Exploring adult learners’ discrimination of non-native speech contrasts under an error-driven learning account

Yuxin Ge¹, Eva Viviani², Michael Ramscar³ & Elizabeth Wonnacott²

1 Lancaster University, Lancaster, UK; 2 University of Oxford, Oxford, UK; 3 Eberhard Karls Universität Tübingen, Tübingen, Germany

Introduction

What underlying mechanisms drive statistical tracking in speech learning? The current study investigates the role of prediction and prediction error, which serves to reduce uncertainty about outcomes via cue competition, in statistical learning. In this error-driven learning process, learners are expected to better discriminate informative from uninformative cues when spoken words are presented before referent objects, allowing predictions about the upcoming object on the basis of the speech cues (discriminative condition); if instead referent object are presented first (non-discriminative condition), learning will depend solely on cue-outcome associations (Nixon, 2020; Ramscar et al., 2010). We tested this hypothesis in Mandarin speakers with an artificial language.

Materials & Methods

N=185

Chinese native

Do NOT know Italian

How frequency

(15% of items)

Low frequency

(75% of items)

bevve_rising
casa_falling

casca_falling

bveve_rising
casa_falling

casca_falling

Materials & Methods

No. of trials = 60

High frequency

(single consonants) and at the same time to ignore an uninformative tonal cue to learn words. Participants learned to discriminate an informative Italian gemination cue (double vs single consonants) and at the same time to ignore an uninformative tonal cue to learn words.

Analysis & Results

Test 1 – Trained Words

• Ambiguous evidence of interaction between frequency and learning condition (p=.064, BF = 3.7554)

Sub-analyses: Overgeneralization

Trials where - if gemination is ignored - both the target and the foil words are associated with the target picture.

Test 2 – Generalization

• Strong evidence of interaction between frequency and learning condition (p=.011, BF = 11.915)

• Ambiguous evidence of simple effect of learning condition for low frequency items (p=.112, BF = 1.714)

• Substantial evidence of simple effect of learning condition for low frequency items (p=.011, BF = 11.915)

Discussion

Participants in the discriminative order:

• showed stronger learning of the critical low frequency items in the generalization test with novel tones (Test 2)

• showed stronger learning of the critical low frequency items with trained words specifically for the subset of items where ignoring gemination leads to overgeneralization based on more salient (but not discriminatory) cues

• It suggests that an ordering which allows for cue competition and prediction error leads to stronger learning.

References
