

## Effect of Phonetically Variable Input for L2 syntactic processing: benefit of short intervention to learn French causative structure

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Today's foreign language learners have access to abundant audio/video resources in the target language, yet the efficacy of phonetically variable input (PVI) at an early acquisition stage is debated. While studies have reported supportive evidence for the claim that PVI elicits richer representations of target forms that facilitate generalization to novel input (Bradlow & Bent, 2008; Sadakata & McQueen, 2014; Sommers & Barcroft, 2011), others have shown a negative impact of PVI that results in higher errors in word learning (Mullennix et al., 1989; Wiener et al., 2020). While the effect of PVI may also depend on the amount of exposure learners receive, the interaction between the two has not been much explored.

The present study tests the effect of input voice variability and the size of training on the processing of a causative structure with L2 French learners. For the intervention, we adopted Processing Instruction (PI) training, which has previously shown a steady effect on the improvement of novel L2 form interpretation (VanPatten & Cadierno, 1993; VanPatten & Wong, 2004). Participants from an intermediate-level French course received either Short, Medium or Long (24, 48 or 96 items) training on the target causative structure, and their sentence comprehension was assessed with a picture-selection eye-tracking task before and after training.

In the critical trials of the eye-tracking task, intermediate French learners whose dominant language is English viewed two quasi-identical scenes (Fig. 1) while listening to a causative sentence (e.g., *Pierre fait faire un sandwich à Marie*. 'Pier makes Marie make a sandwich) and clicked on the picture that better matched what they heard. During the PI training, they heard a target sentence (e.g., *Karen fait raconter l'histoire à Marc*. 'Karen makes Marc tell the story') and saw a question in English (e.g., Who tells the story?) and responded by pressing a button (e.g., a. Karen b. Marc). The correct answer was highlighted after each response. Participants received training in either four different voices (2 males and 2 females) or in a single voice (one of the four). The four native speakers of French exhibited naturalistic fluctuation in duration and gender oriented F0 range differences.

Data from 174 participants (Short 58; Medium 65; Long 51) confirmed a robust effect of PI training on picture selection accuracy, while the size of training had a null effect on the improvement. Due to the tendency to interpret the sentence-initial noun as the agent of the action (or First Noun Principle: VanPatten, 1996, 2020), participants dominantly selected the incorrect picture before the PI training (Fig2, top). The accuracy level became higher after the training yet with no difference between training sizes or by voice variability (Fig2, bottom).

The eye-tracking data showed facilitative effects of voice variability for only Short and Medium training groups. Confirming the First Noun Principle, participants increasingly looked at the incorrect picture before the PI (shown as the downward function in Fig3). After a Short PI training, both multi- and single-voice training groups showed the reduction of the incorrect looks toward the end of the causative sentence (shown as the upward function in the bottom panels of Fig3) while only multi-voice training group showed this recovery from the bias after Medium-size training. Neither multi- nor single-voice groups showed statistically reliable recovery after a Long PI training.

The results confirmed the efficacy of PI training with the shortest training with only 24 items and showed that longer training does not yield higher accuracy in the picture selection. Multi-voice input does not negatively impact the effect of auditory PI training: it facilitates the recovery from the bias to interpret the first noun as the agent, yet only when the phonetic variability is introduced within shorter training. Since the picture selection accuracy did not become much higher than 50% and participants did not respond immediately to the critical cue '*fait* +infinitive verb', we argue that the target causative structure was not fully analyzed yet PVI elicited structural differentiations between causative and non-causative sentences. PVI may be effective only for short L2 auditory training that does not burden L2 processing.

