

Introduction

In many daily situations, readers are guided by concrete goals, which often involve seeking specific information. We compare ordinary and information-seeking reading, operationalized using reading comprehension questions, and study:

- How readers' goals affect their reading times (RTs).
- The extent to which they are affected by linguistic properties of the text.
- The relation between RTs over task critical information and task performance.

Design

We use OneStopGaze [2], an eye movements dataset (269 participants, 162 passages in total, in English) where participants read paragraphs and answer follow-up multiple-choice questions. Examine two between-subjects conditions:

- **Hunting** (information-seeking) – a question is presented to participants before they read the passage.
- **Gathering** (ordinary reading) - participants see the question only after reading the passage.

P: *Angela Erdmann never knew her grandfather. But, on Tuesday 8th April, 2014, she described the extraordinary moment when she received a message in a bottle, ..., **it was presented to Erdmann by the museum that is now exhibiting it in Germany.***

Q: *How did Angela Erdmann find out about the bottle?*

- (A) **A museum told her that they had it**
- (B) *She coincidentally saw it at the museum where it was held*
- (C) *She found it in her basement on April 28th, 2014*
- (D) *A friend told her about it*

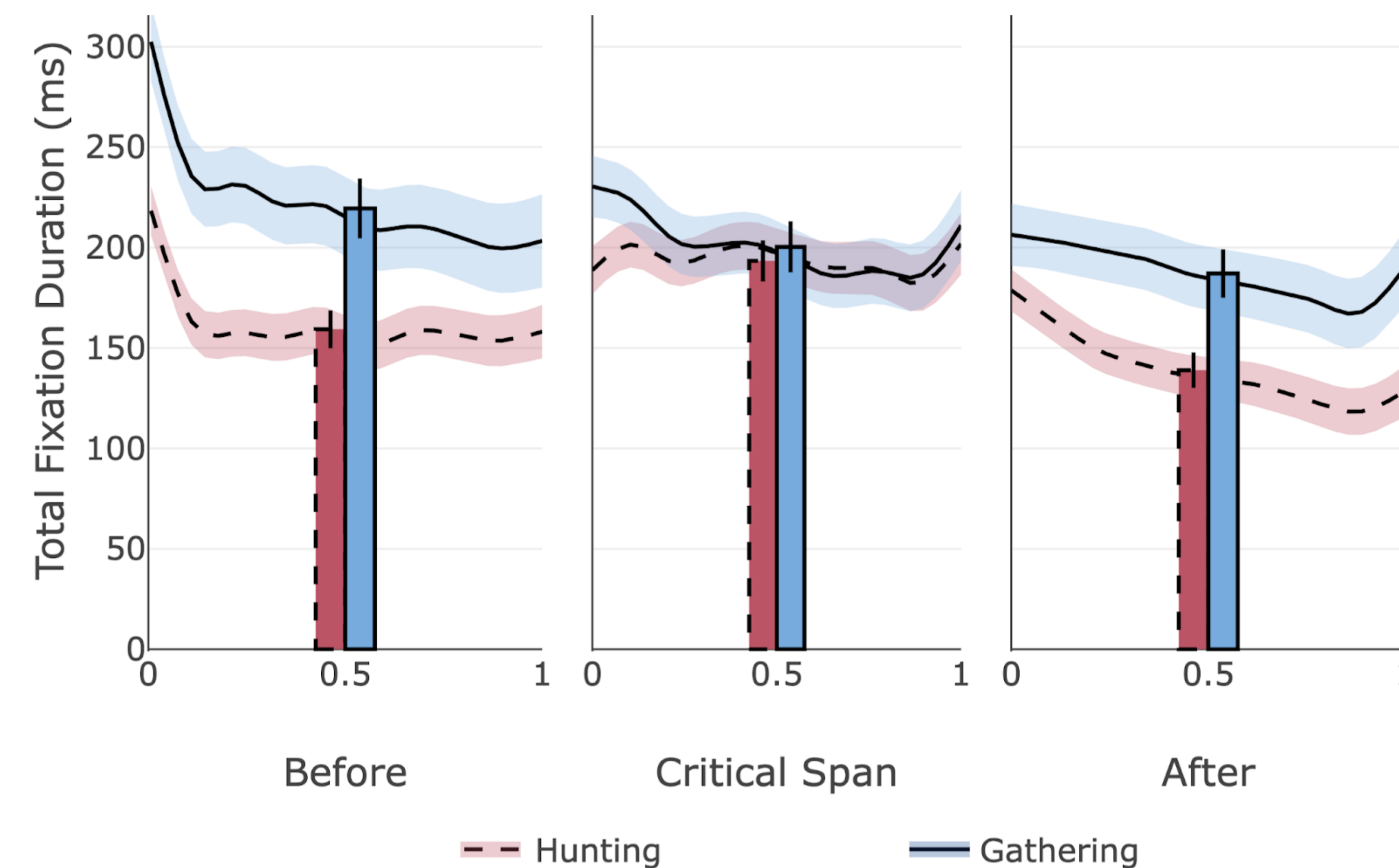
The correct answer (A) is supported by the CS

