

Predicting at speed during L2 sentence processing

Anuenue Kukona (a.p.bakerkukona@greenwich.ac.uk), Khursheda Akhter, Israela Akinyi,

Anika Kandala and Nusrat Tahia

School of Human Sciences, University of Greenwich

Real-world communication requires comprehenders to accommodate variable speech rates, including rapid speech that necessitates rapid processing. In L1, processing of rapid speech is supported by prediction, which has been observed at the rapid end of the speech rate continuum [1]. In contrast, prediction in L2 may differ qualitatively. For example, L2 prediction may be delayed [2] and limited to the slow end of the continuum [3]. The aim of this research was to compare L1 and L2 comprehenders' ability to predict when hearing particularly rapid speech, which was captured using internet-mediated mouse cursor tracking. L2 prediction was hypothesised to be too slow to support processing of rapid speech.

Method. On each trial ($n = 36$), L1 ($n = 40$) and L2 ($n = 45$) participants heard a predictive (e.g., "What the man will ride...is the bike.") or non-predictive (e.g., "What the man will spot...is the bike.") sentence, which was presented at a normal (e.g., ~3 syllables/sec) or fast (e.g., tripled) speech rate, while viewing a visual array with a predictable (e.g., bike) and unrelated (e.g., kite) object, which were presented in the upper corners of the visual array. Participants' task was to use their mouse cursor to click on the object that was referred to.

Results. Divergence point analysis [4] was used to assess the (i.e., time) point of divergence between participants' horizontal mouse cursor movements (i.e., x-coordinates) to predictable objects with predictive vs. non-predictive sentences. This bootstrapping analysis revealed divergence before (e.g., bottom-up processing of) predictable words (e.g., "bike"; whose onset was timepoint zero), providing evidence of prediction, at both normal and fast speech rates in both L1 and L2 participants (L1 Normal: -2.66 seconds, 95% CI = [-2.75, -2.55]; L1 Fast: -0.34 seconds, 95% CI = [-0.50, -0.20]; L2 Normal: -2.38 seconds, 95% CI = [-2.50, -2.30]; L2 Fast: -0.07, 95% CI = [-0.20, 0.10]). Divergence was also earlier at a normal vs. fast speech rate and in L1 vs. L2.

Discussion. This research provides evidence of L1 and L2 comprehenders' ability to predict when hearing impressively rapid speech. Predictive sentence processing differed quantitatively rather than qualitatively between L1 and L2, suggesting that prediction supports the comprehension of rapid speech by speeding both L1 and L2 processing. This research also suggests that internet-mediated mouse cursor tracking provides a powerful tool for comparing predictive sentence processing in L1 and L2.

References

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- [4] Stone, K., Lago, S., & Schad, D. J. (2021). Divergence point analyses of visual world data: Applications to bilingual research. *Bilingualism: Language and Cognition*, 24(5), 833-841.

Figures

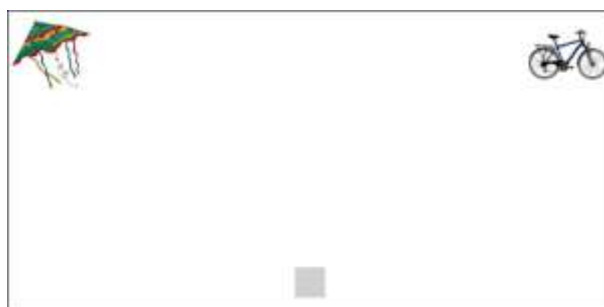


Figure 1. Example visual array with a predictable bike and unrelated kite for the predictive sentence, “What the man will ride, which is shown on this page, is the bike.”

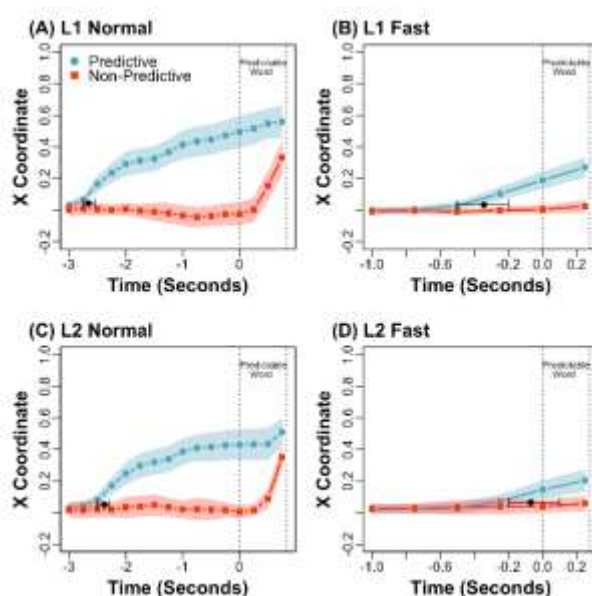


Figure 2. Mean (shaded bands show 95% CIs) x-coordinates across time (i.e., through mean predictable word [e.g., “bike”] offset) for predictive (e.g., “ride...”) and non-predictive (e.g., “spot...”) sentences at normal and fast speech rates in L1 and L2