

The Processing of Backward Sluicing

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1. Introduction: Backward Sluicing
2. Experiment 1: Active Antecedent Search in Backward Sluicing
3. Experiment 2: Antecedent Search and Islands
4. Discussion

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(Backward) Sluicing

Antecedent

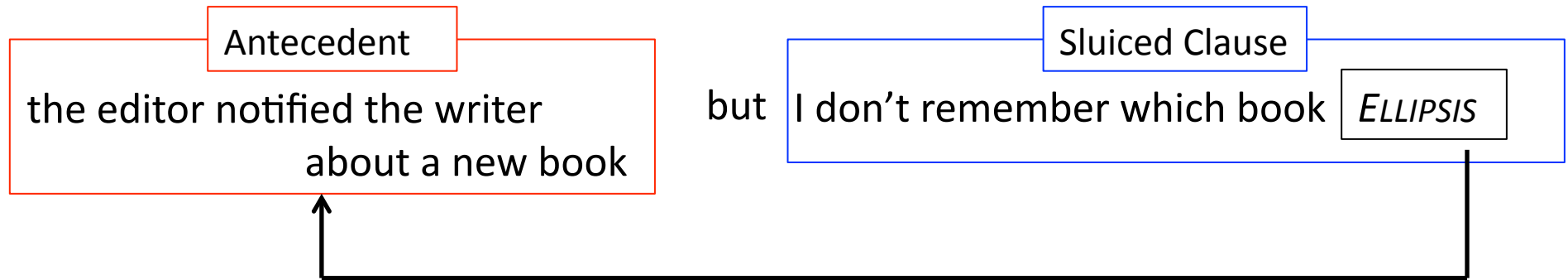
the editor notified the writer
about a new book

Sluiced Clause

but I don't remember which book

ELLIPSIS

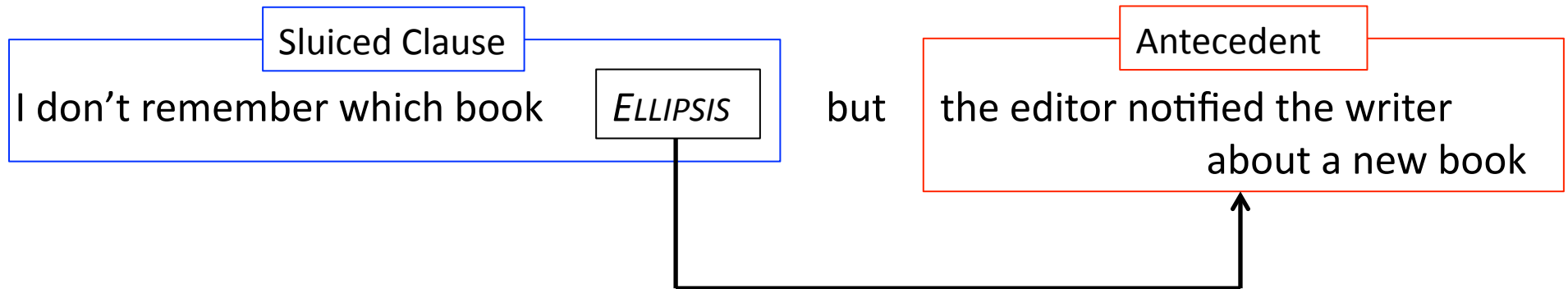
(Backward) Sluicing



-
- A clausal portion of the sentence is omitted (= **Ellipsis**)
 - The wh-phrase normally has the corresponding **indefinite phrase**.
 - The content of the **ellipsis** must be **recovered/copied** from the **antecedent**.
 - Any clause that can supply an appropriate content, can be an antecedent.

In the online processing, the parser must 'find' the antecedent for the ellipsis.

(Backward) Sluicing



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The Problem of Antecedent Search

Q: How does the parser find the antecedent for the ellipsis?

- For an ellipsis, there are in principle multiple possible antecedents

I don't remember which book ELLIPSIS but ...

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I don't remember which book

ELLIPSIS

but ...

the editor notified the publisher
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I don't remember which book

ELLIPSIS

but ...

the editor notified the publisher
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because the famous write wrote
a new book

The Problem of Antecedent Search

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I don't remember which book

ELLIPSIS

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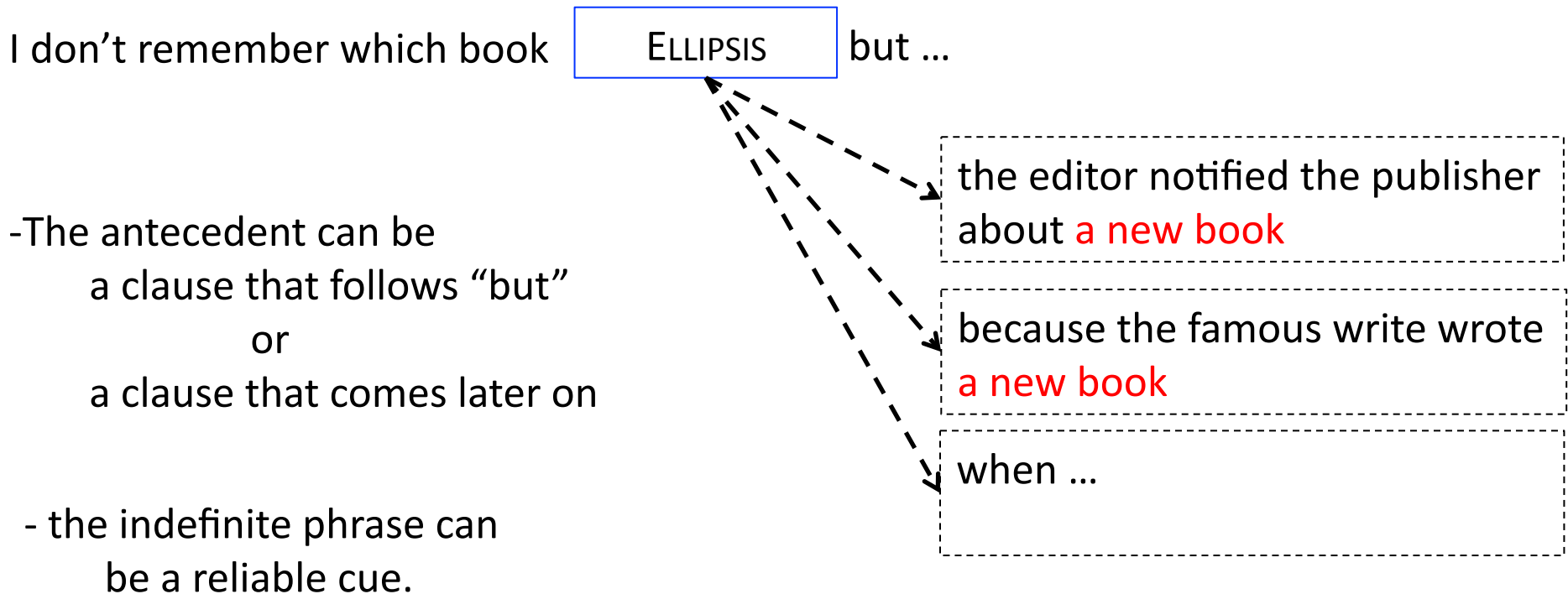
because the famous write wrote
a new book

when ...

The Problem of Antecedent Search

Q: How does the parser find the antecedent for the ellipsis?

- For an ellipsis, there are in principle multiple possible antecedents



Two possible strategies

I don't remember which book, but the editor notified the publisher about a new book

Two possible strategies

I don't remember which book, but the editor notified the publisher about **a new book**

Delay Strategy

- An indefinite phrase can tell that the clause that contains it is likely to be the antecedent for the ellipsis.
- The parser does not start 'recovering' the content of the ellipsis before it finds **a decisive information such as an Indefinite phrase.**

Two possible strategies

I don't remember which book, but the editor notified the publisher about a new book

Delay Strategy

- An indefinite phrase can tell that the clause that contains it is likely to be the antecedent for the ellipsis.
- The parser does not start 'recovering' the content of the ellipsis before it finds **a decisive information such as an Indefinite phrase.**

Active Strategy

- The parser starts searching for the antecedent upon encountering the ellipsis site
- The parser assumes that **the closest clause as the antecedent** for the ellipsis

Two possible strategies

- Delay strategy

Two possible strategies

- Delay strategy

I

Two possible strategies

- Delay strategy

I don't

Two possible strategies

- Delay strategy

I don't know

Two possible strategies

- Delay strategy

I don't know **which**

Two possible strategies

- Delay strategy

I don't know **which book**

Two possible strategies

- Delay strategy

I don't know **which book** but

Two possible strategies

- Delay strategy

I don't know which book

!!
but

A clause is missing!

Two possible strategies

- Delay strategy

I don't know which book

Ellipsis

but

A clause is missing!

Two possible strategies

- Delay strategy

I don't know which book Ellipsis but the

Two possible strategies

- Delay strategy

I don't know which book Ellipsis but the editor

Two possible strategies

- Delay strategy

I don't know which book Ellipsis but the editor notified

Two possible strategies

- Delay strategy

I don't know which book Ellipsis but the editor notified the

Two possible strategies

- Delay strategy

I don't know which book Ellipsis but the editor notified the publisher

Two possible strategies

- Delay strategy

I don't know which book Ellipsis but the editor notified the publisher about

Two possible strategies

- Delay strategy

I don't know which book Ellipsis but the editor notified the publisher
about a new book.

Two possible strategies


- Delay strategy

I don't know which book Ellipsis but the editor notified the publisher !!
about a new book.

Two possible strategies

- Delay strategy

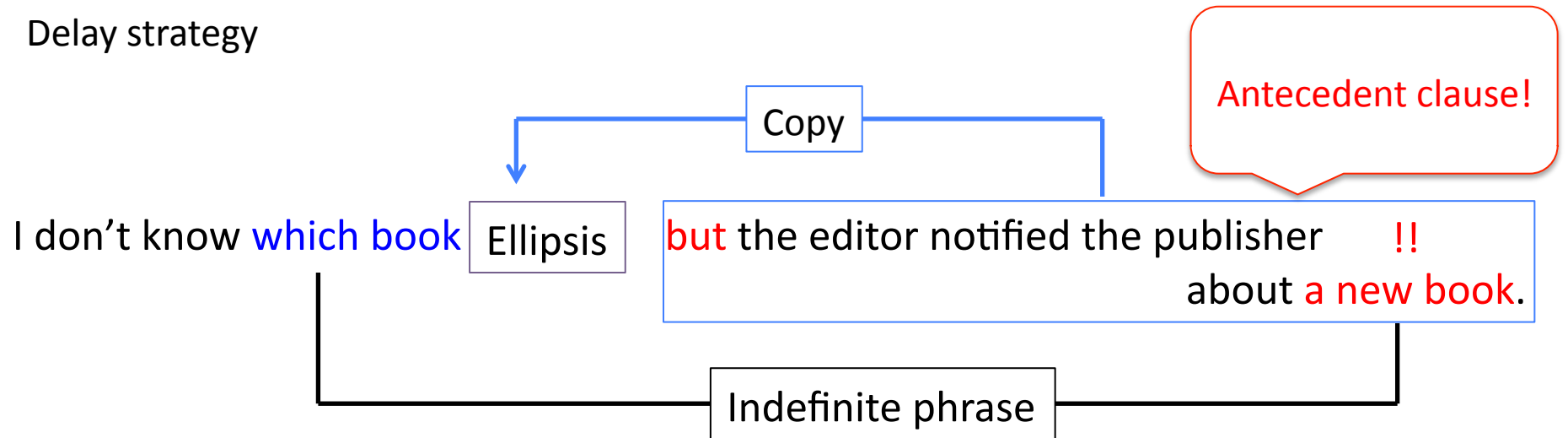
I don't know which book Ellipsis but the editor notified the publisher !!
about a new book.



