Implicit learning of a non-native speech contrast

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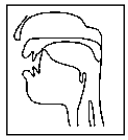
Study Goals

Recent studies[1,2] demonstrate perceptual learning of unattended stimuli that precede or predict an explicit task target. Implicit learning has improved visual coherent motion detection thresholds and auditory categorization of artificial sounds. Based on these findings we train Greek listeners to distinguish a Hindi dental-retroflex contrast without task awareness or feedback, challenging the standard assumption that non-native speech categories are learned by adults only when trained in focused attention with explicit feedback.

Hindi dental-retroflex contrast

Learning one's native language results not only in efficiently processing its sounds of but also in learning to ignore sound differences not used in it. For example, Japanese listeners hear no difference between the English sounds /r/ and /l/. A phonetic pair not existing in Greek concerns a distinction in Hindi between dental and retroflex place of articulation.

In **retroflex** sounds the tongue tip curls up and back to touch the palate.

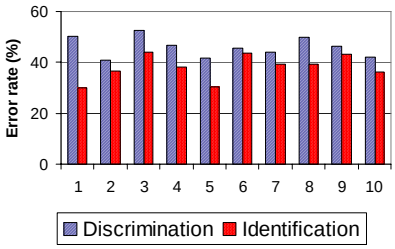


In **dental** sounds the tongue tip presses against the upper teeth

Perceptual pre-tests indicated that Greeks are initially unable to differentiate the Hindi sounds…

Pre-test: Ten Greek students were tested in identification and discrimination of Hindi CV syllables starting with a retroflex or dental consonant.

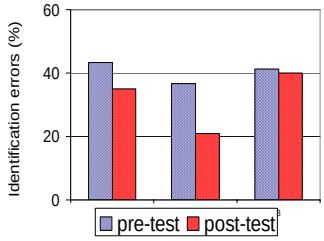
Mean error rate was **38.1%** for identification and **46.1%** for discrimination.



…but can learn the contrast somewhat with standard training

Standard Training: Three students were trained in an explicit identification task with feedback in five daily sessions, then re-tested with the same materials.

Mean improvement was **8.5%** for identification and **4.7%** for discrimination.



In the main experiment, 8 Greek students carry out a demanding voice identification task in 10 daily sessions

Participants heard rapid Greek syllable sequences in a variety of **distractor voices** and had to detect and repeat the syllable pronounced by one of two **target voices**:

a typical sequence of 350-ms syllables:

ro ʈa du xo fu ze da ti ɕe

the Hindi **retroflex sound** precedes a **target-voice**

a **target-voice** says a Greek syllable which must be reported

random Greek syllables in other voices fill the sequence

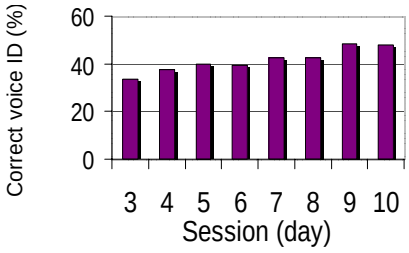
the Hindi **dental** sound appears in a random position

Hindi syllables with **retroflex sounds**, spoken by a single native speaker, always preceded the **target voices**, while Hindi **dentals** appeared in non-predictive positions.

Hypotheses

Participants will learn the unattended and task-irrelevant stimuli (the **retroflex** sounds) as a result of a systematic temporal[1] or predictive[2,3] relation with the task target (**target-voice**). That is, after voice-identification training, listeners will improve in the Hindi dental-retroflex distinction. To test whether learning is a result of **mere exposure** to the Hindi sounds, control groups will be tested with stimulus sequences and procedure identical to that for the experimental group, except for the systematic co-occurrence of Hindi retroflex with the target-voice.

Explicit task performance: During the 10-day training period participants showed an improvement in correctly identifying the target-voices



Preliminary Results

After voice ID training, participants were tested for the first time on Hindi dental-retroflex discrimination and identification. In comparison to the untrained listeners, no statistically significant improvement has thus far been observed. More participants and additional training will be needed before concluding whether implicit learning of non-native speech contrasts is possible.

References

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