HOW (AND WHY) DOES LANGUAGE PROFICIENCY INFLUENCE MEMORY?

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Language proficiency can modulate memory performance in tasks that use linguistic stimuli. For example, in the DRM paradigm, participants study lists of related words and then consistently report "remembering" words that were never presented [1]. In native (L1) speakers of a language, these gist-based false memories are argued to occur due to fast and automatic activation of semantically and associatively related words in semantic networks. False memory rates in non-native (L2) speakers are lower, arguably due to weaker or slower-spreading activation in these networks when material is studied in one's non-dominant language [2]. Other accounts of L1-L2 memory differences stress the higher distinctiveness of linguistic material in L2 than in L1 [3] and the higher likelihood of L2 speakers retaining verbatim detail than L1 speakers [4,5].

This study used more ecologically valid materials to test one strong prediction of the activation account [2], namely that L2 false memories rates should increase, and thus should be more comparable to L1 false memory rates, given sufficient time for activation to spread in semantic networks in L2.

Method: 40 L1 and 36 highly proficient L2 speakers of English completed an online experiment where they studied pictures of simple events accompanied by recorded descriptions (e.g., "The frog <u>caught</u> the fly"; 40 target items embedded in a list of 78 fillers). Presentation of sentences with pictures ensured comprehension in all speakers. To manipulate study time, sentences and pictures were presented either once or twice, for 5 seconds each. The second presentation occurred approx. 10 trials after the first presentation [6]. The test phase was a recognition memory test where participants judged whether they had studied two types of sentences: sentences with the original wording ("The frog <u>caught</u> the fly") and sentences expressing unstudied pragmatic inferences ("The frog <u>ate</u> the fly" [7]).

Results: Hit rates (correct endorsement of sentences with the original wording as having been studied) and false alarm rates (incorrect endorsement of inference sentences as having been studied) are plotted in Figure 1 and were compared in two separate 2 (Language) x 2 (Repetition) mixed-model analyses. Discriminability (*d'*) is plotted in Figure 2, and *d'* values were compared with a 2 (Language) x 2 (Repetition) ANOVA.

Hit rates for sentences that had been studied once were similar in the two language groups. As expected, hit rates increased with repetition, but there was a larger repetition benefit in L2 than in L1 (20% increase in hit rates in L2 vs. 11% in L1; Language * Repetition interaction: $z = 2.38$). False alarm rates were generally lower in L2 than in L1 (main effect of Language: $z = 2.94$), replicating previous findings of L1-L2 differences in false memory rates with a new paradigm and new materials. False alarms also increased with repetition, and while this increase was numerically smaller in L2 than in L1 (7% in L2 vs. 13% in L1), the Language * Repetition interaction did not reach significance ($z = 1.2$).

Given these differences, discriminability (*d'*) increased with repetition in L2 but not in L1 (Language * Repetition interaction: $F[1,74] = 4.96$, $p = .03$).

Conclusions: Repeated exposure to the target sentences at study increased false memory rates in both L1 and L2, and, consistent with an activation-based account, L2 false memory rates for sentences studied twice were indeed similar to L1 false memory rates for sentences studied once. Thus, differences in the automaticity of processing linguistic input may explain, in part, the observed L1-L2 differences in gist-based errors. Importantly, repeated exposure to the target sentences also improved hit rates (i.e., "true" recognition), with a stronger benefit in L2 than in L1. This result is harder to explain with an activation-based account. Instead, it suggests that re-exposure to the same linguistic material boosted retention of *linguistic* detail in L2, consistent with accounts that non-native speakers devote more processing resources to surface-level linguistic detail than native speakers [4,5].

[1] Roediger & McDermott, 1995, *JEP:LMC*; [2] Arndt & Beato, 2017, *JML*; [3] Francis & Strobach, 2013, *PBR;* [4] Sampaio & Konopka, 2013, *Memory*; [5] Bordag et al., 2021; *Bilingualism*; [6] Cepeda et al., 2006, *Psych. Bull.*; [7] McDermott & Chan, 2006, *Mem & Cog*.