The diagram illustrates the 'Delay strategy' by showing a sentence with an ellipsis. The text is 'I don't know which book Ellipsis but the editor notified the publisher !! about a new book.' The words 'which book' are in blue, 'Ellipsis' is in a box, 'but' is in red, and '!!' is in red. A horizontal line with vertical end caps connects 'which book' to 'a new book', with a box labeled 'Indefinite phrase' in the center.

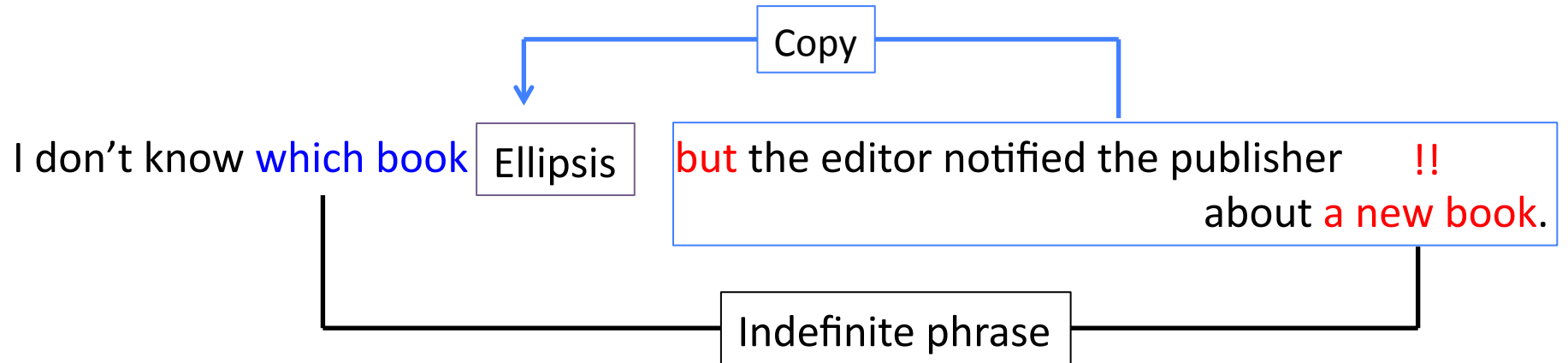
Two possible strategies

- Delay strategy



Two possible strategies

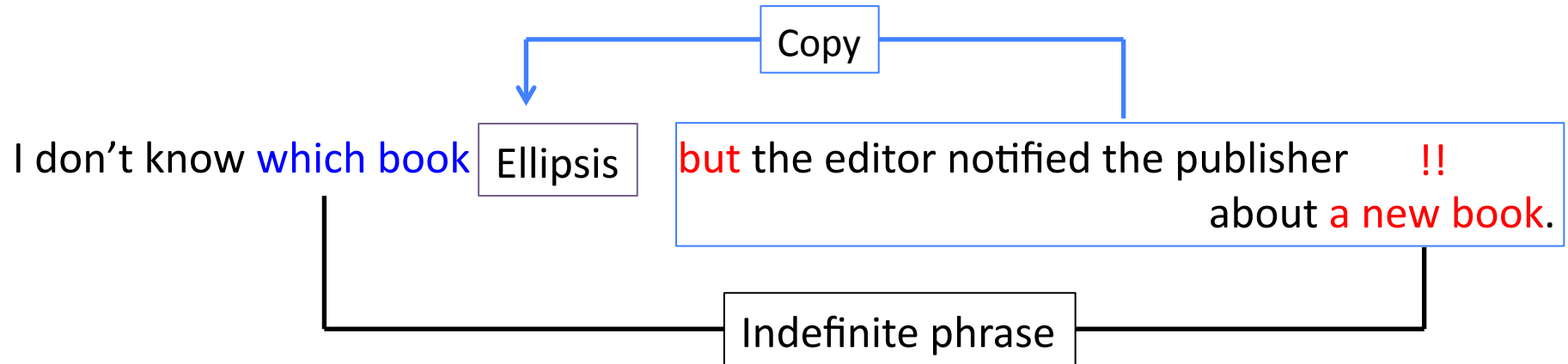
- Delay strategy



-
- Active Strategy

Two possible strategies

- Delay strategy

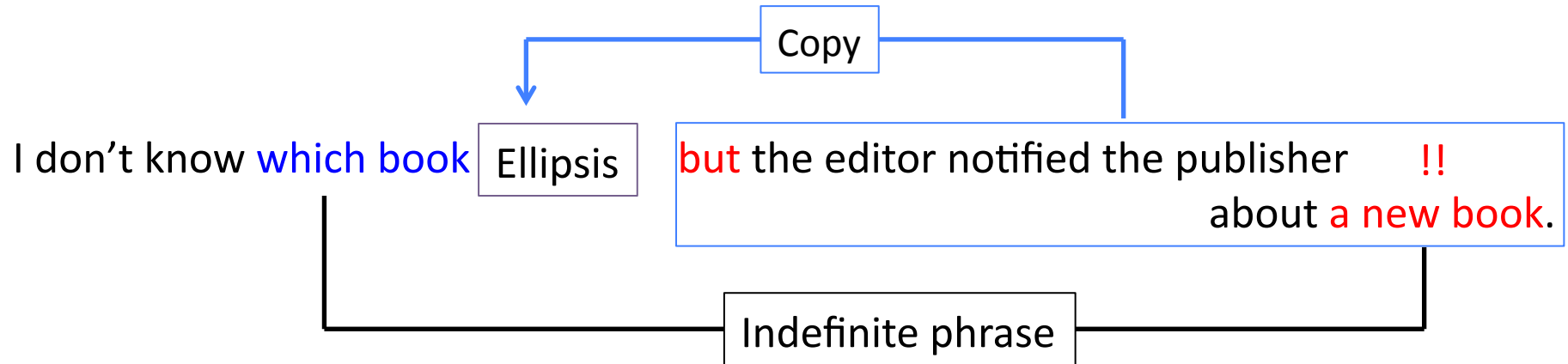


-
- Active Strategy

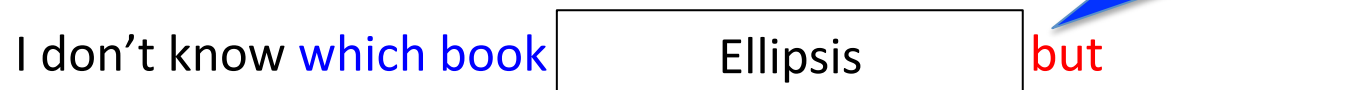
I don't know which book Ellipsis but

Two possible strategies

- Delay strategy

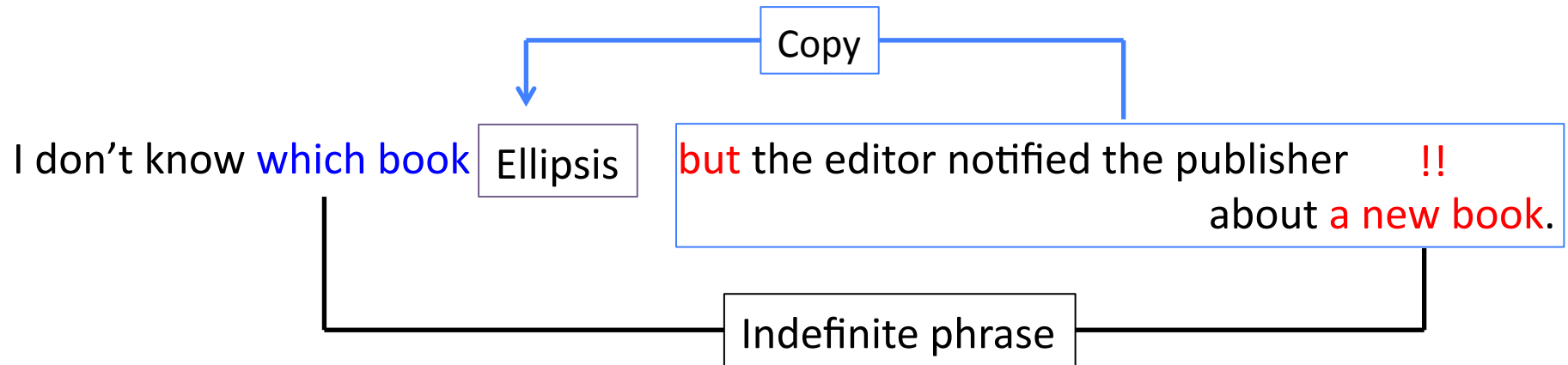


- Active Strategy



Two possible strategies

- Delay strategy

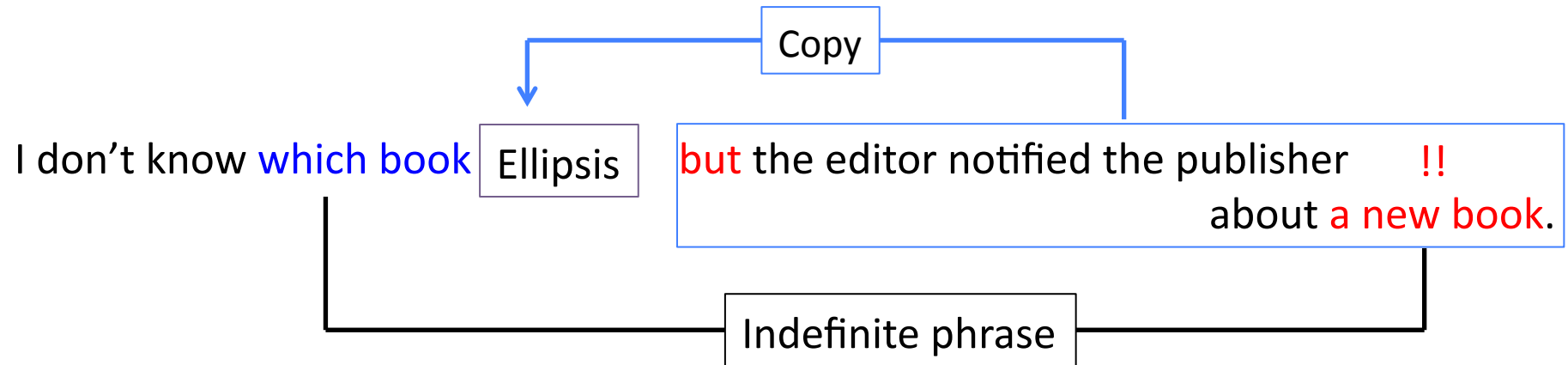


- Active Strategy



Two possible strategies

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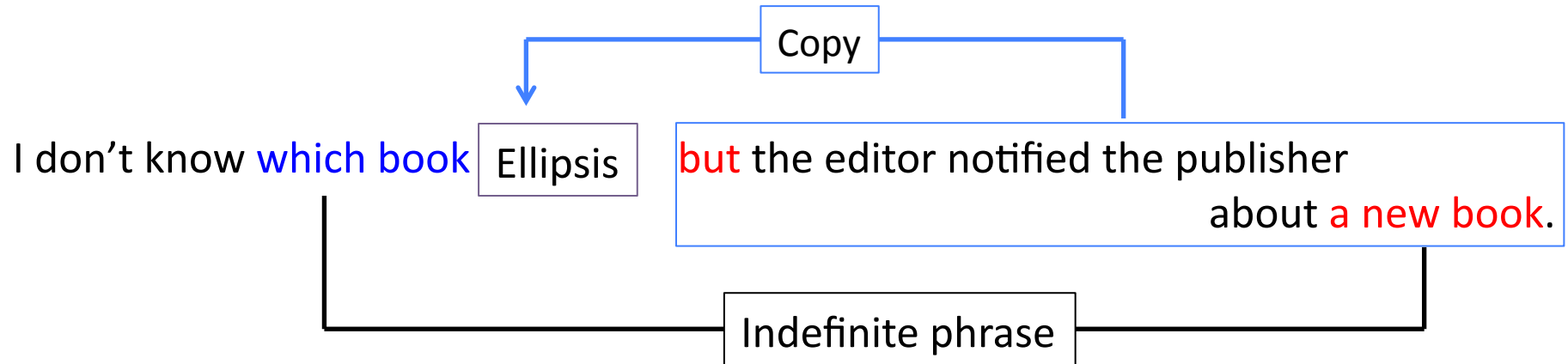


