Interference and filler-gap dependencies in native and non-native language comprehension

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Successful language comprehension of filler-gap sentences as in (1a) requires that readers recover the information of the filler ("the beer") upon encountering the gap ("drank"). Previous studies have demonstrated that native (L1) and non-native (L2) speakers actively form filler-gap dependencies [4]. Recently, [3] reported that similarity-based interference [5] influences this active gap-filling operation in L1 speakers, which was taken to indicate that filler-gap dependency resolution in L1 comprehension utilises a cue-based memory retrieval mechanism. However, the interplay between active gap filling and similarity-based interference remains unexplored in L2 comprehension. There are three possible processing patterns regarding how L2 speakers process filler-gap sentences and are susceptible to interference effects. One is that L2 speakers have difficulty forming filler-gap dependencies [1]. Another is that L2 speakers are more susceptible to interference than L1 speakers [2]. The other is that L1 and L2 share similar mechanisms in filler-gap dependency formation and memory retrieval operations. To tease these possibilities apart, we conducted two experiments, modelled after [3], that used eye movement during reading and speeded judgement tasks.

Eye movement during reading task: Eighty L1 speakers and 80 L2 speakers with different L1 backgrounds (English placement test scores 46/60) read sentences as in (1a–d). These sentences manipulated the plausibility of the retrieval target ("the beer'/'the cake") and a linearly closer distractor ("the wine/the food") as an object of the verb ("drank") at the gap. We predicted longer reading times at "drank" in implausible (1a/b) than plausible (1c/d) sentences due to implausibility effects. If interference influences filler-gap dependency formation, implausible sentences should elicit reduced reading times when the distractor is a plausible object (1c) than when it is an implausible object (1d). If L2 speakers have difficulty forming filler-gap dependencies, they may focus on the linearly closer distractor, which would predict longer reading times in implausible distractor (1b/d) than plausible distractor (1a/c) conditions. If L2 speakers are more susceptible to interference, they should show larger interference effects (i.e., a bigger difference between (1c) and (1d)) than L1 speakers.

Speeded judgement task: Ninety-six L1 speakers and 96 L2 speakers with different L1 backgrounds (English placement test scores 50/60) read sentences as in (2a–d) presented word by word at the centre of the screen. (2a–d) are identical to (1a–d) except that they do not contain a spillover region ("during the party"). If interference influences filler-gap dependency formation, participants should judge implausible sentence as plausible more often when the distractor is plausible (2c) than when it is implausible (2d). If L2 speakers are more susceptible to interference, they should misjudge (2c) more often than L1 speakers.

For the eye movement during reading task, pre-registered analyses showed longer regression path and total viewing times in implausible than plausible sentences ($ps < .001$), which indicates implausibility effects. There was also a significant target by distractor interaction in regression path times ($p < .001$) because reading times in implausible sentences were significantly shorter when the distractor was plausible (Figure 1). We did not find evidence of significant L1/L2 differences in filler-gap dependency formation and susceptibility to interference in any measures. **The speeded judgement task** showed a significant target by distractor interaction likewise ($p < .001$) because participants misjudged implausible sentences as plausible more often when the distractor was plausible (Figure 2). Also, there was no evidence of significant L1/L2 differences in susceptibility to interference.

The results indicated that interference affects L1 and L2 filler-gap dependency formation. There was also no significant evidence that L1 and L2 speakers differ in filler-gap dependency formation or susceptibility to interference. These findings suggest that an analogous cue-based mechanism operates in filler-gap dependency formation and memory retrieval operations in L1 and L2 language comprehension.

Items from the eye-movement during reading task (n = 24)

(1a) Plausible Target, Plausible Distractor
Mary saw the beer that the man with the wine very happily drank during the party.
(1b) Plausible Target, Implausible Distractor
Mary saw the beer that the man with the food very happily drank during the party.
(1c) Implausible Target, Plausible Distractor
Mary saw the cake that the man with the wine very happily drank during the party.
(1d) Implausible Target, Implausible Distractor
Mary saw the cake that the man with the food very happily drank during the party.

Items from the speeded judgement task (n = 24)

(2a) Plausible Target, Plausible Distractor
Mary saw the beer that the man with the wine very happily drank.
(2b) Plausible Target, Implausible Distractor
Mary saw the beer that the man with the food very happily drank.
(2c) Implausible Target, Plausible Distractor
Mary saw the cake that the man with the wine very happily drank.
(2d) Implausible Target, Implausible Distractor
Mary saw the cake that the man with the food very happily drank.

Figure 1. *Reading times (critical region = "drank"; spillover region = "during the party")*.

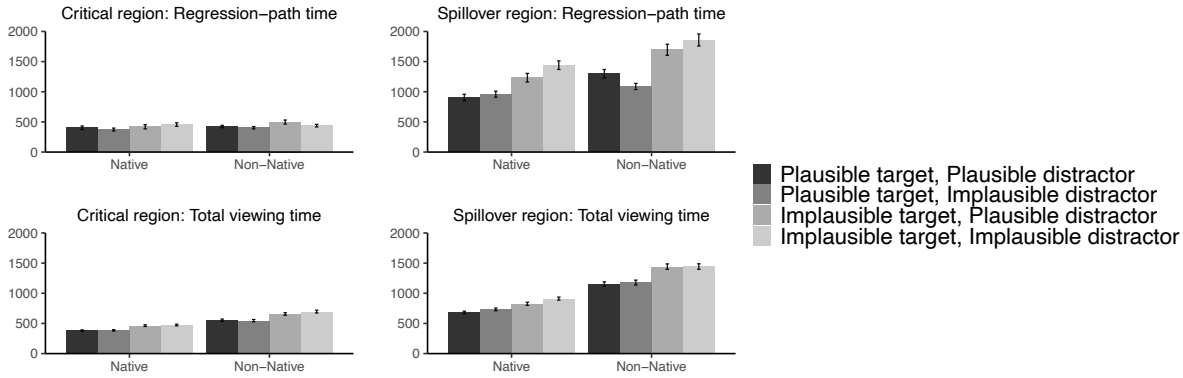
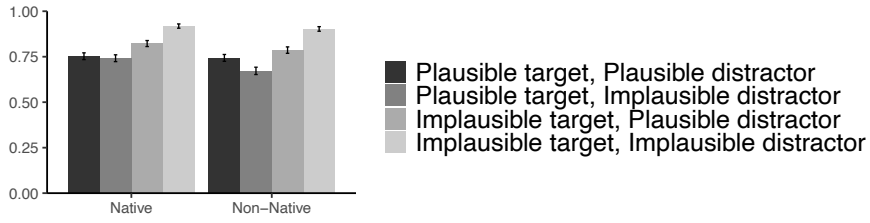


Figure 2. *Judgement accuracy rates*.



References

[1] Clahsen & Felser (2006). *TiCS*, 10, 564–570; [2] Cunnings (2017). *BLC*, 20, 659–678; [3] Cunnings & Sturt (2018). *JML*, 102, 16–27; [4] Felser et al. (2012). *SSLA*, 34, 67–98; [5] Jäger et al. (2020). *JML*, 94, 316–339