

How odd: Diverging effects of predictability and plausibility violations on initial sentence reading and subsequent word memory

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During sentence reading, people continuously predict information about upcoming words. But what happens when expectations about upcoming content are disconfirmed? Prior research suggests that readers show different processing routines depending on the plausibility of the unexpected input [1,2; but see 3]: Whereas severe violations of plausibility are registered during earliest stages of reading, mild deviations from plausibility elicit processing difficulties not until somewhat later. ERP studies have argued that primarily mild deviations from plausibility elicit repair and re-analysis, whereas others have suggested the same only for severe implausibilities [4,5]. Here, we investigate whether violations of predictability and plausibility have dissociable effects during initial sentence processing and subsequent word recognition.

We present data from an online self-paced reading (non-cumulative) and subsequent word recognition task in 80 German-speaking adults (54 f, 25 m, 1 non-binary; mean age=22.27, $SD=5.16$). Stimuli were strongly constraining sentences that ended in a predictable-plausible continuation, an unexpected, somewhat plausible continuation, and an unexpected, deeply implausible continuation (see Table 1). Offline cloze probability ratings from 55 native speakers of German showed high cloze probabilities for plausible-predictable nouns ($> .8$), but low cloze probabilities for unpredictable, somewhat plausible & unpredictable, deeply implausible nouns ($< .01$). Plausibility ratings from 44 different native speakers of German showed gradual plausibility differences between the three conditions (predictable-plausible: $M=6.6$; $SD=3.9$; unpredictable-somewhat plausible: $M=3.94$, $SD=1.36$; unpredictable-deeply implausible $M=1.41$; $SD=0.36$). During word recognition, participants performed “old”/“new” judgments on previously seen/unseen nouns and indicated their confidence with their judgments. To reliably distinguish between effects of plausibility and predictability on reading and memory, we report two contrasts: a predictability contrast (unpredictable,-somewhat plausible vs predictable-plausible) and a plausibility contrast (unpredictable-deeply implausible vs unpredictable-somewhat plausible).

During reading, there was an early-emerging effect of predictability, in that unpredictable, somewhat plausible items were read more slowly than predictable-plausible items on all critical words including the noun (Fig. 1, left panel; $b=.025$, $SE=.01$, $t=3.63$, $p<.001$). Plausibility did not affect reading rates until one word after the noun ($b=.03$, $SE=.01$, $t=-4.89$, $p<.001$)¹. Models on trial-by-trial recognition accuracy showed a plausibility effect in that unpredictable-deeply implausible nouns were remembered more accurately than unpredictable-somewhat plausible nouns ($b=0.29$, $SE=.11$, $z=2.74$, $p<.01$), irrespective of confidence. There was no difference in recognition memory for the predictability contrast ($b=-0.01$, $SE=.10$, $z=-0.12$, $p=.90$)

Our data suggest that predictability violations affect reading rates earlier than plausibility violations do, although plausibility violations slow comprehension more dramatically overall. Crucially, memory seems to be driven by severe violations of event plausibility, not so much by whether a word is globally unpredictable given its context. Implications for models of event memory will be discussed.

¹ We obtained the same results regarding plausibility and predictability when subsetting reading data to items that were subsequently remembered.

Table 1. Experimental stimuli. During SPR, full sentences were presented word by word using a Latin square design (i.e., one participant saw one version of each experimental item). During word recognition, the critical noun read during initial SPR had to be judged as “old”.

	predictable-plausible	unpredictable, somewhat plausible	unpredictable, deeply implausible	sentence continuation
Da Anne Angst vor Spinnen hat, geht sie bei sich zuhause nur ungern nach unten in ...	den ^{determiner} Keller ^{noun}	den ^{determiner} Garten ^{noun}	den ^{determiner} Mond ^{noun}	oder ^{spill 1} die ^{spill2} (Waschküche ^{spill3})
Since Anne is scared of spiders, she doesn't like [in her home] going down into ...	the basement	the garden	the moon	or the (washroom).

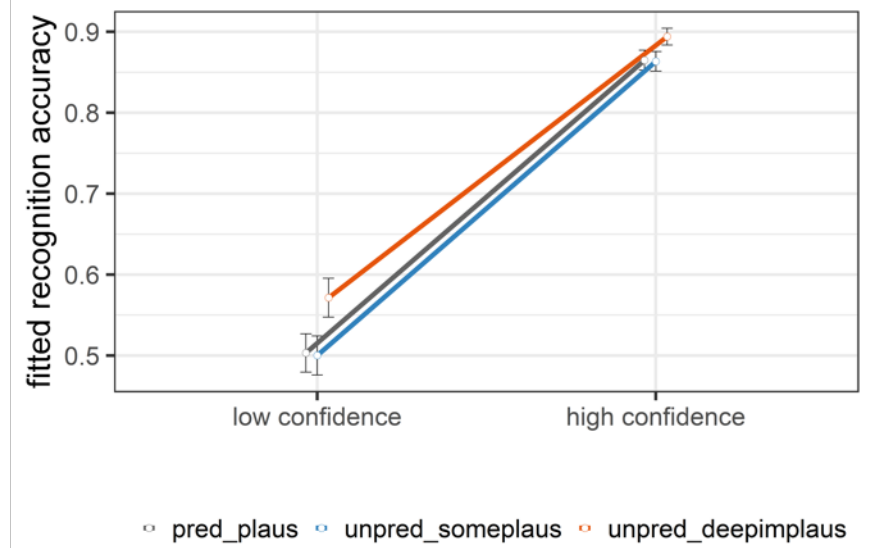
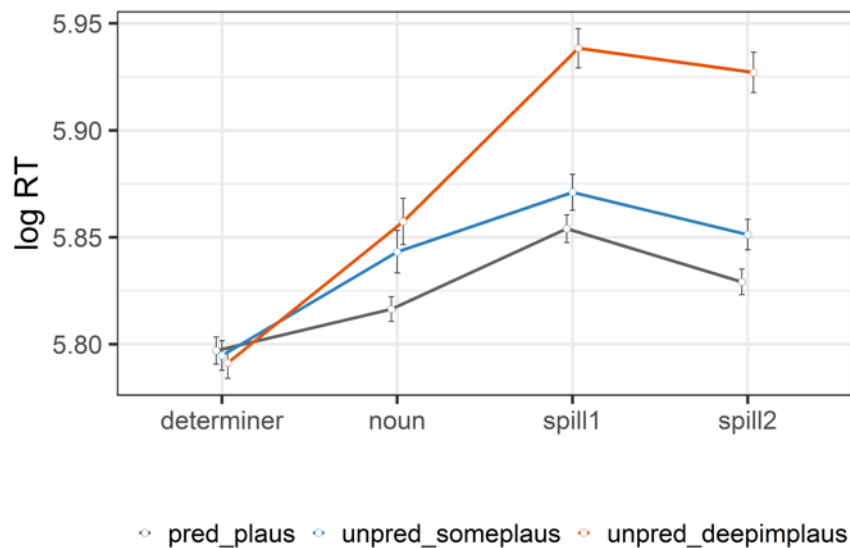


Figure 1. Left panel: Log-RTs (± SE) on target nouns and the spill-over region across conditions. Right panel: Fitted recognition accuracy split out by condition.

References

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