-
- Active Strategy

I don't know which book Ellipsis but the

Two possible strategies

- Delay strategy

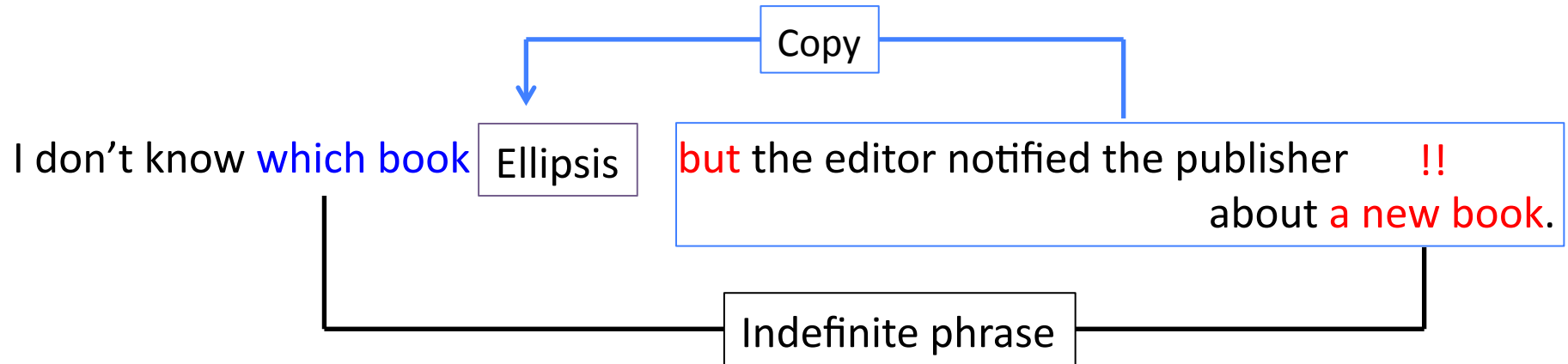


-
- Active Strategy

I don't know which book the but the

Two possible strategies

- Delay strategy

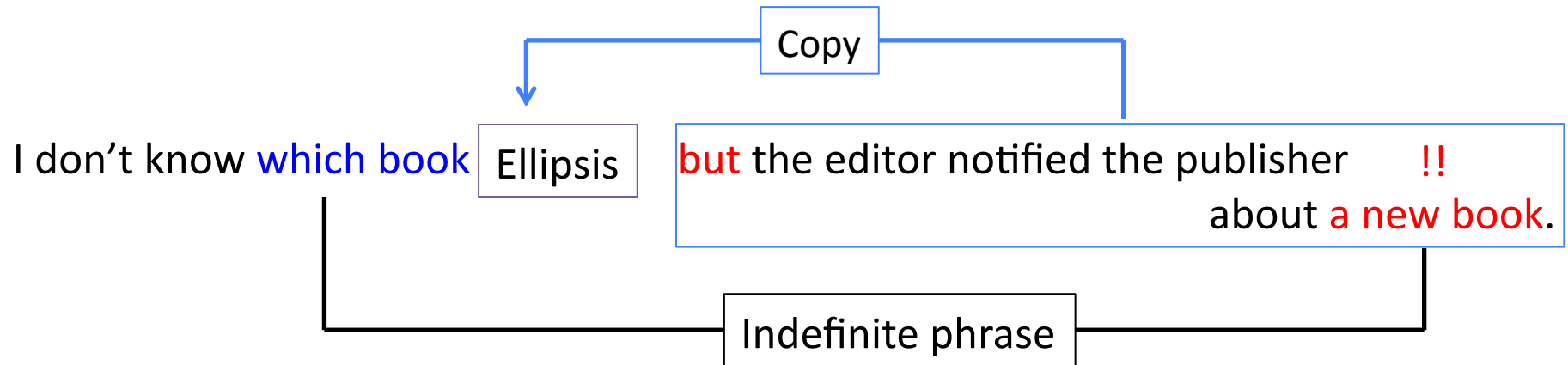


-
- Active Strategy

I don't know which book the but the editor

Two possible strategies

- Delay strategy

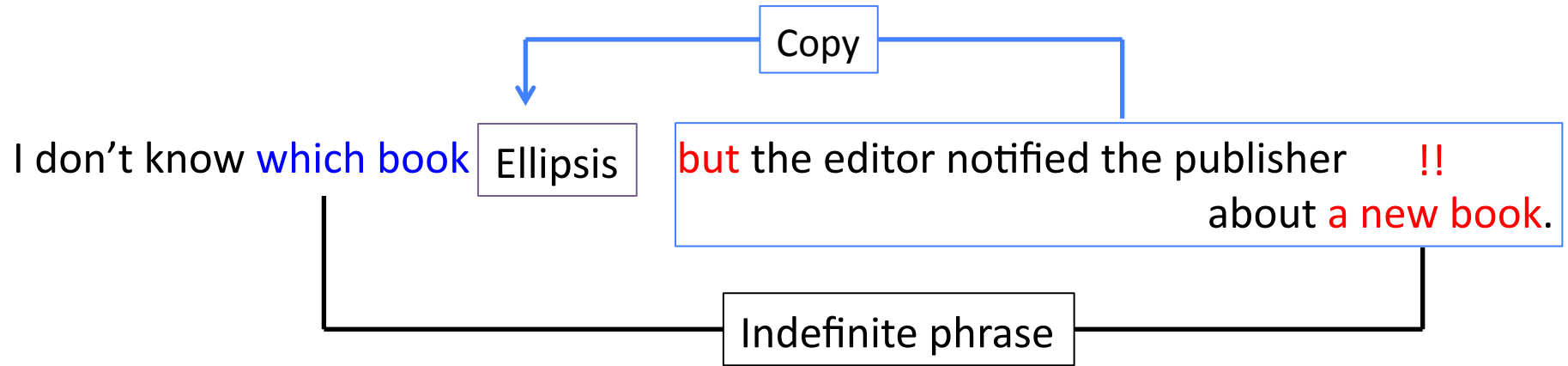


- Active Strategy

I don't know which book the editor but the editor

Two possible strategies

- Delay strategy

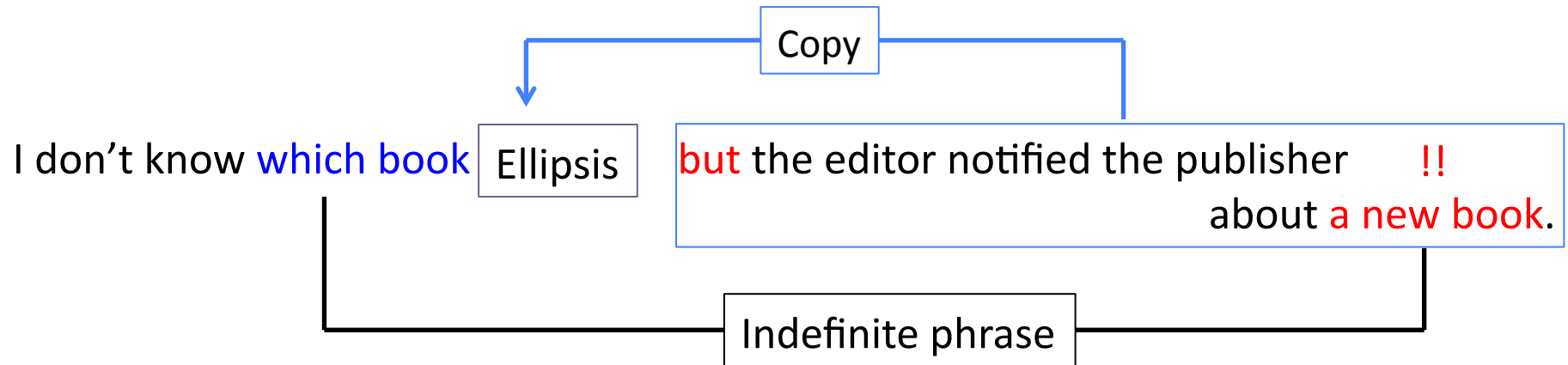


-
- Active Strategy

I don't know which book the editor but the editor notified

Two possible strategies

- Delay strategy

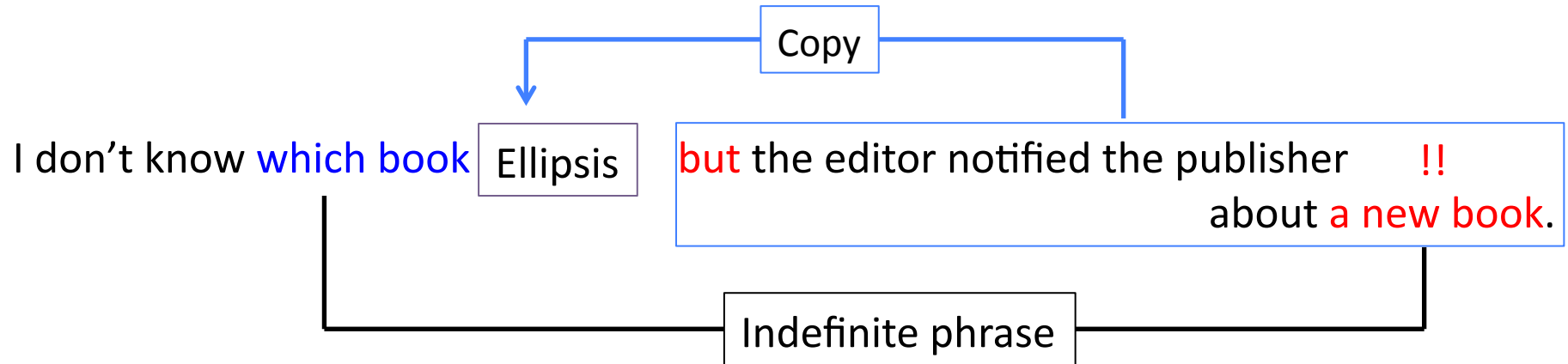


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Two possible strategies

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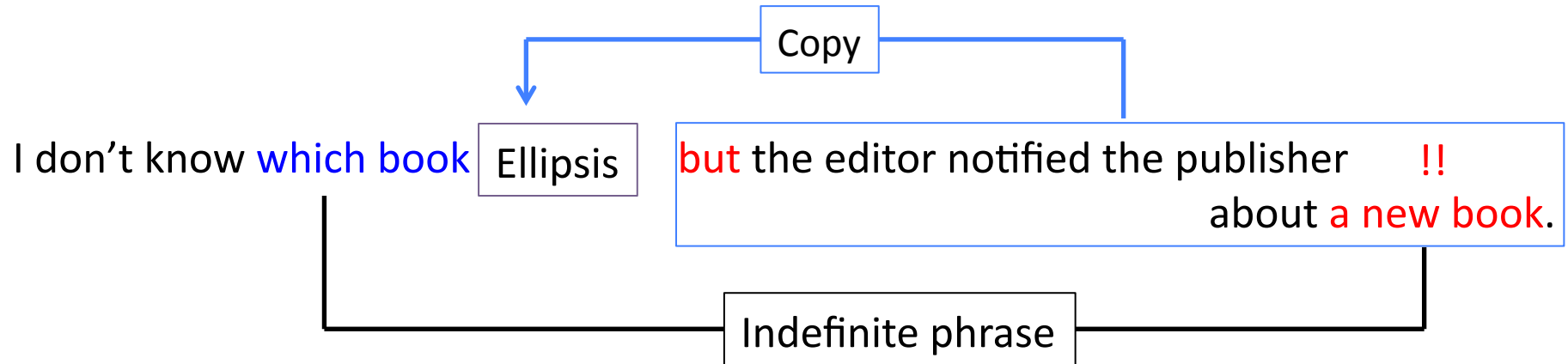


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I don't know which book the editor notified but the editor notified

Two possible strategies

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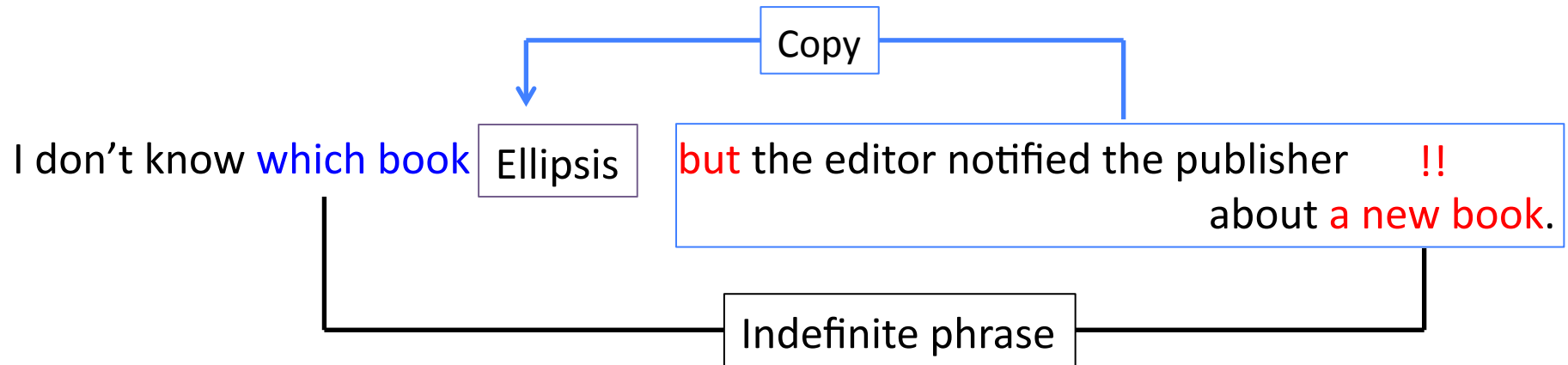


- Active Strategy



Two possible strategies

- Delay strategy



- Active Strategy



- Two important points:

- 1) Ellipsis resolution is carried out online, incrementally
