

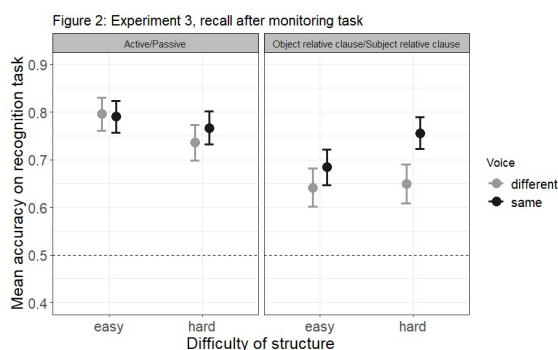
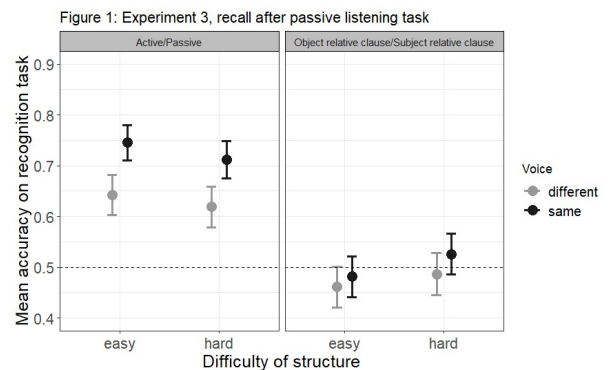
**Introduction:** In recall tasks, listeners perform better when the recall test is presented in the same voice as the original words (Clapp et al., 2023). This same-voice advantage is attributed to the encoding of phonetic detail, such as speaker voice, along with the more abstract lexical information. However, it is not obvious how encoding of phonetic detail might be affected by listening effort. When the listener's ability to perceive phonetic detail is reduced by cognitive load (Mattys et al., 2014) or by processing bottlenecks (Christiansen & Chater, 2016) less phonetic detail can be encoded.

**Hypothesis:** If effortful processing affects the ability to encode phonetic detail—either by disrupting it or enhancing it— then listeners should show a different degree of same-voice advantage in recalling words that were initially in difficult structures, relative to words initially presented in easy structures.

In this study, we investigate the effect of several types of difficult structures – both lexical and syntactic – on listeners' phonetic encoding. In a set of 3 experiments, we present listeners with recorded sentences spoken in one voice, and then test their memory for key words presented either in the same or a different voice. In Experiment 1, we manipulate 'difficulty' at the lexical level, by varying the frequency and phonological neighbourhood density (PND) of the target words. Low frequency and high PND words are typically considered more difficult for a listener to process than high frequency or low PND. In Experiments 2-3, we look at syntactic difficulty. In Exp 2, we vary the determiner in front of the target noun: nouns after demonstrative determiners (*this/that*) tend to be harder to recognize than nouns after the definite determiner *the* (Cohen, 2024). In Experiment 3, we focus on the recall of verbs presented in active voice (easier) compared to passive voice (harder); and verbs in subject relative clauses (easier) compared to object relative clauses (harder).

Each experiment involves two tasks. The first task asks listeners to listen passively to the sentence and then answer comprehension questions. The second intentionally directs listeners to the target word by means of a monitoring task in which the target sounds appear in the word whose recall will subsequently be tested. In both tasks, we measure listeners pupil sizes as an index of listening effort.

**Results:** Preliminary results from 99 participants (Exps 1-2: 39; Exp 3: 60) suggest that the same-voice advantage (i.e., the degree of phonetic encoding) depends on the type of structure, the difficulty of that structure, and the task that listeners are engaged in when the structure is presented. For example, in Experiment 3, the passive listening task (Fig. 1) reveals a larger same-voice advantage for active-passive structures than for relative clauses, suggesting superior encoding in simpler, single-clause sentences. The more difficult, multi-clause



sentences with relative clauses have recall accuracy hovering around chance (dashed line). However, in the monitoring task (Fig. 2), when attention is specifically directed to the target word, this pattern is reversed. We see a same-voice advantage emerge for relative clauses in their harder (object-relative) form. This suggests that encoding advantage can also emerge in a difficult structure when the listener's attention is appropriately directed. Ongoing analysis is examining whether these encoding effects reflect the effort that the listener expended during the initial presentation of the target word, as indexed by their pupillometric measures.

Christiansen, M. H., & Chater, N. (2016). The now-or-never bottleneck: A fundamental constraint on language. *Behavioral and Brain Sciences*, 39, 1–52. <https://doi.org/10.1017/S0140525X1500031X>

Clapp, W., Vaughn, C., & Sumner, M. (2023). The episodic encoding of talker voice attributes across diverse voices. *Journal of Memory and Language*, 128, 104376. <https://doi.org/10.1016/j.jml.2022.104376>

Cohen, C. (2024). Predicting this rock: Listeners use redundant phonetic information in online morphosyntactic processing. *Glossa Psycholinguistics*, 3(1). <https://doi.org/10.5070/G60111493>

Mattys, S. L., Barden, K., & Samuel, A. G. (2014). Extrinsic cognitive load impairs low-level speech perception. *Psychonomic Bulletin & Review*, 21(3), 748–754. <https://doi.org/10.3758/s13423-013-0544-7>