

PRIOR LEARNING OF ACOUSTIC CUES BLOCKS LEARNING OF NEW CUES IN NON-NATIVE SPEECH ACQUISITION

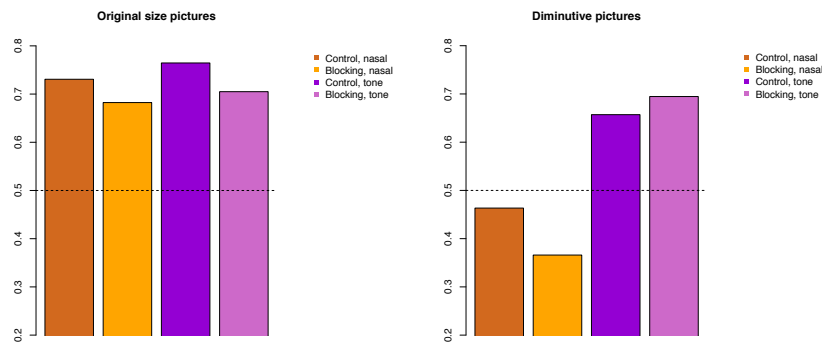
Authors
Affiliations

Introduction. Half a century ago, Kamin (1968) demonstrated that, in animal learning, cue learning can be diminished - 'blocked' - by previously learned cues when those cues are sufficient to predict a given outcome. Cues are not learned simply due to co-occurrence with a particular outcome (Rescorla, 1988, 1968), but instead compete for relevance for predicting important outcomes (Ramscar, Dye, & McCauley, 2013). Evidence has accumulated over the last two decades suggesting listeners are highly sensitive to the statistical distribution of linguistic cues. However, statistical models of speech acquisition and perception often focus on listeners' sensitivity to the statistical distribution of cues in the input, without accounting for effects of blocking and cue competition in speech acquisition. The present study investigates whether acquisition of new non-native speech cues can be blocked by prior knowledge of predictive cues.

Method. Participants were 191 native English speakers, recruited online via Amazon Mechanical Turk. Participants heard Southern Min Chinese words and saw two pictures of 'alien' objects (original size and small/diminutive). Words were mid-level or high-level tone with either a nasal or oral vowel. Mid-level tone, oral words served as baseline as they are closest to English speech. The experiment had three phases: pre-training, training and test. The training was the same for all participants. Baseline words corresponded to original size pictures and diminutive pictures corresponded to high tone, nasal words. Participants either received *blocking pre-training* or *control pre-training*. In the blocking condition, participants heard a single cue (e.g. high-tone words) before the training phase. During test, participants were tested on the cue that was not pre-trained (e.g. nasal words). In the control pre-training condition they heard unrelated cues, not presented in training or test.

Results. Results are shown in Figure 1. A glmer model showed that accuracy was higher for the original size picture, which corresponded to baseline words, as well as for the tone cue. Most importantly, for the nasal cue, accuracy was significantly lower for participants who had had blocking pre-training, compared to control pre-training. There was no effect of condition for the original size picture, probably because this was the baseline, it was the most often selected picture and accuracy was very high. There was also no effect of condition for tone. The nasal cue was not learned completely during pre-training, and therefore did not block learning of the tone cue because it left sufficient uncertainty available to drive further learning in the training phase.

Discussion. The present study demonstrates that in speech acquisition, learning new cues to a linguistic outcome can be blocked by already-learned cues. These results have important implications for theories of speech acquisition. Firstly, they suggest that acoustic knowledge will not necessarily always reflect statistical structure of language input, but will depend on the predictive structure of learning events. Secondly, these results may help explain transfer effects in second language acquisition. They also have implications for the order of acquisition in first language acquisition.



- Kamin, L. J. (1968). Attention-like” processes in classical conditioning. In *Miami symposium on the prediction of behavior: Aversive stimulation* (pp. 9–31).
- Ramscar, M., Dye, M., & McCauley, S. M. (2013). Error and expectation in language learning: The curious absence of mice in adult speech. *Language*, 89(4), 760–793.
- Rescorla, R. A. (1968). Probability of shock in the presence and absence of cs in fear conditioning. *Journal of comparative and physiological psychology*, 66(1), 1–5.
- Rescorla, R. A. (1988). Pavlovian conditioning: It’s not what you think it is. *American Psychologist*, 43(3), 151.