- 2) Linking of wh-phrase with the verb is part of the ellipsis resolution process

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Experiment 1: Self-Paced Reading

Experiment 1: Self-Paced Reading

Sluicing

- (1)a. I don't know which **book**, but the editor **notified** the publisher about a new book...
- (1)b. I don't know which **author**, but the editor **notified** the publisher about a new author ...

Experiment 1: Self-Paced Reading

Sluicing

(1)a. I don't know which **book**, but the editor **notified** the publisher about a new book...

(1)b. I don't know which **author**, but the editor **notified** the publisher about a new author ...

Wh-Filler-Gap Dependencies

(1)c. I don't know which **book** the editor **notified** the publisher about __ ...

(1)d. I don't know which **author** the editor **notified** the publisher about __ ...

Experiment 1: Self-Paced Reading

Sluicing

(1)a. I don't know which **book**, but the editor **notified** the publisher about a new book...

Slow down

(1)b. I don't know which **author**, but the editor **notified** the publisher about a new author ...

Wh-Filler-Gap Dependencies

(1)c. I don't know which **book** the editor **notified** the publisher about __ ...

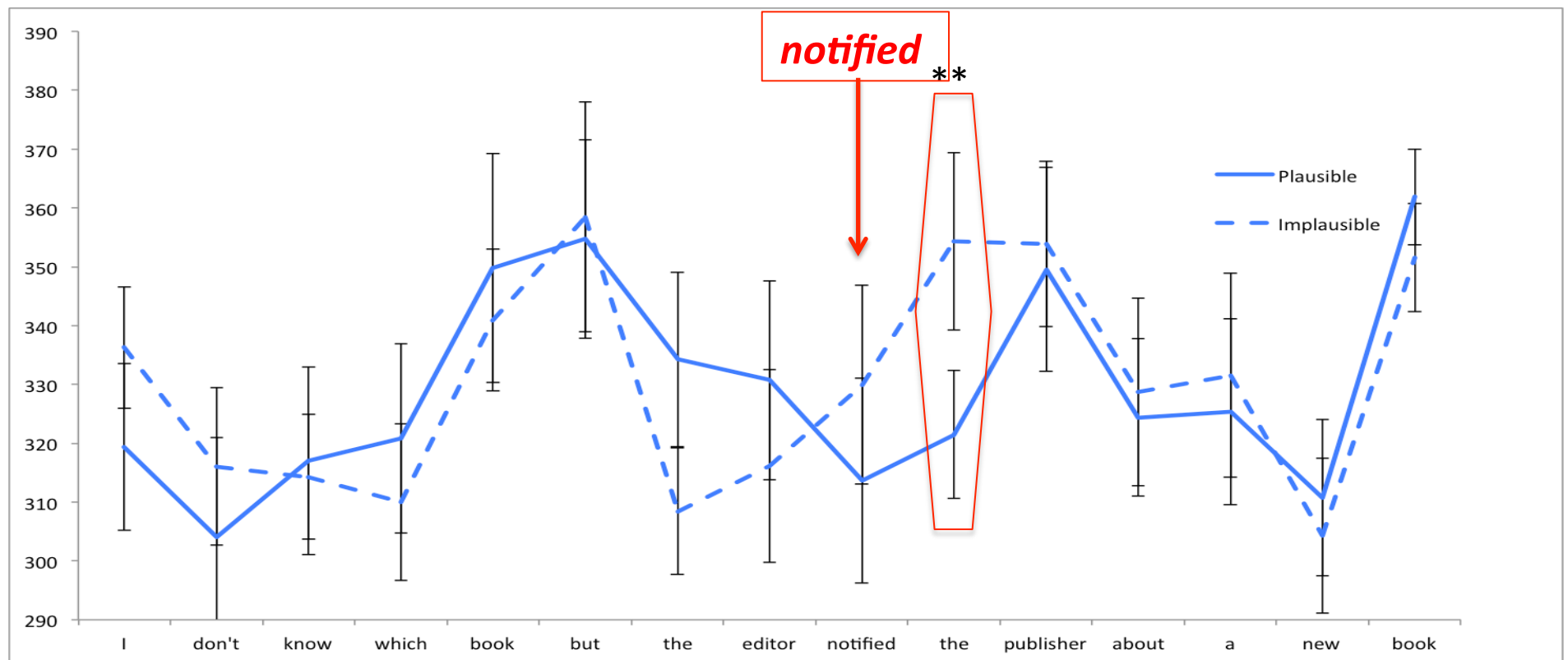
Slow down

(1)d. I don't know which **author** the editor **notified** the publisher about __ ...

