

## INTRODUCTION

## Does pitch in nonspeech have the same perceptual salience as speech?

Prior work tested dynamic pitch perception with stimuli that are do not resemble natural language or speech: [1] created nonspeech stimuli consisting of pulse trains; [2, 4] used analog formant synthesis. [3] used prolonged isolated syllables resynthesized from naturally produced speech. *How well do these nonspeech analogs approximate pitch perception for real speech?*

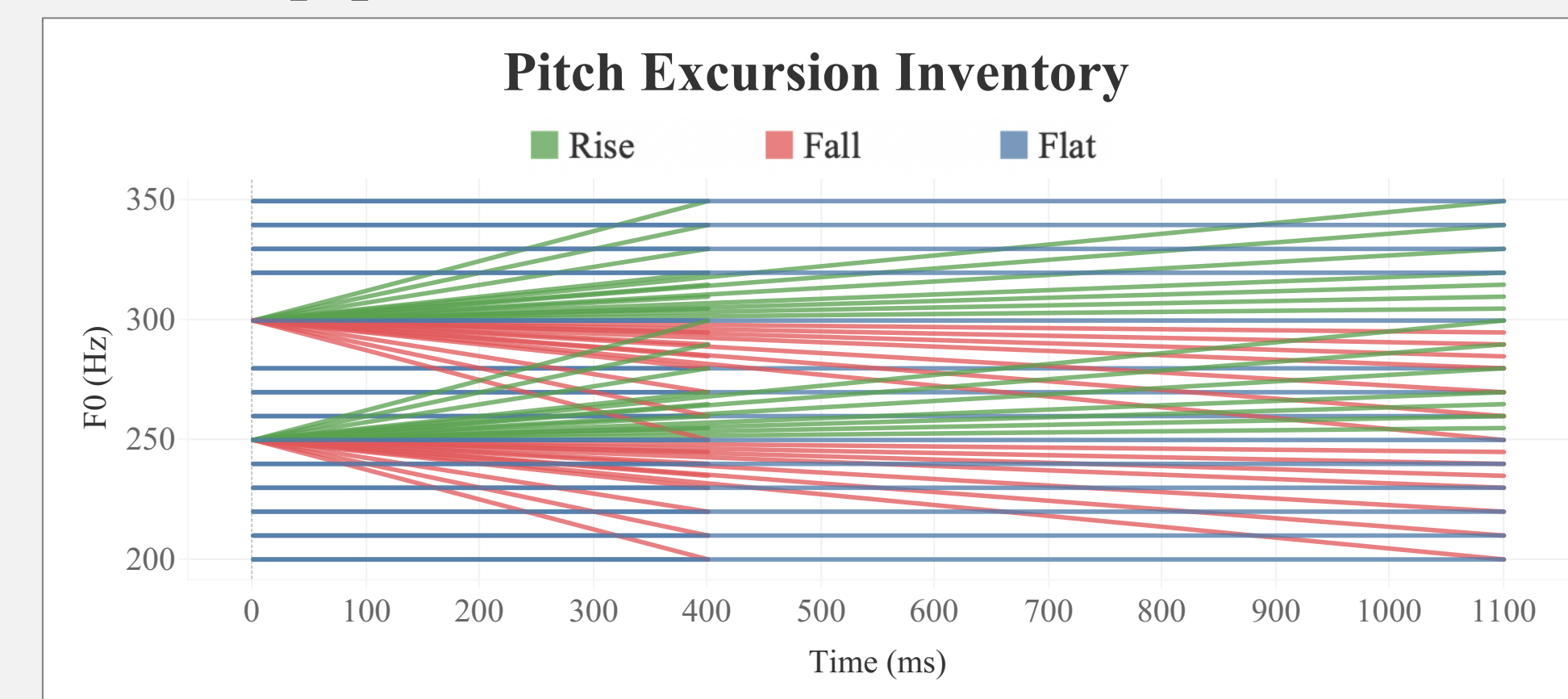
The present study is the first to test dynamic pitch perception over stimuli with segmental content and syllable structures found in natural speech.