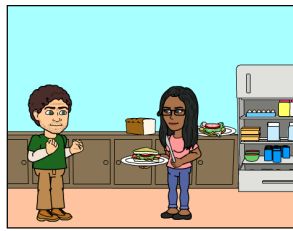
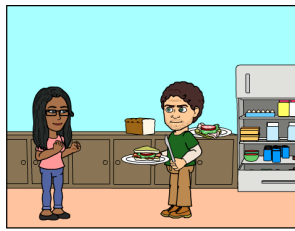


Fig 1: Example picture-selection visual stimuli for *Pierre fait faire un sandwich à Marie*. 'Pierre makes Marie make a sandwich'. The correct choice is the right. For a non-causative *Pierre fait un sandwich por Marie* 'Pierre makes a sandwich for Marie' the left is correct.

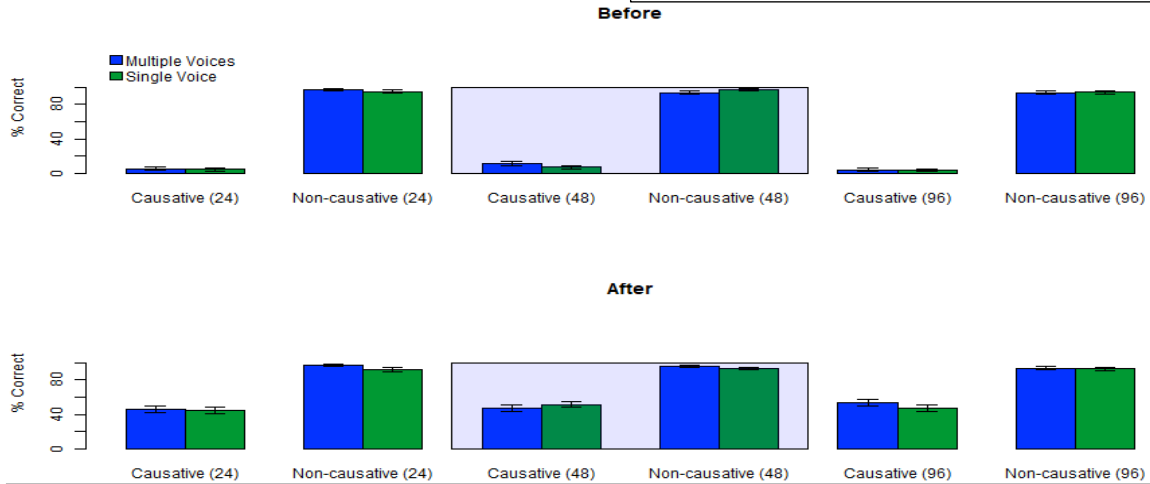


Fig2: Picture selection accuracy for causative and non-causative sentences before (upper) and after (lower) the PI training

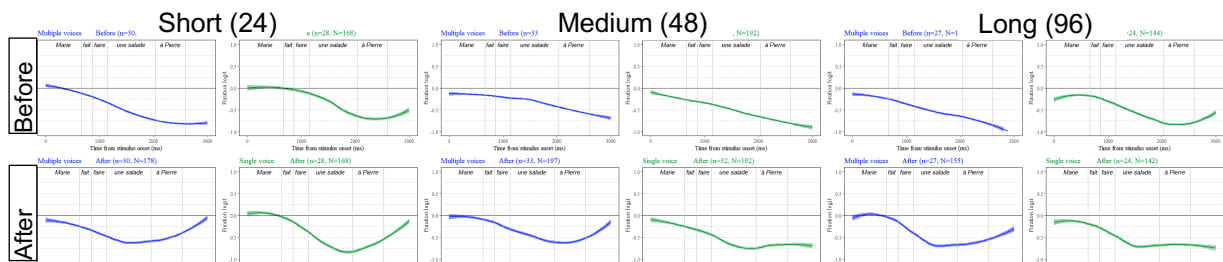


Fig3: Eye-tracking data for the causative sentences during the picture selection task: Before (upper) and After (lower) PI training; Multi (blue) and Single (green) voice training. The function is the log ratio of the looks to correct and the looks to incorrect picture: the downward deviation from the 0 line indicates more looks to the incorrect picture.

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