2X2 design; 24 items; 40 participants

Experiment 1: Self-Paced Reading

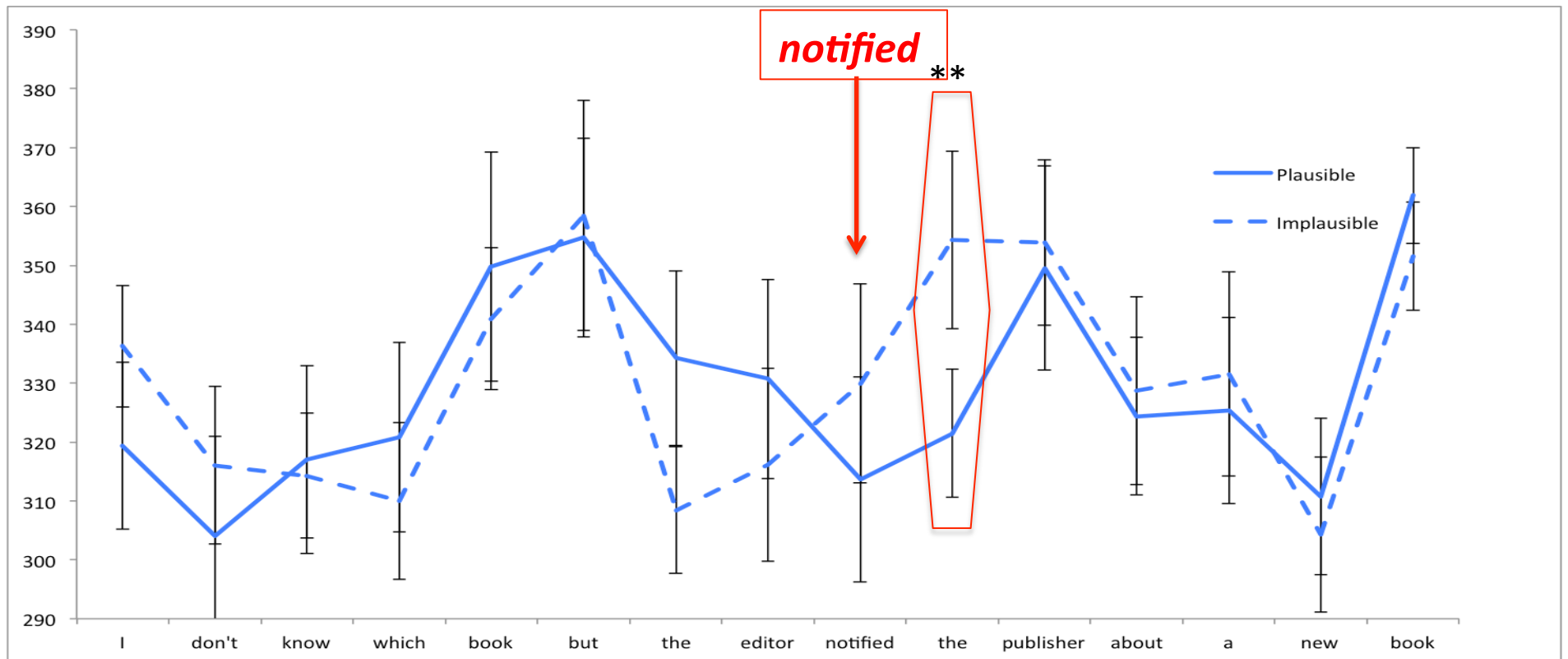
Sluicing



Experiment 1: Self-Paced Reading

Sluicing

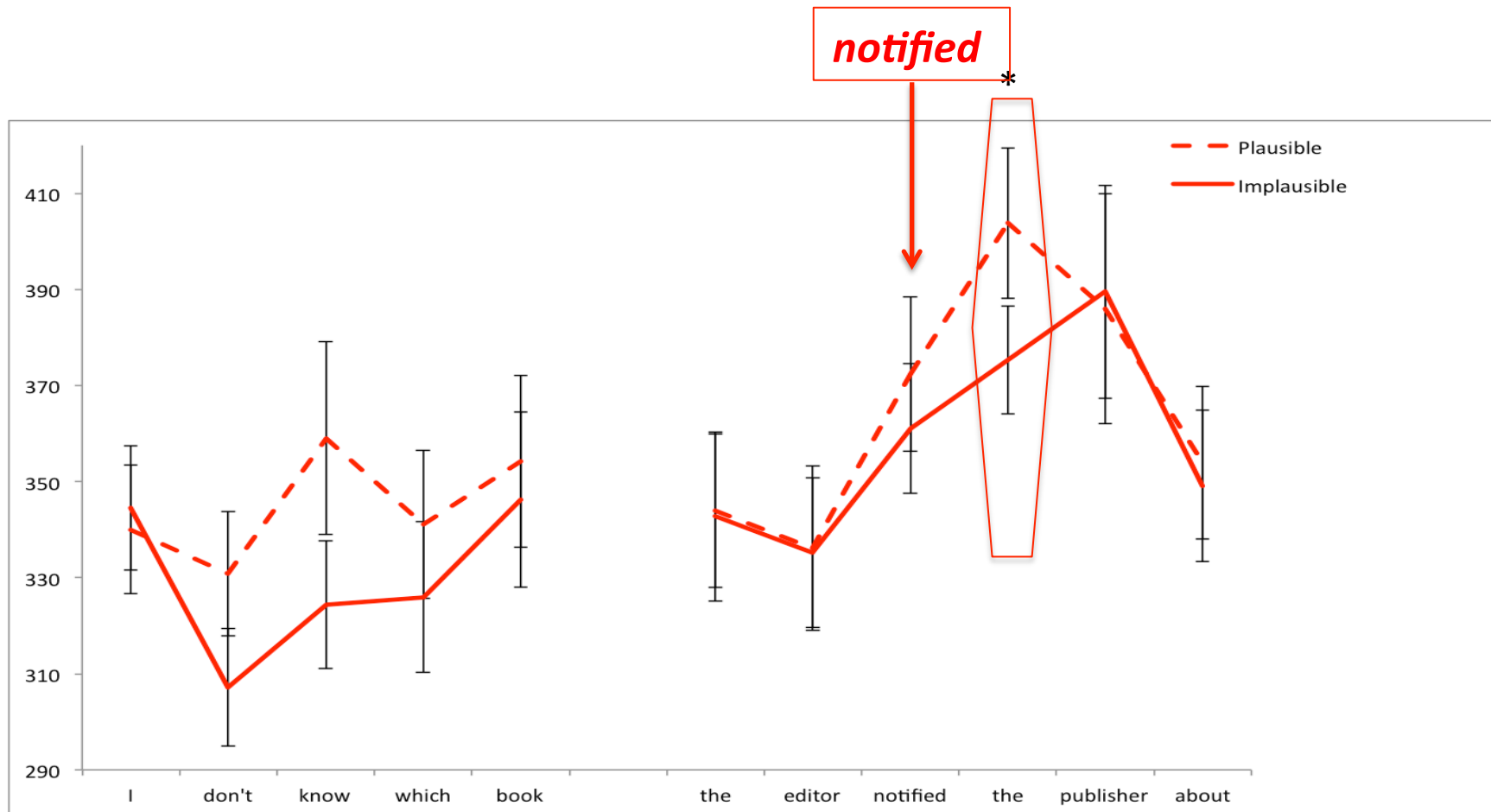
- The plausibility effect is observed right after the verb region
- The parser tries to connect the wh-phrases with the verb as soon as possible.

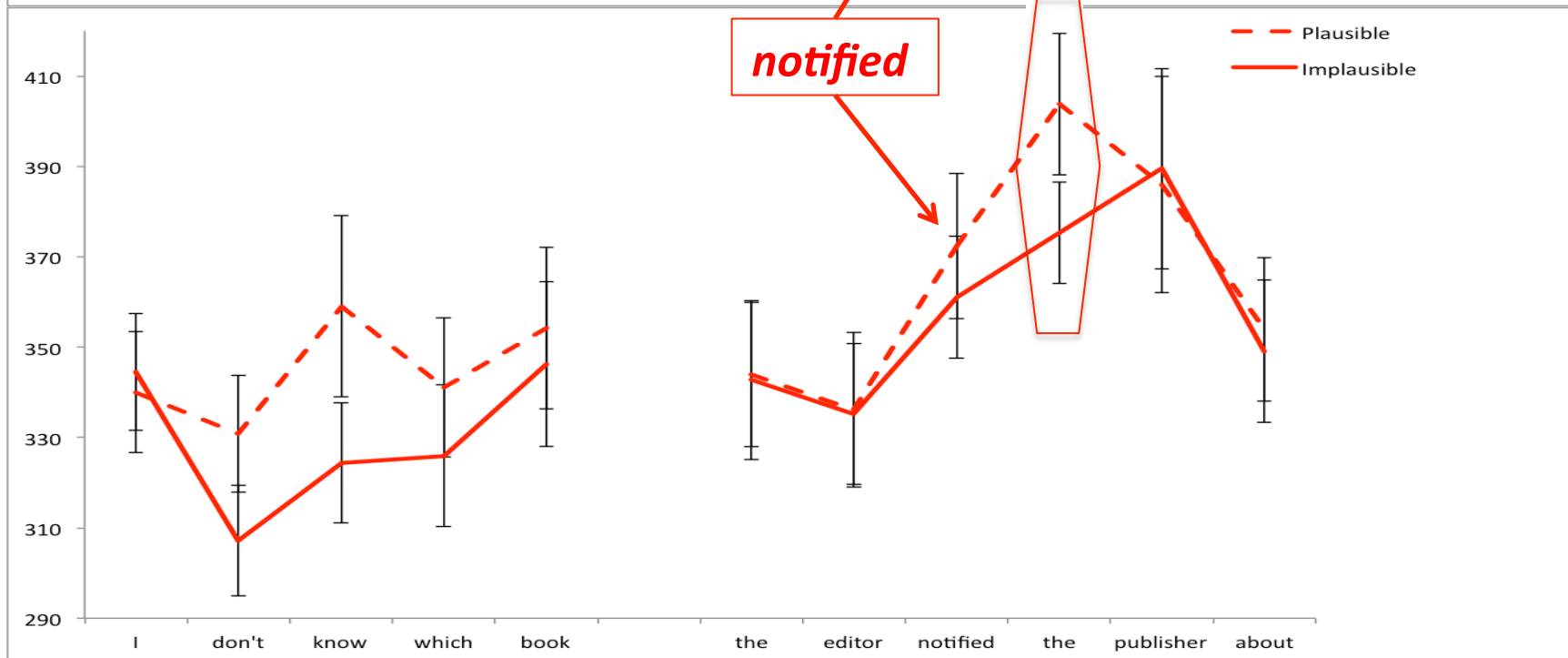
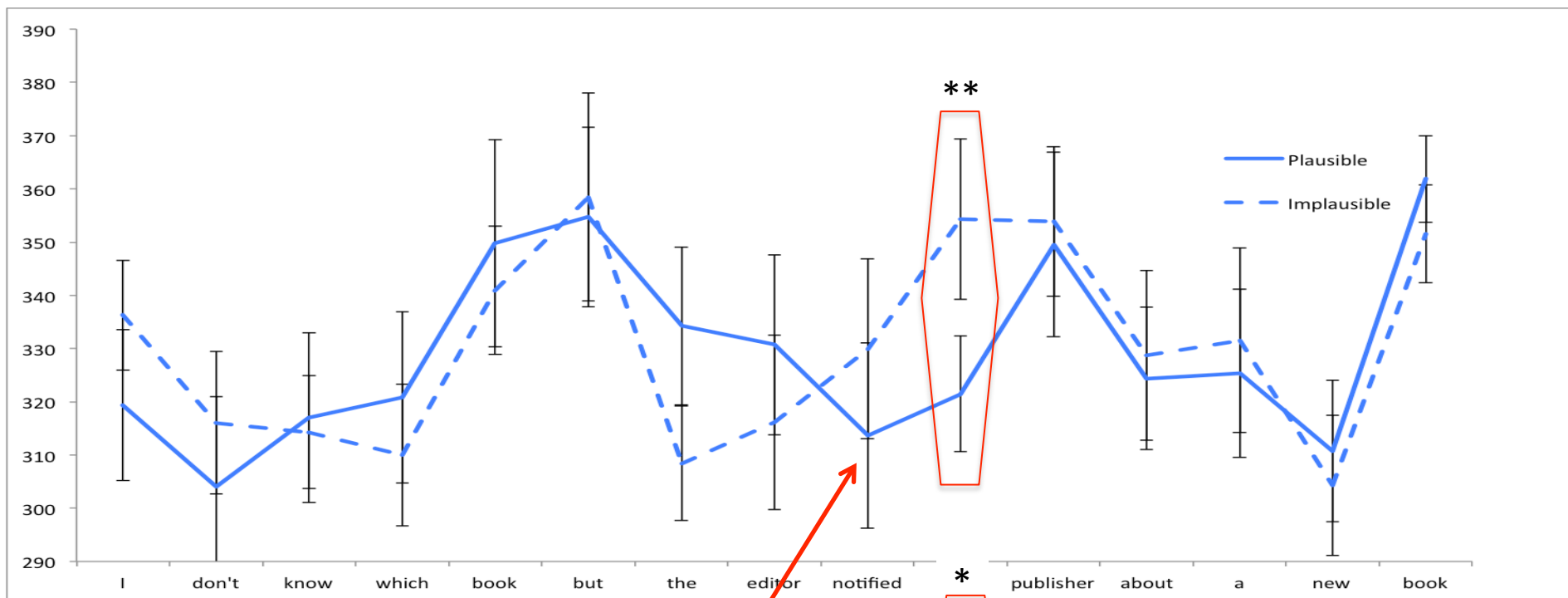


Experiment 1: Self-Paced Reading

WH-FGD

- The similar Plausibility effect is observed right after the verb region





Summary

- Both in Sluicing conditions and FGD condition, the plausibility penalty was observed
- The plausibility effect suggests that the parser tries to connect (and license/interpret) the wh-phrase as soon as possible
- The plausibility effect in Sluicing condition suggests that the parser actively searches for the antecedent clause, and the 'copying' (or ellipsis resolution) is going on online (on word-by-word basis)

Summary

- Both in Sluicing conditions and FGD condition, **the plausibility penalty was observed**
- The plausibility effect suggests that the parser tries to connect (and license/interpret) the wh-phrase **as soon as possible**
- The plausibility effect in Sluicing condition suggests that the parser actively searches for the antecedent clause, and **the 'copying' (or ellipsis resolution) is going on online (on word-by-word basis)**



1. The parser employs the very similar mechanism for the search for the licensing verb for Wh-phrase in Sluicing and WHFGD. (cf. Gullifer 04)
2. Like other cases (WhFGD (Stowe 86, Phillips 06 A.O.) and Cataphoric Dependencies (Kazanina et al., 07)), Active Strategy is used also for ellipsis resolution.

