# Expectations about a foreign accent influence speech perception even without prior experience


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## Introduction

Listener expectations have been shown to shift the perception of vowels in accordance with information about the regional origin of the speaker, even when the information provided to the listeners about regional origin is incorrect (Hay & Drager, 2010; Hay, Nolan, & Drager, 2006; Niedzielski, 1999).

Exemplar theories offer a straightforward account of how experienced-based expectations may have an influence on speech perception (Hay & Drager, 2010; Hay et al., 2006).

**Do listener expectations about the regional origin of the speaker influence vowel perception even when listeners do *NOT* have *prior experience* with the speech from that area?**

## Methodological approach

We tested **Australian-accented listeners**' recovery of **Vietnamese-accented vowels** in a vowel categorization task.

We chose listeners who reported having **no prior experience with the Vietnamese accent**.

***Treatment condition:***

Told to expect an Australian-accented speaker in the Training phase and a Vietnamese-accented speaker in the Test phase.

***Control condition:***

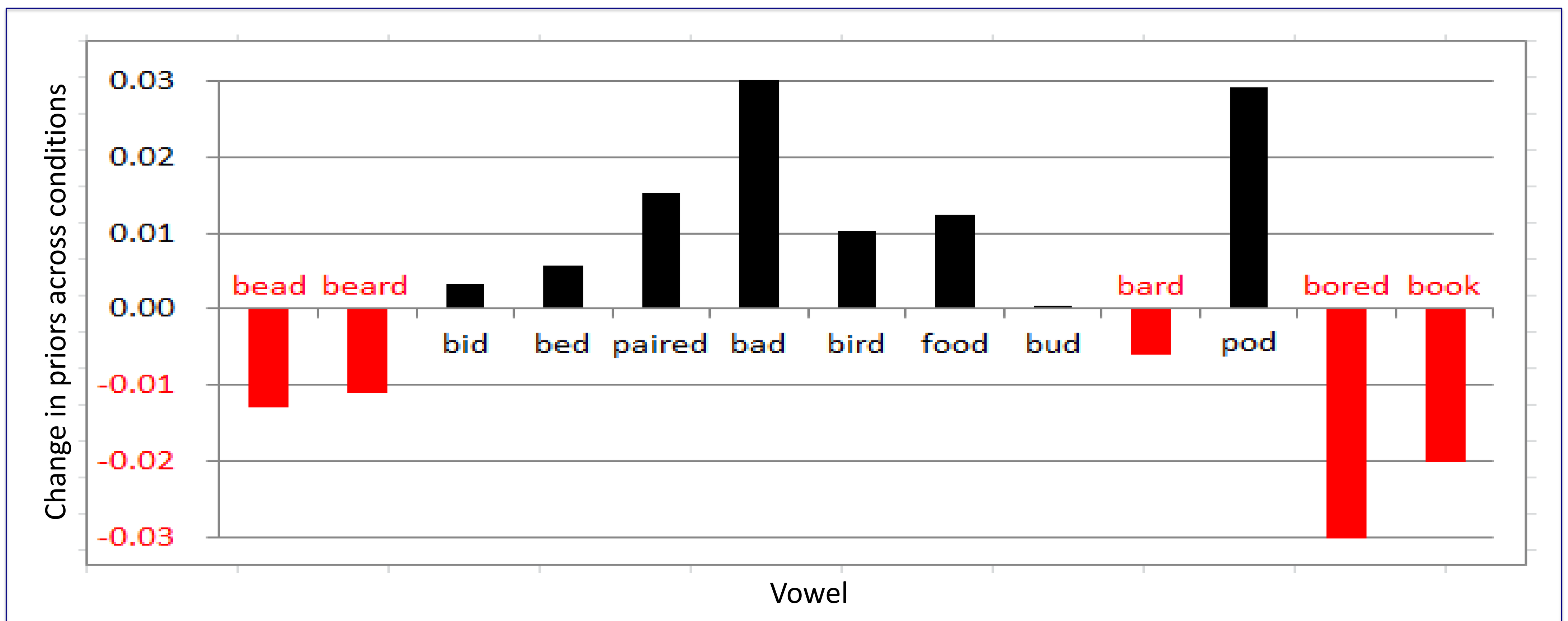
Told to expect two different speakers and given no additional information about the speakers' accents.

