

## L2 learners can predict during complex sentence processing

Eunjin Chun (The Hong Kong Polytechnic University), Joshua Daniels, Chenyue Zhao, & Edith Kaan (University of Florida)  
eunjin.chun@polyu.edu.hk

Recent studies have shown that proficient L2 listeners are able to predict upcoming linguistic information to the same extent as L1 listeners during simple phrase or sentence processing [1, 2, 3]. These findings may suggest that L2 listeners use the same mechanisms as L1 listeners for prediction under certain conditions [4]. Yet, it has not been fully specified under which conditions L2 listeners can use predictive mechanisms. In order to further address this issue, we investigated whether advanced L2 listeners make predictions while processing complex constructions (i.e., in a more cognitively taxing condition than processing simple constructions tested so far). Given that L2 processing is inherently more taxing than L1 processing [4] and that prediction in L1 as well as L2 is delayed by cognitive load [3], predicting during complex sentence processing may overburden L2 listeners, which may lead them to be reluctant to actively predict or cause them to compromise prediction. On the contrary, it is also possible that advanced L2 listeners would predict even during complex sentence processing if they have sufficient cognitive resources. In contrast with an Ito et al. (2018) study which imposed an external load on sentence processing via an additional task, the cognitive load in this study is internal to sentence processing. Investigating prediction during complex sentence processing therefore would help us understand L2 prediction under cognitive load in a single task condition and will shed more light onto the extent of L2 prediction in more cognitively challenging situations of real-life L2 use.

As prediction during simple sentence processing has been well replicated in the previous studies thus far, this study exclusively focused on comparison between L1 and L2 listeners' prediction while processing relative clause (RC) sentences with a complex noun phrase (e.g., I meet the father of the boy that will *ride/need* the bike). During incremental computation of input, this type of sentence is known to be hard and resource-demanding for both L1 and L2 speakers [6]. In an eye-tracking study with a visual world paradigm, we measured listeners' prediction using their anticipatory eye fixations during sentence processing. Participants were instructed to look at a visual display (see Fig. 1) and listen to RC sentences containing either a semantically biasing verb (e.g., *ride*, Biasing condition) or a neutral one (e.g., *need*, Neutral condition). Then, they needed to click the last mentioned object on the visual display.

We analyzed data from 21 advanced Mandarin L2 learners of English and 24 native English speakers. Fig. 2 plots the proportions of fixations on targets (e.g., bike) between the Biasing and the Neutral condition in L1 listeners (left panel) and L2 listeners (right panel). As shown in Fig. 2, the fixations on targets in both groups started to differ between two conditions upon hearing the target verb. This pattern was confirmed by statistical analyses on log-transformed fixation proportions on targets from 200ms after the onset of the verb until 200 ms after the onset of the target noun. There was no main effect of Group (dummy coded, L1 as the reference group vs. L2) or any interaction effect between Group and Condition (contrast coded, Biasing vs. Neutral). However, there was a significant main effect of Condition; both groups of participants showed significantly more fixations on the targets in the Biasing condition than in the Neutral condition ( $b = 1.46$ ,  $SE = 0.37$ ,  $t = 4.01$ ,  $p = .0001$ ).

The results from L1 listeners were consistent with previous findings, indicating that native speakers of English are able to predict upcoming information and show anticipatory looks on the items during complex sentence processing [5]. More surprisingly, L2 listeners also showed prediction while processing complex sentences, namely, even in a cognitively taxing condition. These results not only further specify the conditions under which L2 listeners can make predictions, but also provide more evidence for the claim that L2 listeners use the same mechanisms for prediction as L1 listeners.



Fig. 1. An example of a visual display

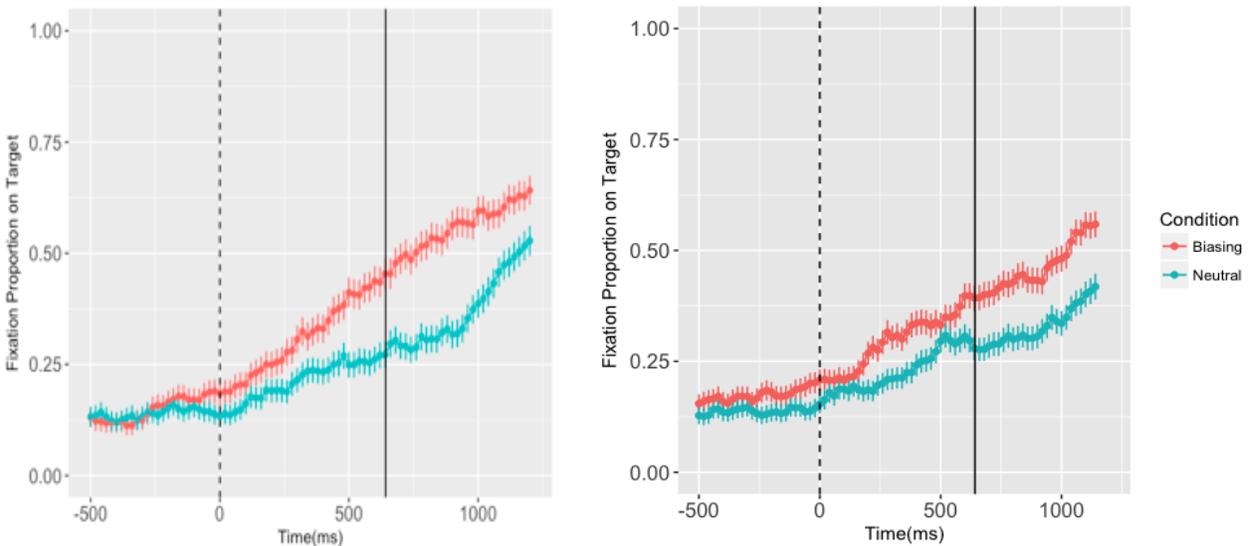


Fig. 2. Fixation proportions on the target objects (e.g., bike) between the Biasing and Neutral condition in L1 listeners (left panel) and L2 listeners (right panel). Time 0ms: the onset of the verb. The solid vertical line: the onset of the target noun. (error-bars: SE around the mean)

## References

- [1] Dijkgraaf, A., Hartsuiker, R. J., & Duyck, W. (2016). Predicting upcoming information in native-language and nonnative-language auditory word recognition. *Bilingualism: Language and Cognition*.
- [2] Foucart, A., Martin, C. D., Moreno, E. M., & Costa, A. (2014). Can bilinguals see it coming? Word anticipation in L2 sentence reading. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 40(5), 1461.
- [3] Ito, A., Corley, M., & Pickering, M. J. (2018). A cognitive load delays predictive eye movements similarly during L1 and L2 comprehension. *Bilingualism: Language and Cognition*, 21(2), 251-264.
- [4] Kaan, E. (2014). Predictive sentence processing in L2 and L1: What is different? *Linguistic Approaches to Bilingualism*, 4(2), 257–282.
- [5] Kamide, Y. (2012). Learning individual talkers' structural preferences. *Cognition*, 124(1), 66-71.
- [6] Kim, J. H., & Christianson, K. (2017). Working memory effects on L1 and L2 processing of ambiguous relative clauses by Korean L2 learners of English. *Second Language Research*, 33(3), 365-388.