Further Questions

- It seems that both in sluicing and WhFGD the **parser actively forms a dependency** between the wh-phrase and the licensing verb.
- We know that the **Wh-Verb/Gap dependency formation is constrained by islands:** The parser does not form a dependency across island domains.
- **Is the dependency formation in the processing of Sluicing also constrained by Islands?**

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2. Like other cases (WhFGD (Stowe 86, Phillips 06 A.O.) and Cataphoric Dependencies (Kazanina et al., 07)), Active Strategy is used also for ellipsis resolution.

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(Broadly) Two Approaches to Islands

Q. Is the dependency formation in the processing of Sluicing also constrained by Islands?

Sluicing

I don't know which book, but the editor that notified the publisher about

WhFGD

I don't know which book the editor that notified the publisher about

(Broadly) Two Approaches to Islands

Q. Is the dependency formation in the processing of Sluicing also constrained by Islands?

Sluicing

I don't know **which book** but **the editor that notified the publisher about** ...

Wh-phrase

Island domain

Licensing verb

WhFGD

I don't know **which book** **the editor that notified the publisher about** ...

- Very similar ingredients (wh-filler, islands, and licensing verb) in both constructions.
- Both shows active the search effect for the verb in non-island environment.
- Do islands block the wh-verb dependency formation?

(Broadly) Two Approaches to Islands

Q. Is the dependency formation in the processing of Sluicing also constrained by Islands?

Processing capacity/complexity approach

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Island effects = **Storage** + **Interveners** (+ **retrieval**)

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Which book... [NP **the editor** [CP **who** notified ___ ...]]

Too much!



The diagram illustrates a processing difficulty in a sentence. It starts with the phrase 'Which book...' in red. This is followed by a nested clause structure enclosed in a red dashed box: '[NP the editor [CP who notified ___ ...]]'. The words 'the editor' and 'who' are in blue, while 'notified' and '...' are in green. A black line connects the 'Which book...' phrase to the gap '___' in the nested clause. Below this line is a red-outlined box containing the text 'Too much!', indicating that the dependency is complex and difficult to process.

(Broadly) Two Approaches to Islands

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Processing capacity/complexity approach

Island effects = **Storage** + **Interveners** (+ **retrieval**)

Which book... [NP **the editor** [CP **who** notified ___ ...]]

Too much!

- The parser should not try to find the licenser of the Wh-phrase in an island

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Grammatical approach

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Grammatical approach

Island effects = violation of a formal constraint

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Which book... [NP **the editor** [CP **who** notified ...]]

Too much!

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Grammatical approach

Island effects = violation of a formal constraint

Which book... [**NP** the editor [who [**S** notified ...]]

Subjacency violation

(Broadly) Two Approaches to Islands

Q. Is the dependency formation in the processing of Sluicing also constrained by Islands?

Processing capacity/complexity approach

Island effects = **Storage** + **Interveners** (+ **retrieval**)

Which book... [NP **the editor** [CP **who** notified ...]]

Too much!

- The parser should not try to find the licenser of the Wh-phrase in an island

Grammatical approach

Island effects = violation of a formal constraint

Which book... [**NP** the editor [who [**S** notified ...]]

Subjacency violation

- Different structures are subject to different constraints
- Sluicing and WhFGD have different structure: **sluicing is not sensitive to islands**
- The parser tries to find the licenser of the wh-phrase in an island

Experiment 2: Self-Paced Reading

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Sluicing

(2)a. I don't know which **book**,

but the editor who notified the publisher about a new book recommended a new mystery novel...

(2)b. I don't know which **author**,

but the editor who notified the publisher about a new author recommended a new mystery novel...

Experiment 2: Self-Paced Reading

Sluicing

- (2)a. I don't know which **book**,
but the editor who **notified** the publisher about a new book recommended a new
mystery novel...
- (2)b. I don't know which **author**,
but the editor who **notified** the publisher about a new author recommended a new
mystery novel...

Wh-Filler-Gap Dependencies

- (2)c. I don't know which **book** the editor who **notified** the publisher about a new book
recommended __ ...
- (2)d. I don't know which **author** the editor who **notified** the publisher about a new author
recommended __ ...

2X2 design; 24 items; 40 participants

Experiment 2: Self-Paced Reading

Sluicing

(2)a. I don't know which **book**,

but the editor who **notified** the publisher about a new book recommended a new mystery novel... **Slow down**

(2)b. I don't know which **author**,

but the editor who **notified** the publisher about a new author recommended a new mystery novel...

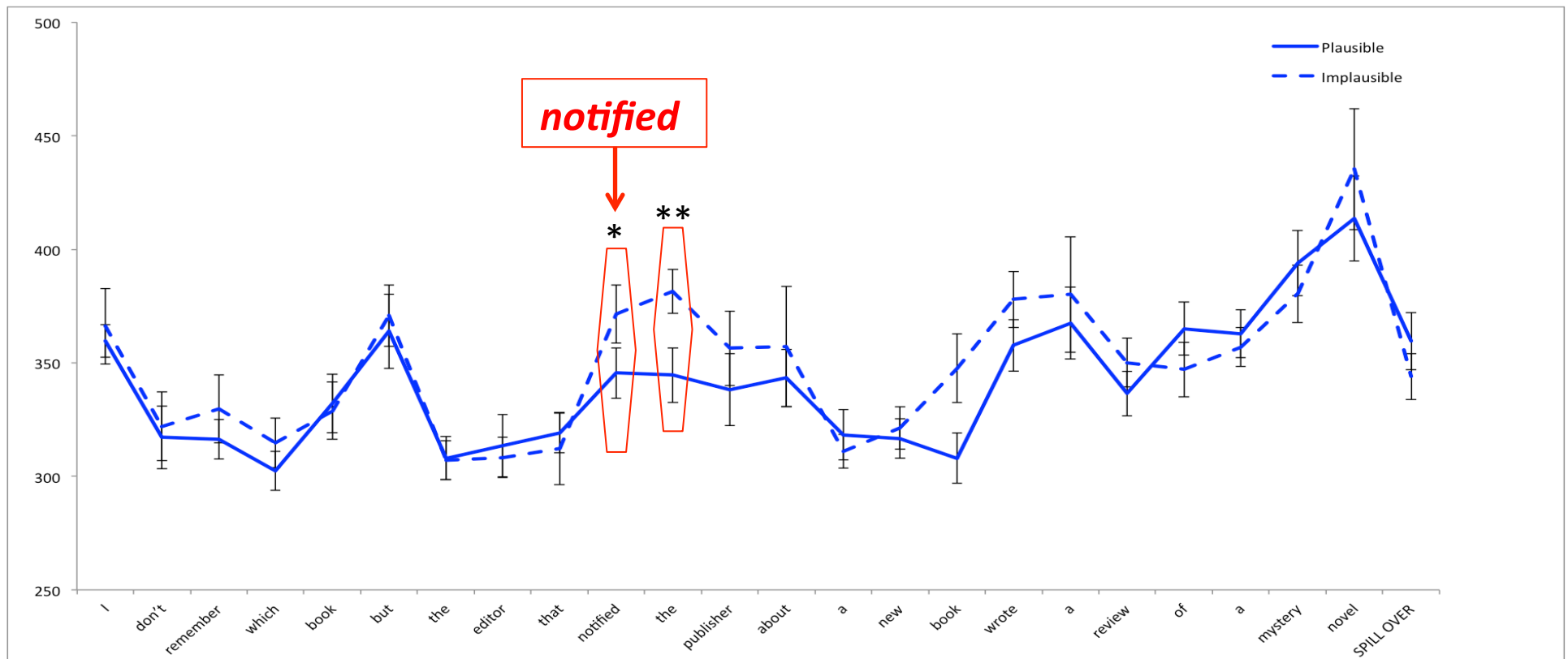
Wh-Filler-Gap Dependencies

(2)c. I don't know which **book** the editor who **notified** the publisher about a new book recommended __ ... **No Slow down**

(2)d. I don't know which **author** the editor who **notified** the publisher about a new author recommended __ ...