## Vowel categorization task

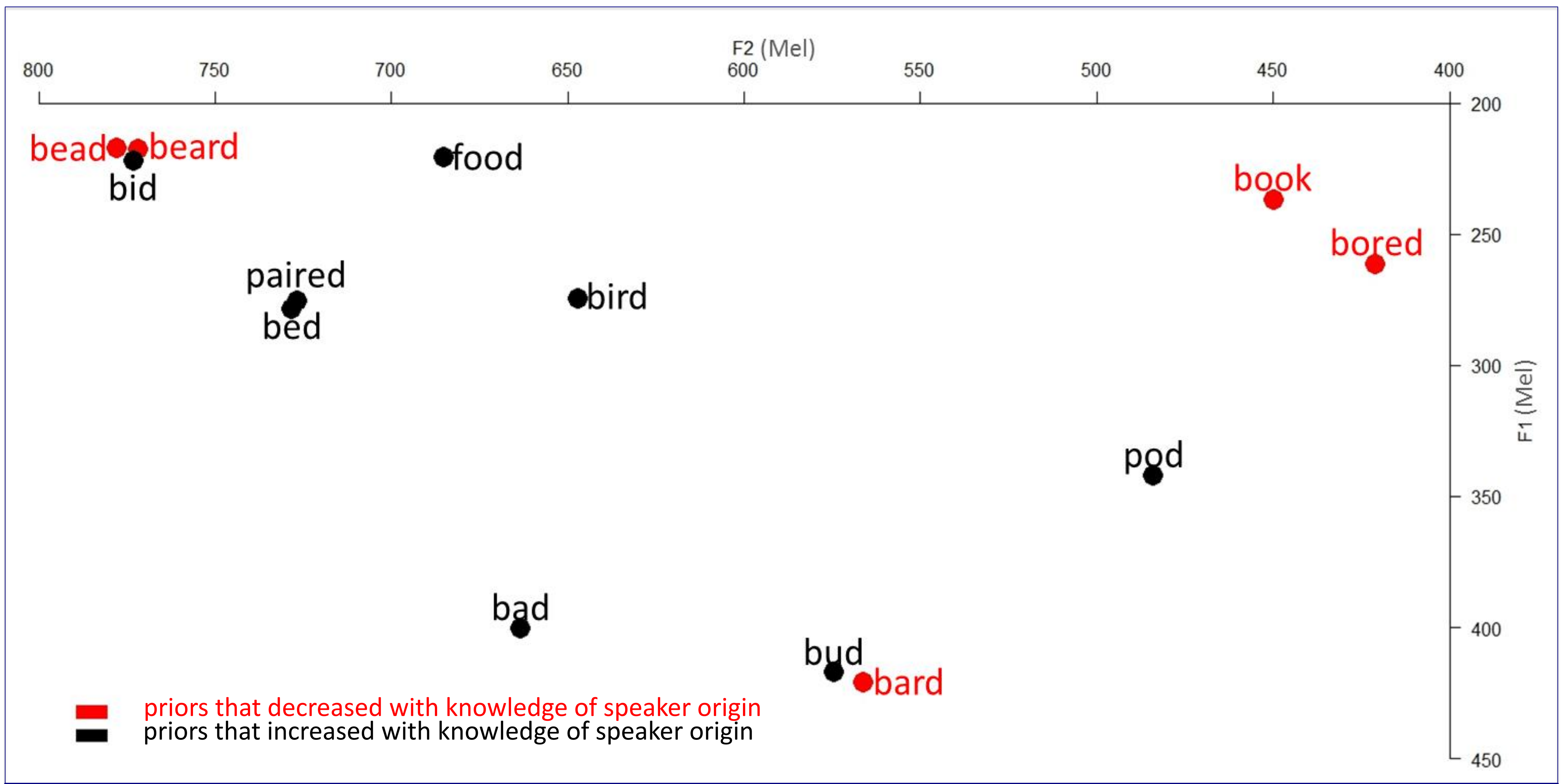
| | | | | |
|---|---|---|---|---|
| paired | bed | bead | pod | bad |
| bard | bird | bud | beard | food |
| | book | bid | bored | |

43 Australia-born volunteers from the Greater Sydney area (age ranged = 18 - 45 years) listened to tokens of 13 /hVdə/ nonce words (e.g., heeda, hidda, hedda, hadda).

## Results




**Change in priors across conditions based on differences in accuracy across conditions (see details of analysis below)**




**Decrease and increase in priors within the Australian English vowel space**

## Discussion and/or Conclusion

**Despite having *NO prior experience* with Vietnamese-accented English, listeners who were told that the speaker was of Vietnamese origin expected to hear more central vowels** (i.e., bid, bed, paired, bad, bird, food, bud, and pod)**, suggesting shrinkage of the perceptual space due to expectations about the accent.**

That ***non-experienced-based expectations also shift vowel perception*** provides an interesting challenge to exemplar theory accounts of past research. A more abstract formalization of beliefs may be necessary to provide a unified explanation for how expectations influence speech perception.

## Analyses

We quantified expectations as a Bayesian prior, $P(h_i)$, in the formula below:

$$P(h_i|d) = \frac{P(d|h_i)P(h_i)}{\sum_{h_j \in H} P(d|h_j)P(h_j)}$$ (Perfors, Tanenbaum, Griffiths, & Xu, 2011)

As applied to our experiment, we interpreted the terms of Bayes' law as follows:

$\frac{P(d|h_i)}{\sum_{h_j \in H} P(d|h_j)P(h_j)}$: signal specificity

$P(h_i|d)$: vowel categorization accuracy

$P(h_i)$: vowel expectations

This leads us to the following conceptualization:

$$Vowel\ categorization\ accuracy = Vowel\ expectations \times Signal\ specificity$$

=>

Since listeners heard each vowel an equal number of times in the Training phase, for the Control group we assumed that they assigned equal prior probabilities to the 13 vowels in the Test phase ($Vowel\ expectations\ (Control)$ = 1/13) and solved for the signal specificity values.

$$Signal\ specificity = \frac{Vowel\ categorization\ accuracy\ (Control)}{Vowel\ expectations\ (Control)}$$

Since the stimuli were the same across conditions, we kept the values of $Signal\ specificity$ constant across conditions and solved for $Vowel\ expectations\ (Treatment)$ in the Treatment condition.

$$Vowel\ expectations (Treatment) = \frac{Vowel\ categorization\ accuracy\ (Treatment)}{Signal\ specificity}$$

We then subtracted $Vowel\ expectations\ (Control)$ from $Vowel\ expectations\ (Treatment)$ to examine the change in expectations across conditions (Control vs. Treatment).

$$Change\ in\ expectations = Vowel\ expectations\ (Treatment) - Vowel\ expectations\ (Control)$$

The bar graph above shows this change in priors across conditions.