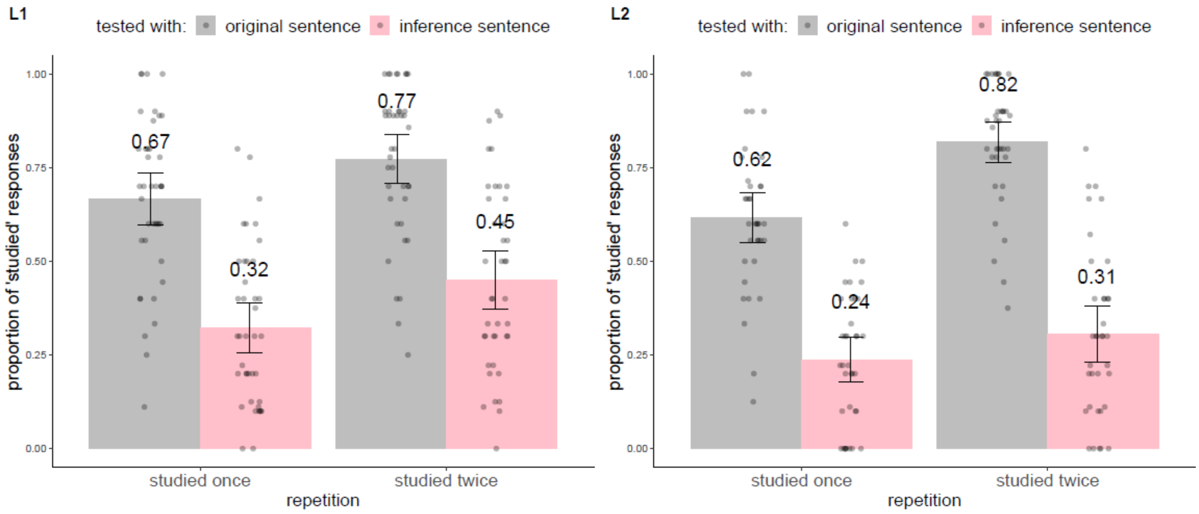

Figure 1. Proportions of "studied" responses for sentences that had been studied once vs. twice and that were then tested with the same wording (*original sentences*; i.e., hit rates) vs. different wording (*inference sentences*; i.e., false alarm rates) in L1 and L2. Error bars show 95% CIs.

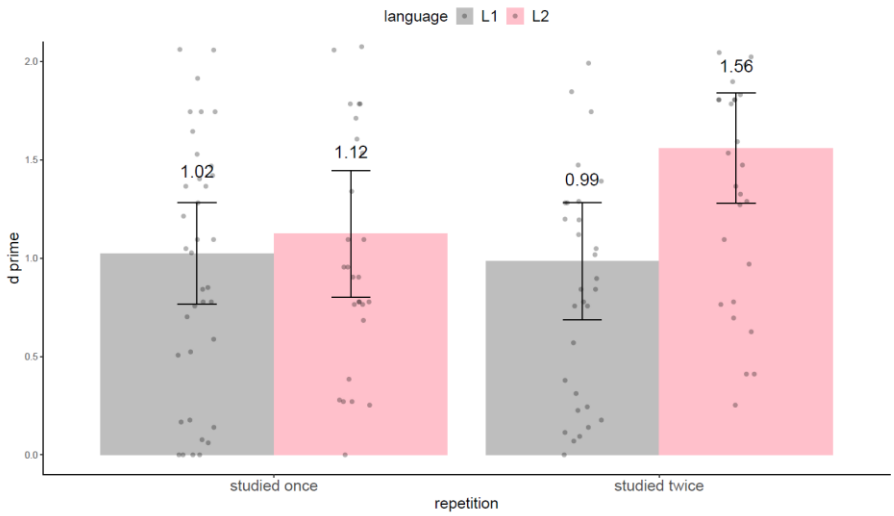

Figure 2. Discriminability (d') for sentences that had been studied once vs. twice in L1 and L2. Error bars show 95% CIs.