Experiment 4: Self-Paced Reading

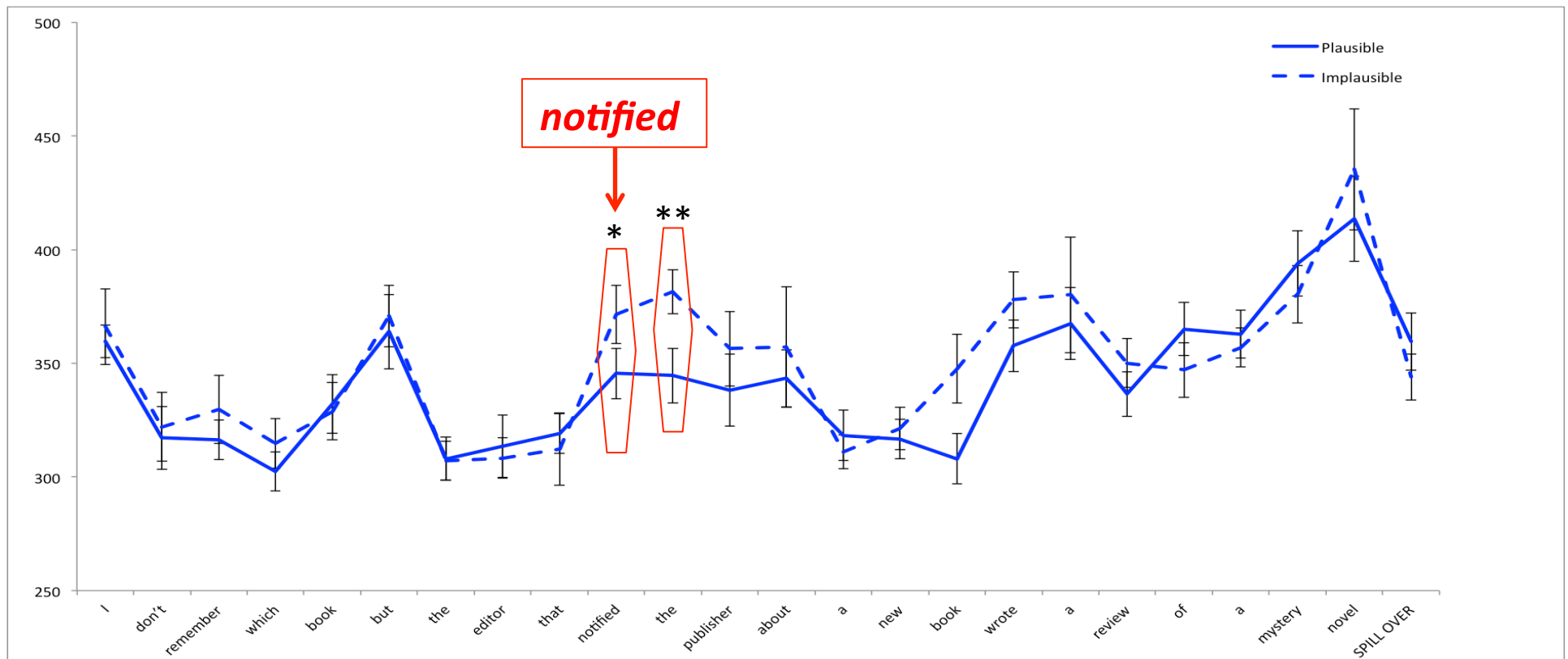
Sluicing



Experiment 4: Self-Paced Reading

Sluicing

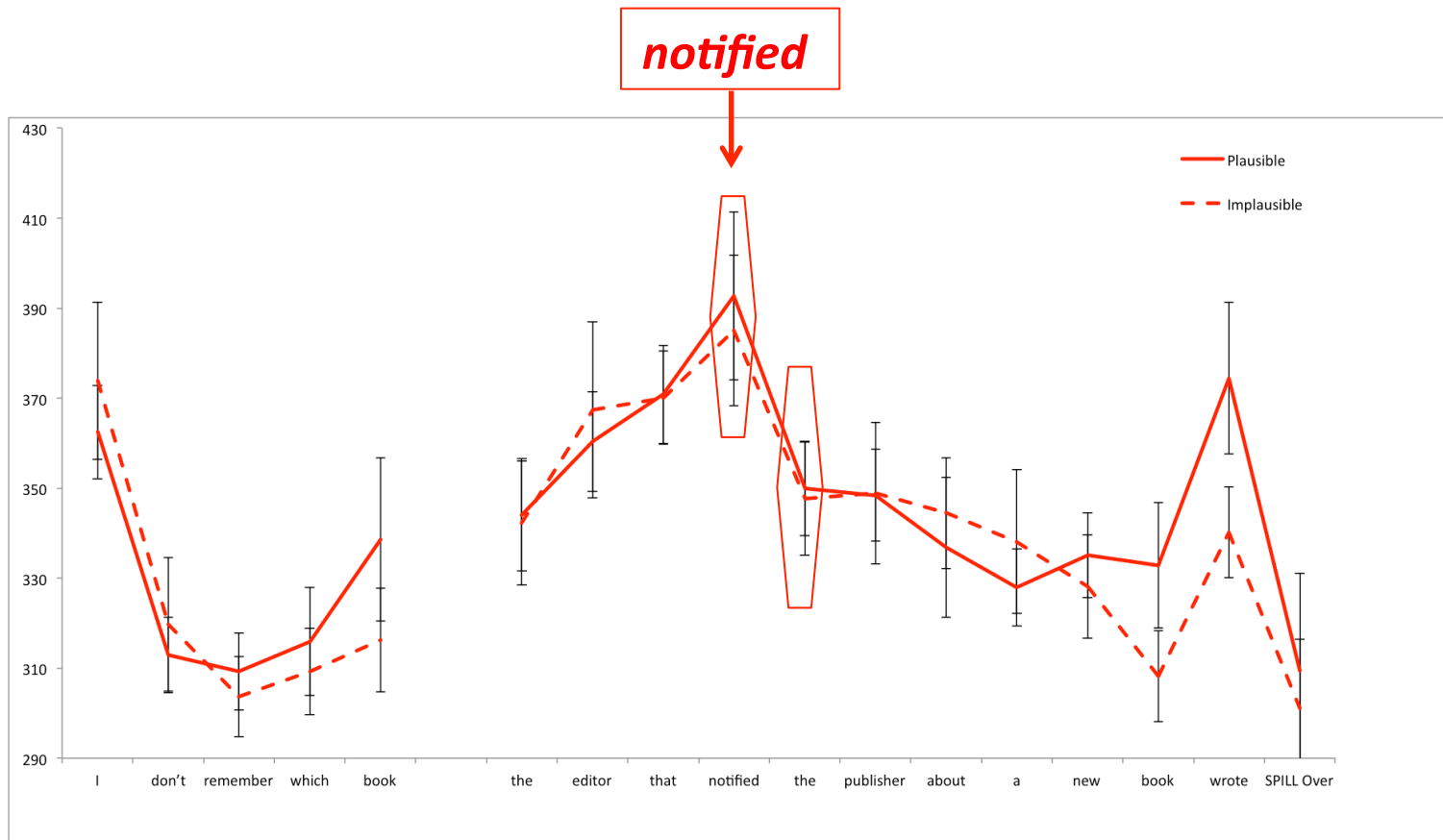
- The plausibility effect is seen inside an island (a relative clause in subject position)
- The parser forms the dependency across an island domain.

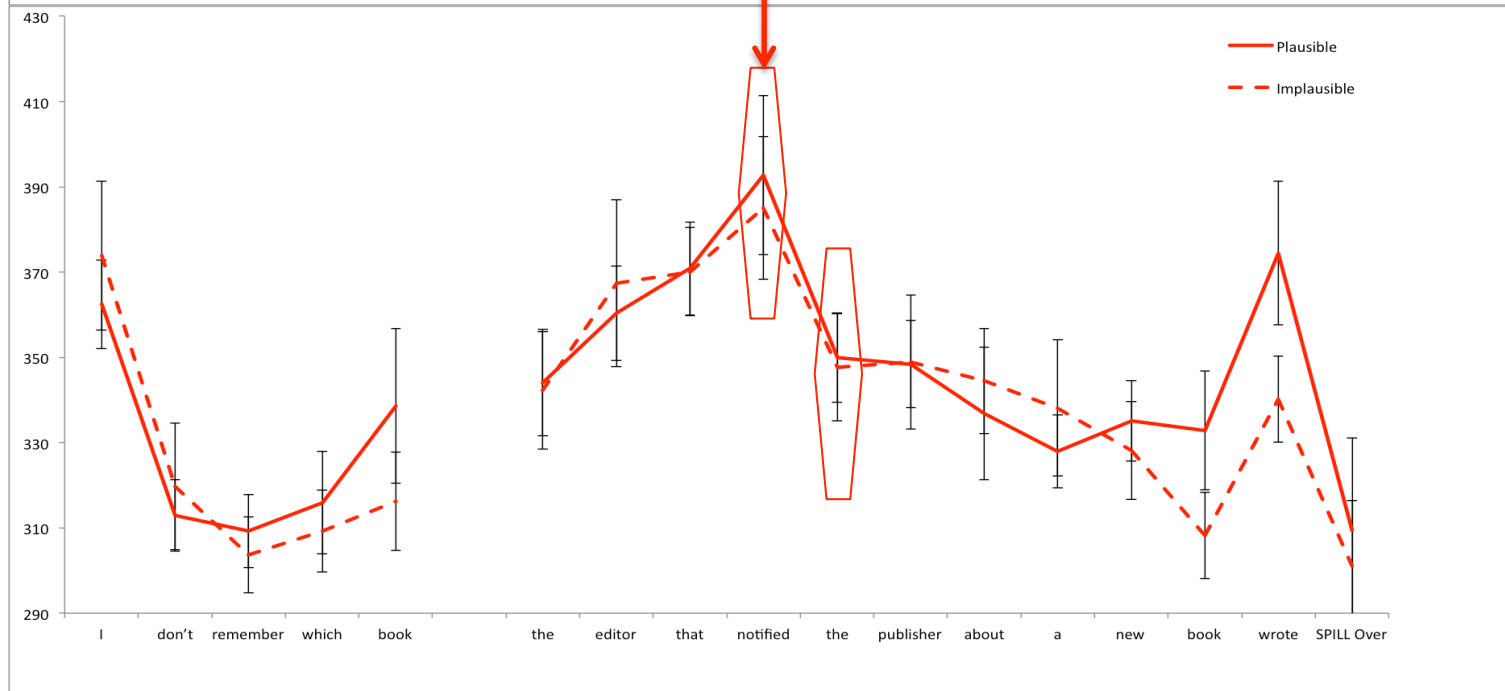
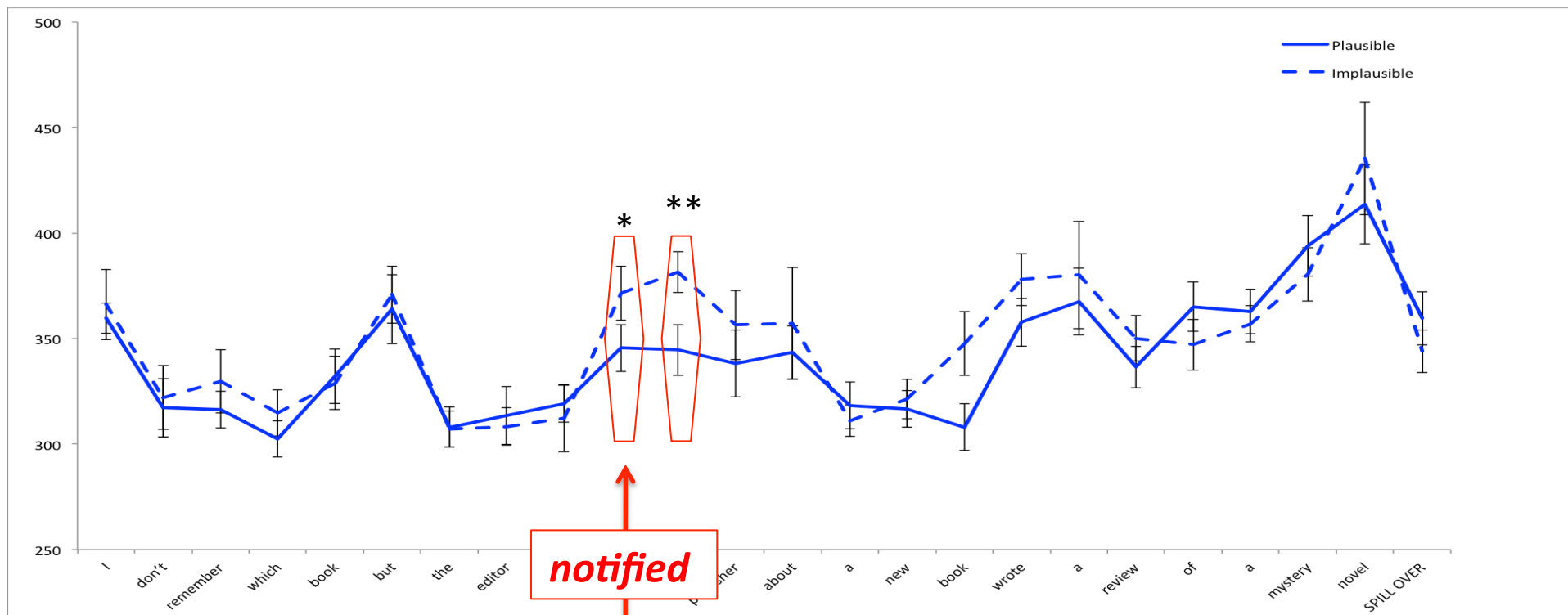


Experiment 4: Self-Paced Reading

WHFGD

- No plausibility effect is observed
- The parser respects island when the FGD is processed





Summary

- The plausibility effect was observed in the relative clause island.
- The parser tries to find the licensing verb for the wh-phrase even within an island when dealing with sluicing.
- The active search process is sensitive to differences between sluicing and non-ellipsis wh-filler-gap constructions

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Discussion

- The plausibility effect was observed in the relative clause island.
- This result can **potentially** support grammatical approaches to islands.
- Still we have to ask the following questions:

Q: From the processing capacity point of view

- Why do island domains in a sluicing context not cause the processing difficulty, **even though the wh-phrase and the verb are connected online (cost of holding wh-phrase and island domain)?**
- Does the ellipsis resolution process make sluicing easier?
But how/why?

