *wh*-expressions:

- they can give rise to independent questions

Which book did you read ___ ?

- multiple independent questions

Which book did you send ___ to which reviewer?

- functional questions

Which book did each author like best ___ ? (Answer: *His own.*)

• Elements treated via unselective binding (indefinites and D-linked phrases) do not have uniform semantic properties.

• No precise formulation of or independent motivation for D-Linking analysis.

• Superiority-violating multiple *wh*-phrase examples are treated via a further 'non-explanatory' stipulation (the principle of Minimal Compliance).

Superiority violations beyond D-Linking

1. Triple *wh*-questions

Triple *wh*-questions are known to violate Superiority (e.g., Bolinger 1978)

- (7) a. *Who* ___ took what where?
b. *What did who* take ___ where?
c. *Where did who* take what ___ ?

2. Reprise questions

- A: What did Przemyslaw see?
B: What did WHO see? [Echo Reprise (rising intonation)]
A: What did he see?
B: What did WHO see? [Reference Reprise (falling intonation)]

Researchers have always recognized so-called reprise-questions. They are traditionally argued to have "extragrammatical" or "metalinguistic" status. D-linking fails to countenance these superiority-violating reprise uses, whose systematicity has been demonstrated by Ginzburg and Sag (2000).

3. Superiority violations from the internet

A: *did you know that there are no licensing laws or sales taxes in andorra?*

B: *I did not. What did who bring back?*

<http://www.youtube.com/watch?v=UWUWUWUWUW>

We watch for a few more minutes as the recriminations begin: what did whom say and what, did did who hear ___? But already we are bored and fearful of the ensuing calm. [Tomato is Coming, by Crispin Oduobuk]

Although nothing on this planet (or any other) can compete with the utter horror that is cilantro! Where the heck did who the heck come up with adding that gawdawful weed to otherwise civilized hote-cue-zeen?

<http://www.youtube.com/watch?v=UWUWUWUWUW>

Rule 9(b) requires claimants only to particularize the nature of the underlying fraud -- when and where did who do what to whom?

<http://www.youtube.com/watch?v=UWUWUWUWUW>

What, do you think this is a game? What rules should who follow? This shitsandwich is a reality -- a competition for survival between all souls, Muslim, Jew, American...African.

<http://www.youtube.com/watch?v=UWUWUWUWUW>

I must have missed something. What did who do to Pierre Salinger?

<http://www.youtube.com/watch?v=UWUWUWUWUW>

• In sum, so called Superiority violations are not ungrammatical but rather *dispreferred*.

• We suggest that the interaction of four sources of processing complexity accounts for the observed preferences in *wh*-phrase order.

A Processing Model of WH-dependencies

I. More distance between filler and gap increases processing cost.

II. Fillers with less accessible referents increase processing cost.

III. Interveners with less accessible referents increase processing cost.

IV. WH-attachment ambiguity increases processing cost.

• How to derive preferences for *wh*-phrase ordering (i.e. Superiority effects *and* violations)? **Increased processing cost incurs reduced acceptability.**

(e.g., Featherston 2005; Fanselow & Frisch, in press)

Experiments

Ongoing experiments provide preliminary support for our model. Our immediate goals are to:

• Test the four preferences.

• Examine the relative strength of each of the preferences.

• Investigate the role of context on the accessibility of the *wh*-filler and interveners.

Predictions

I. Prefer short-distance dependencies

A filler should be as close to the gap as possible:

Which student ___ talked to Kim? \geq (is not worse than)

Which student did Kim talk to ___ ?

Preserving the filler and looking for an argument position to associate it with is cognitively demanding. Encountering a new filler exacerbates this. The processor, for however short a time, may be actively looking for two gaps for two distinct fillers, yielding the following prediction:

Which student ___ talked to who? \geq

Who did which student ___ talk to ___ ?

This principle competes with the preference for greater descriptive content (see Principle II).

II. Prefer more accessible fillers

In accordance with the processing literature on accessibility of referring expressions (e.g. Ariel 1990; Warren & Gibson 2002), we suggest that more salient *wh*-fillers are easier to process. However, *wh*-expressions occur without a specified, identifiable referent already in mind. Rather the less complex set of possible referents of a *wh*-expression is, the more accessible it is. Thus, increasing the descriptive content of the *wh*-filler *ameliorates* the processing difficulty:

Which book did who read? \geq

What did who read?

Note that often *wh*-NPs with greater descriptive content are also further from the gap (see Principle I):

What book on the Civil War did who read? \geq

What book did who read?

III. Prefer more accessible interveners

Best interveners refer to maximally accessible entities in the common ground:

I wonder which book you read. \geq

I wonder which book a man read.

Minimal pairs differing only in the status of the intervening *wh*-phrase show a preference for *wh*-phrases with higher accessibility:

I wonder which book which student read. \geq

I wonder which book who read.

I wonder what results what lecturer presented. \geq

I wonder what results who presented.

IV. Prefer syntactically unambiguous *wh*-phrase sequences

Ambiguities that arise when the second *wh*-phrase could also be interpreted as a modifier of the first are responsible for contrasts like the following:

I wonder what clown which child found most fascinating. \geq

I wonder what toy which child found most fascinating.

Conclusion

We propose a treatment of multiple *wh*-questions based on processing-related preferences instead of grammatical constraints.

The proposed processing preferences are grounded in general considerations of memory and complexity in real-time language processing.

Our model predicts Superiority effects to be graded. The higher the processing costs of a *wh*-question the more difficult and therefore less acceptable it will be.

This prediction is in accordance with the corpus data presented above. Ongoing experiments will provide further testing of the model as well as the relative weight of each of the suggested processing preferences.

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