

## Congruence effects in narrative time shifts

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Previous research has shown that readers track and integrate temporal information as they construct situation models of narratives (Zwaan & Radvansky, 1998; Speer & Zacks, 2005). Explicit markers of temporal shifts (i.e., *a moment/hour/day later...*) have been claimed to increase processing times with longer shifts requiring more resources to track time in the situation model and therefore resulting in longer reading times (Zwaan, 1996; Ditman, Holcomb, & Kuperberg, 2008). In this paper, we present evidence that suggests that longer temporal shifts are not costly *per se*. Rather, upon reading about an event, readers generate expectations about *when* the next-mentioned event is likely to take place: elevated reading times arise when the size of the temporal shift is *incongruent* with readers' expectations.

In three experiments, we manipulated situation complexity (*simple/complex*), which we hypothesize to lead to different expectations about the temporal location of the next-mentioned event. Complex situations always involved plural/collective agents, had longer temporal durations, and had salient sub-events, while simple situations always involved singular agents and had shorter temporal durations. Experiment 1 involved an offline comprehension-to-production story-continuation task, where participants provided what they thought was a plausible continuation to single-sentence prompts that differed in situation complexity (*Madison spread some mayo on bread vs. The US Navy abandoned its foreign bases*). We measured proportions of responses that moved time forward, as well as responses that held time static. We found that temporally-static responses were more likely given complex events, while forward-moving responses were more likely given simple events. Experiment 2 also involved a story-continuation task. But this time, participants were constrained to continue the discourse with what they thought would happen next (*Then, ...*). Participants were then asked to estimate the size of the temporal shift between the end of the prompt event and the beginning of the event they wrote in response. We found that complex events elicited longer shifts than simple events. Experiment 3 involved an online moving-window reading task, manipulating the size of temporal shifts through the use of temporal connectives. Reading times were analyzed in a linear mixed-effects logistic regression model with temporal shift size, event complexity, and probability of moving time forward after reading the first sentence (as estimated in Experiment 1) as predictors. We predicted and confirmed a significant interaction between complexity and temporal shift size. Reading times on the region immediately after the temporal connective (the subject region of the second sentence) were observed to be elevated when simple events were paired with long temporal shift connectives and when complex events were paired with short temporal shift connectives. There was no main effect of temporal shift size as would be predicted by Zwaan (1996) and Ditman et al. (2008).

The results of our experiments suggest a more active view of discourse comprehension than is often assumed. In building situation models, readers do not just passively track time; they actively generate expectations about *when* the next-mentioned event is likely to take place. Our experiments also show that one source of these expectations is the complexity of the event readers just learned about.

### Sample Stimuli

- Simple
  - *Madison spread some mayo on bread.*
    - Expt. 1: \_\_\_\_\_.
    - Expt. 2: *Then,* \_\_\_\_\_.
    - Expt. 3: *After a few seconds/weeks, she added lettuce and ham.*
- Complex
  - *The US Navy abandoned its foreign bases.*
    - Expt. 1: \_\_\_\_\_.
    - Expt. 2: *Then,* \_\_\_\_\_.
    - Expt. 3: *After a few seconds/weeks, they were re-occupied by foreign governments.*