Q: From the grammatical accounts' point of view

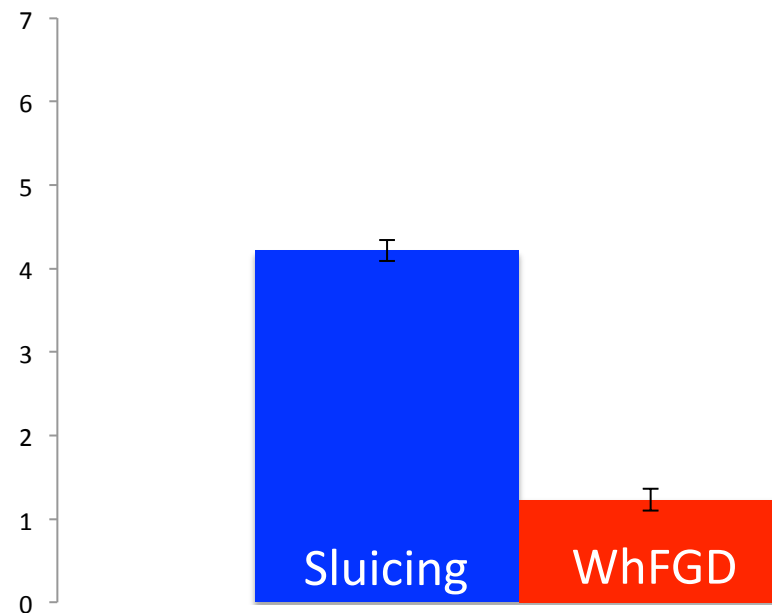
- Why are island violations acceptable under sluicing?
- What is the relation between the parser and the grammar?
The parser must be sensitive to the details grammatical differences of WhFGD & Sluicing.

Thank you!!

Acceptability Rating with Island

(3)a. I don't know **which author**, but the editor **who notified** the publisher about a new author recommended ...

(3)b. I don't know **which author** the editor **who notified** the publisher about ____ recommended ...



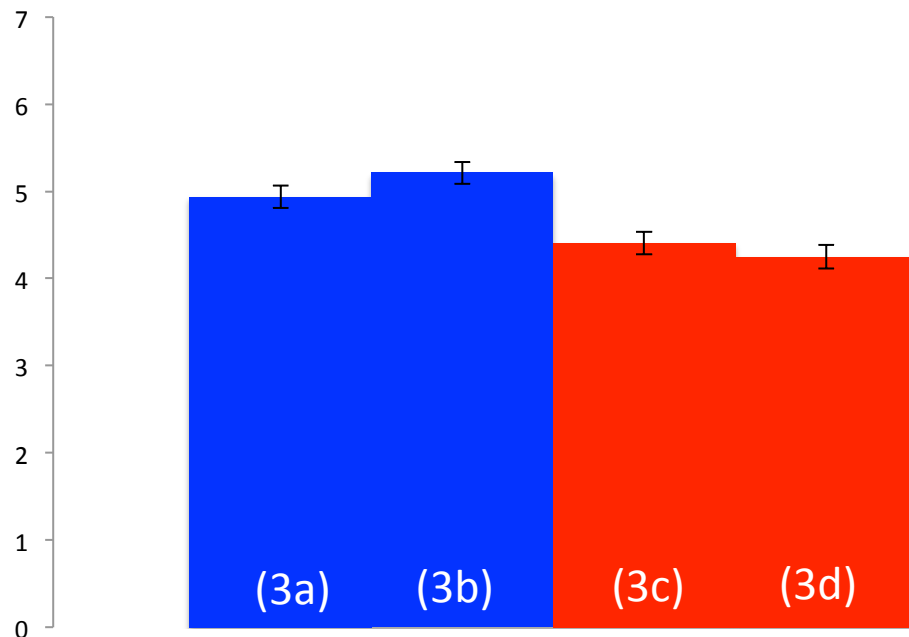
Acceptability Rating

(4)a. I don't know which **book**, but the editor **notified** the publisher about a new book...

(4)b. I don't know which **author**, but the editor **notified** the publisher about a new author ...

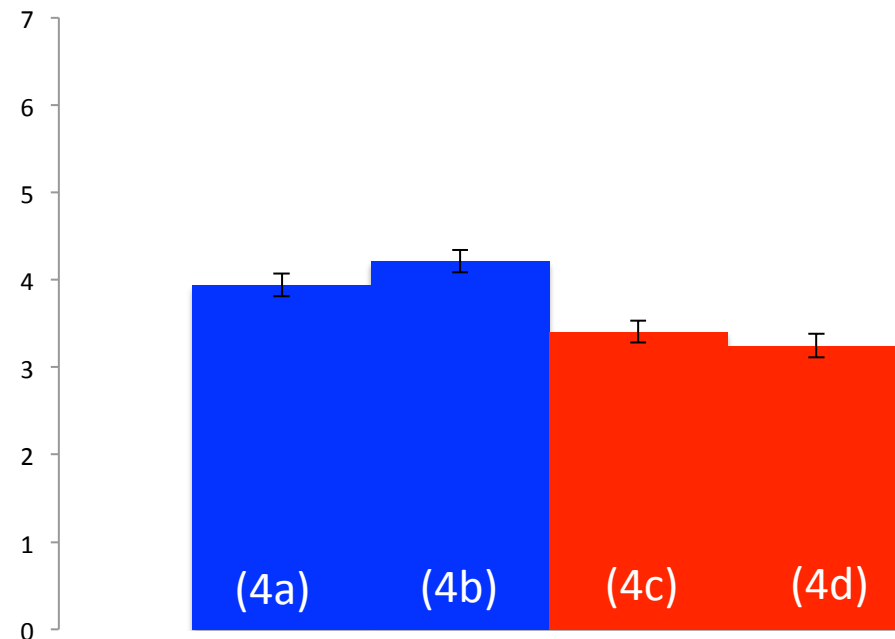
(4)a. I don't know which **book** the editor **notified** the publisher about __ ...

(4)b. I don't know which **author** the editor **notified** the publisher about __ ...



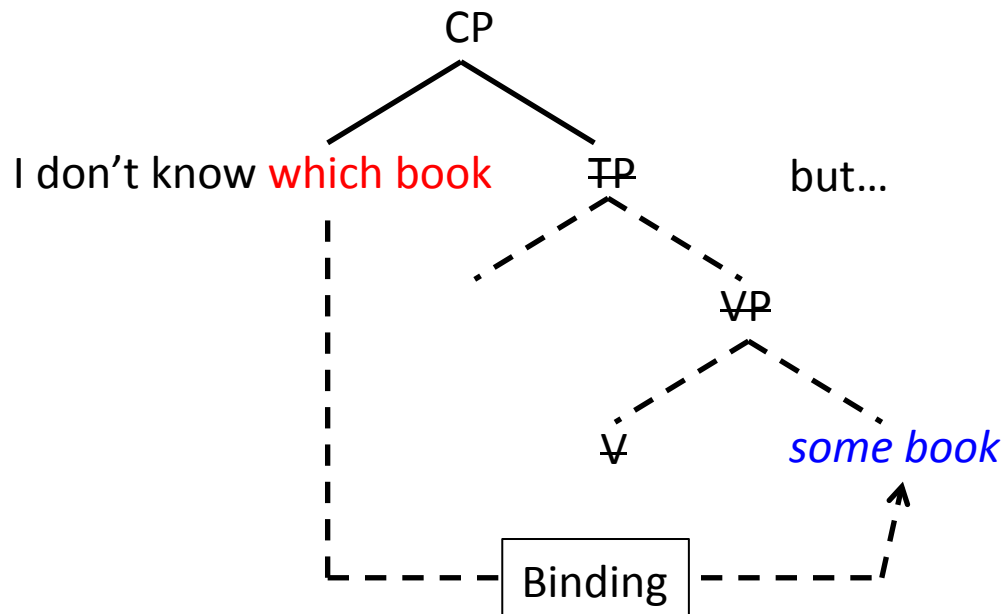
Mean Acceptability Rating

- (5)a. I don't know which **book**, but the editor who **notified** the publisher about a new book recommended a new mystery novel...
- (5)b. I don't know which **author**, but the editor who **notified** the publisher about a new author recommended a new mystery novel...
- (5)a. I don't know which **book** the editor who **notified** the publisher about a new book recommended __ ...
- (5)b. I don't know which **author** the editor who **notified** the publisher about a new author recommended __ ...



A possible account of island insensitivity

- What sort of structure building process is working?
 - The parser respects a distinction between sluicing and WhFGD
 - Still the parser tries to form a ‘dependency’ between the wh-phrase and the verb

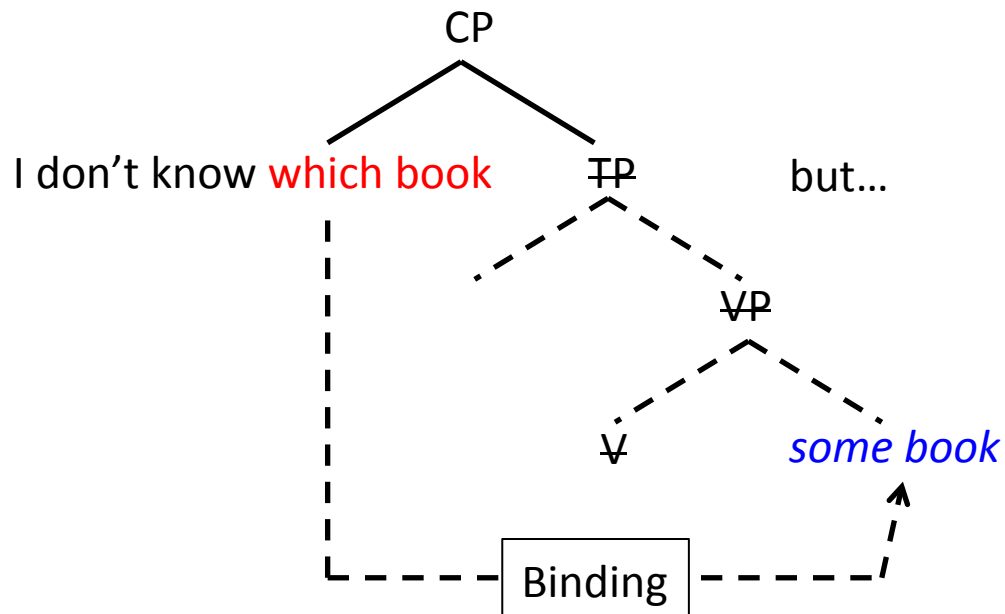


- Upon recognizing the ellipsis, the parser builds the clausal structure of ellipsis
- In Merger-Type sluicing, the parser posits the indefinite/variable in the thematic position (Chung et al., 1995)
- Because the parser forming a ‘binding’ like dependency, islands do not matter

I'm not sure how the structure building mechanism looks like under ‘deletion’ approaches (e.g., Merchant 01)

A possible account of island insensitivity

- What sort of structure building process is working?
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