

The influence of talker variability, working memory, and vocabulary size on L2 speech perception training

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High variability phonetic training (HVPT) has been shown to improve second language (L2) learners' perception of difficult phonemic contrasts, particularly when learners are exposed to multiple talkers and varied phonetic contexts [1,2]. However, findings remain mixed regarding the optimal structure of variability (e.g., blocked vs. mixed presentation), and learner outcomes vary widely [3,4]. Recent research suggests that individual differences—particularly in working memory and vocabulary size—may moderate the effectiveness of HVPT [5], but few studies have systematically examined their interaction with training structure. This study investigated how variability structure (1-talker, 6-talker blocked, 6-talker mixed) interacts with learner profiles to predict outcomes in L2 speech learning and retention.

Seventy-nine Korean learners of English with minimal exposure abroad were randomly assigned to one of three HVPT conditions: 1-talker ($n = 29$), 6-talker blocked ($n = 25$), or 6-talker mixed ($n = 25$). The training targeted the English vowel contrasts /i/-/ɪ/ and /ɛ/-/æ/, using minimal pairs in a two-alternative forced choice (2AFC) task with feedback. All learners completed a pretest, five training sessions, an immediate posttest, and a delayed posttest two weeks later. Test items included trained and novel words produced by an unfamiliar talker. Working memory capacity was assessed using forward and backward digit span tasks, and vocabulary size was measured using the Vocabulary Size Test [6]. The study was conducted online using Gorilla Experiment Builder [7].

Results showed robust pre-to-posttest improvement across all groups, with gains sustained at delayed posttest. Learners in the high-variability conditions (6-talker blocked and mixed) outperformed those in the low-variability (1-talker) condition, indicating a general benefit of talker variability (see Fig. 1). Crucially, individual differences moderated these effects. In the 1-talker condition, higher working memory capacity was associated with greater gains, suggesting reliance on internal rehearsal when external variability was limited. In contrast, vocabulary size was a stronger predictor of learning outcomes in the 6-talker mixed condition than in the blocked condition. Learners with larger vocabularies showed greater gains and retention in the mixed condition, suggesting that mixed variability supports better generalization for learners with richer lexical representations (see Fig. 2).

These findings underscore the importance of tailoring HVPT design to learner profiles. While high-variability input is generally effective, the structure of that variability interacts with learners' cognitive and linguistic abilities. Mixed variability appears particularly beneficial for learners with larger vocabularies, whereas learners with lower working memory may benefit from lower-variability or more structured input before engaging with mixed-talker training. This study contributes to the growing body of work seeking to personalize L2 phonetic training by identifying which types of learners benefit most from which types of training structures.

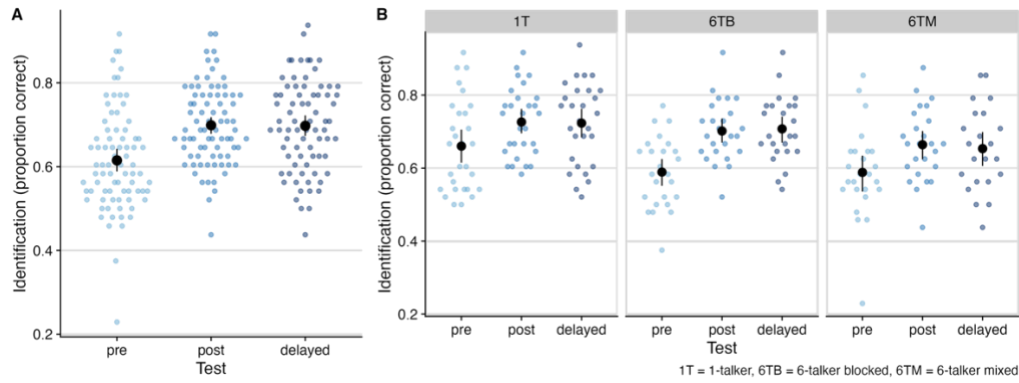


Fig. 1. Identification accuracy by test and condition

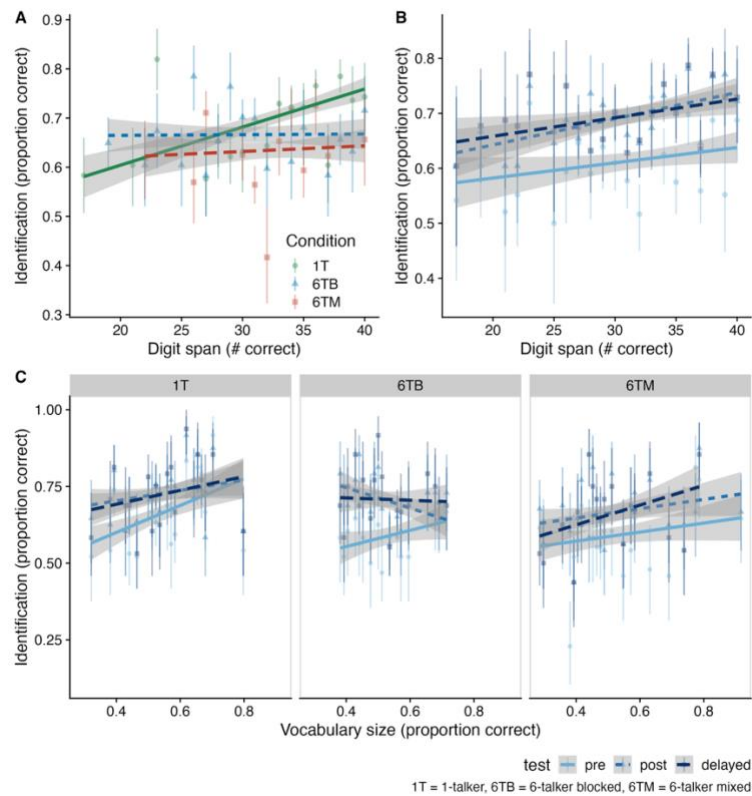


Fig. 2. Interactions between individual differences (working memory, vocabulary size), condition, and test

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