Various Distractors

Critical Span (CS) = The text portion which contains the information essential for answering the question (manually annotated) [4].

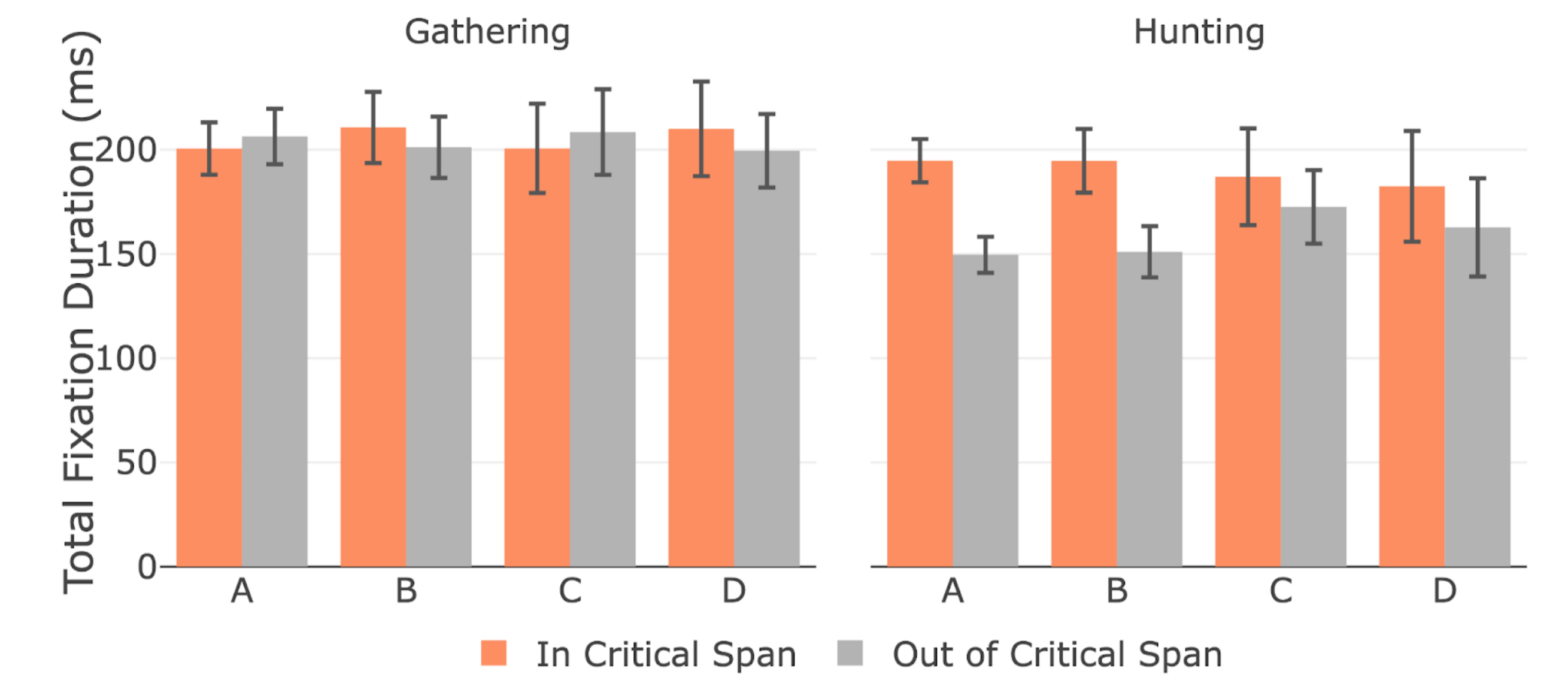
Reading Times

Total Fixation Duration (TF) by reading condition and passage section. X axis represents normalized word position within the corresponding section. Curves are GAM fits with random effects for subjects and paragraphs. Bars represent per-word section averages.



