

Saturating the Anticipatory Mechanisms



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of Syntactic Priming during Situated Language Understanding

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Background

Method

In situated language understanding, syntactic priming (e.g., Bock, 1986) manifests in anticipatory looks to the (depicted) most probable upcoming linguistic element, according to the prime structure (e.g., Arai et al., 2007).

Prime : The assassin will send the dictator the parcel. Target: The pirate will <u>send</u> the princess the necklace.

Previous research reports apparent contradictory effects of cumulativity and surprisal: increased exposure to a structure (during an initial phase, e.g., Kaschak et al., 2006, or half an experiment, e.g., Jaeger & Snider, 2013: Study 3) can make it both more and less likely to be produced as target. 24 Portuguese participants read 1 or 2 (disambiguated) high (HA) or low (LA) attached relative clause primes and then heard a (temporarily ambiguous between HA and LA) auditory target (e.g., *The father of the baby who will drink the beer/ the milk is tall*) while their gaze to a picture was recorded. The picture depicted pronoun antecedents (S1: father, S2: baby) and verb objects (O1: beer, O2: milk) associated with HA and LA, plus 2 distractor objects.

Primes

Activation-1

The carrier airline will have more flight destinations next year. (Filler)



Our Study

We investigate repeated exposure within-trial and the interaction between this short-term priming and long-term adaptation on predictive eye-movements during situated language understanding.

Activation2

We focus on looks to S1 (consistent with dispreferred HA interpretation)

Within-trial (short-term) priming: Time-course analysis of Proportion of Fixations on S1 from who onset up to 400 ms (8 slices, 50 ms each) after (Figure 1, Table 1). Maximal-random linear-mixed effects modelling under the Growth Curve Analysis approach is used for inferential statistics (Mirman et al., 2008), with Prime (HA, -0.5, LA, 0.5), Activation (1, -0.5; 2, 0.5) and Time (Linear, Quadratic) as predictors. Participants and Items are random effects.

Analyses

• Within-trial (short-term) and Across-trial (long-term adaptation) priming: Average Fixation Proportion on first 400ms along the experimental session (Figure 2, Tables 2-3). MLME modelling with predictors *Prime, Activation* and *Adaptation* (i.e., trials progression, from 0 to 48), and further analyses of *'LA prime'* condition.

The fan [sg] of the players [pl] / The fans [pl] of the player [sg] who will [sg] (...)

Activation-2

The relative [sg] of the boys [pl] / The relatives [pl] of the boy [sg] who will [sg] (...) The fan [sg] of the players [pl] / The fans [pl] of the player [sg] who will [sg] (...)

Target

The father of the baby **who** will drink the beer/ the milk is tall





Results





Fixations prop on S1				
Predictor	Est.	S.E.	t	р
(Intercept)	0,15	0,02	7,87	0,0001
activation	0,00	0,03	0,00	1,00
prime	0,01	0,03	0,19	0,85
Time 1	-0,02	0,01	-2,31	0,02
Time2	0,00	0,01	-0,44	0,66
activation:prime	0,06	0,02	4,15	0,0001
activation:Time1	0,02	0,02	0,97	0,33
prime:Time1	0,04	0,02	2,12	0,03
activation:Time2	0,02	0,02	0,93	0,35
prime:Time2	0,01	0,02	0,58	0,56
activation:prime:Time1	-0,07	0,04	-1,63	0,10
activation:prime:Time2	-0,03	0,04	-0,73	0,47

Within a trial:

- experiencing a single HA prime (*Activation* 1) primes HA interpretation (**classical priming**).
- but experiencing two HA primes (Activation2) saturates anticipation of HA; instead, experiencing two LA primes increases looks to HA antecedent (reversed priming).

Table 2

Table 1

Mean Fix. Prop. 400ms S1				
Predictor	Est.	S.E.	t	р
(Intercept)	0,15	0,02	8,88	0,0001
activation	0,00	0,02	-0,20	0,84
prime	0,01	0,02	0,26	0,80
adaptation	0,07	0,05	1,43	0,15
activation:prime	0,06	0,04	1,46	0,15
activation:adaptation	-0,10	0,07	-1,37	0,17
prime:adaptation	0,07	0,07	0,91	0,36
activation:prime:adaptation	-0,22	0,14	-1,57	0,12

Across trials:

 through the experimental session, participants increasingly show saturation of LA anticipation after experiencing a single LA prime.

 but evaluation of the alternative HA structure after experiencing two LA primes occurs consistently from the beginning of the experiment.



Table 3

Mean Fix. Prop. 400ms S1, prime LA

Predictor	Est.	S.E.	t	р
(Intercept)	0,15	0,02	7,27	0,0001
activation	0,03	0,03	1,00	0,32
adaptation	0,09	0,05	1,72	0,09
activation:adaptation	-0.20	0.10	-1.98	0,05

Conclusion

When a syntactic structure (e.g., LA) is repeatedly primed within a trial (*Activation2*), anticipatory effects get immediately saturated, and the alternative structure (e.g., HA) is instead evaluated. Long-term saturation effects also emerge through the experiment, but only on trials with less loaded short-term priming (*Activation1*). Overall, our results suggest an adaptive pattern of surprisal and an apparent lack of cumulative priming for dispreferred readings (HA).

References

Figure 1

Activation 1

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