Reading Comprehension Performance

Total Fixation Duration by condition, passage section and chosen answer.



Discussion

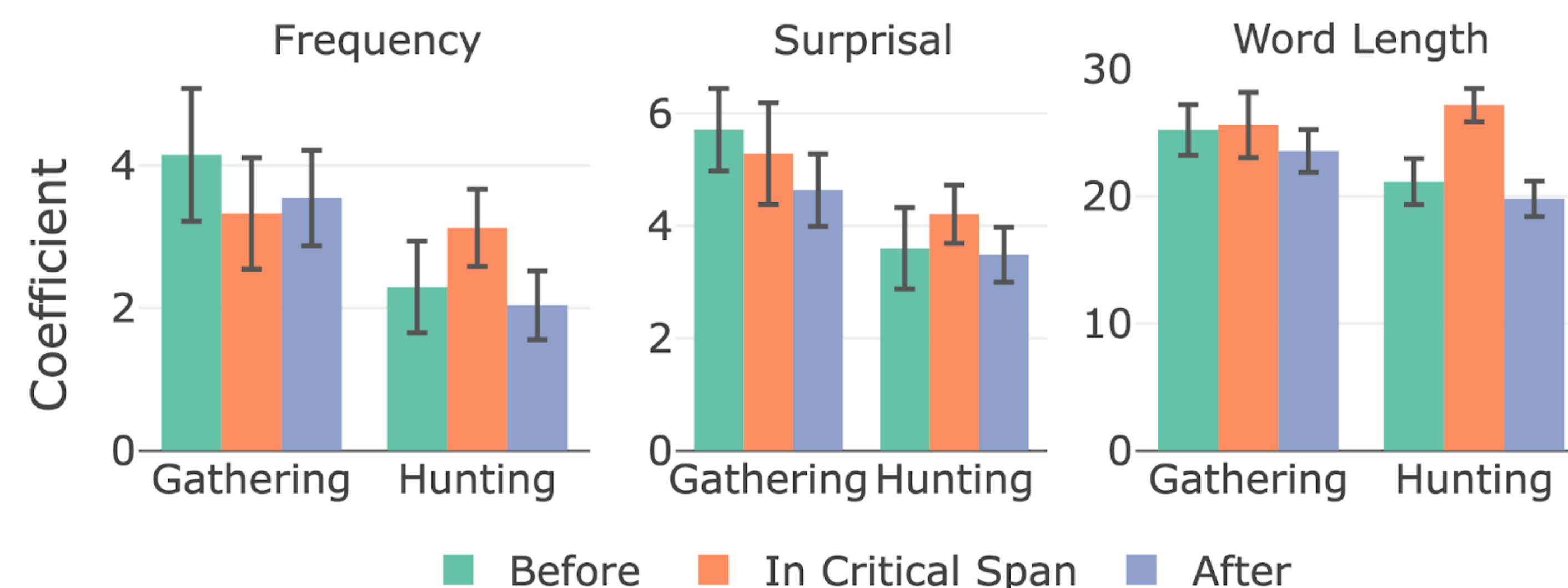
- Before identifying task critical information in the Hunting regime, readers engage in skimming-like behavior with shorter RTs and weaker responses to linguistic properties of the text.
- After identifying task critical information, RTs remain constant and similar to average RTs and word property responses in the Gathering regime.
- Task-driven behavior is marked by shorter and rapidly decreasing RTs and weaker word property responses after the CS.
- Tight correspondence between higher engagement with information in the CS as compared to outside it, and reading comprehension behavior.

Conclusions

- Readers adjust their behavior to the given task in a manner consistent with a rational account of cognitive resource allocation.
- Reading behavior around task critical information is informative with respect to question answering behavior.

Response to Word Properties

Current word coefficients from a mixed-effects model predicting TF times from frequency, surprisal (GPT-2), and word length of the current and previous words, fitted separately for each reading condition and passage section.



References

[1] Radach and Kennedy, Eur. J. Cogn. Psychol., 2004. [2] Malmaud, Levy, and Berzak, Proc. CoNLL, 2020. [3] Hahn and Keller, Cognition, 2022. [4] Berzak, Malmaud, and Levy, 2020. [5] Radford, Alec, et al. OpenAI blog, 2019.