## METHODS

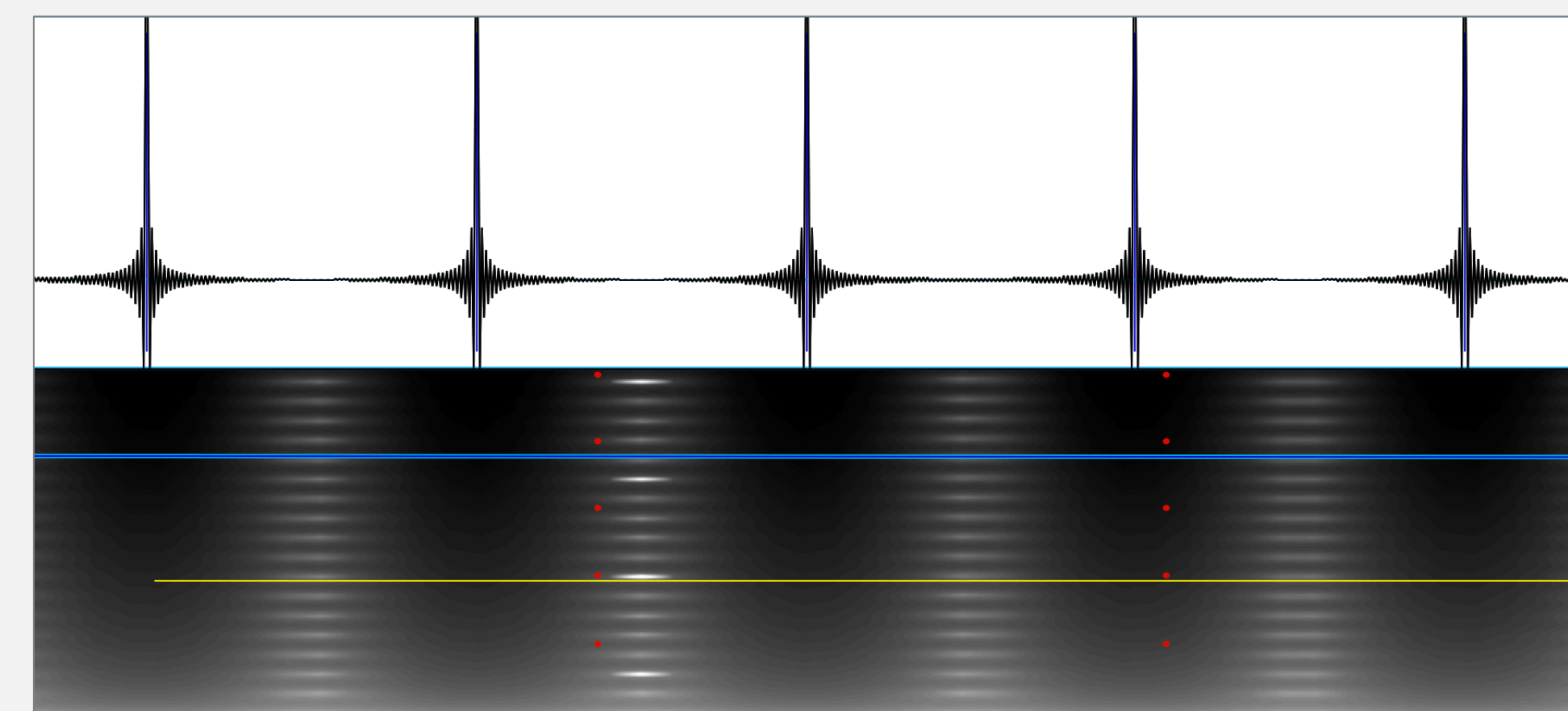
- ❖ 32 right-handed Native English listeners
- ❖ 336 speech trials + 336 nonspeech trials
- ❖ Identified pitch pattern (rising, falling, or flat) of speech and nonspeech auditory stimuli in a speeded 3 AFC task

## MATERIALS

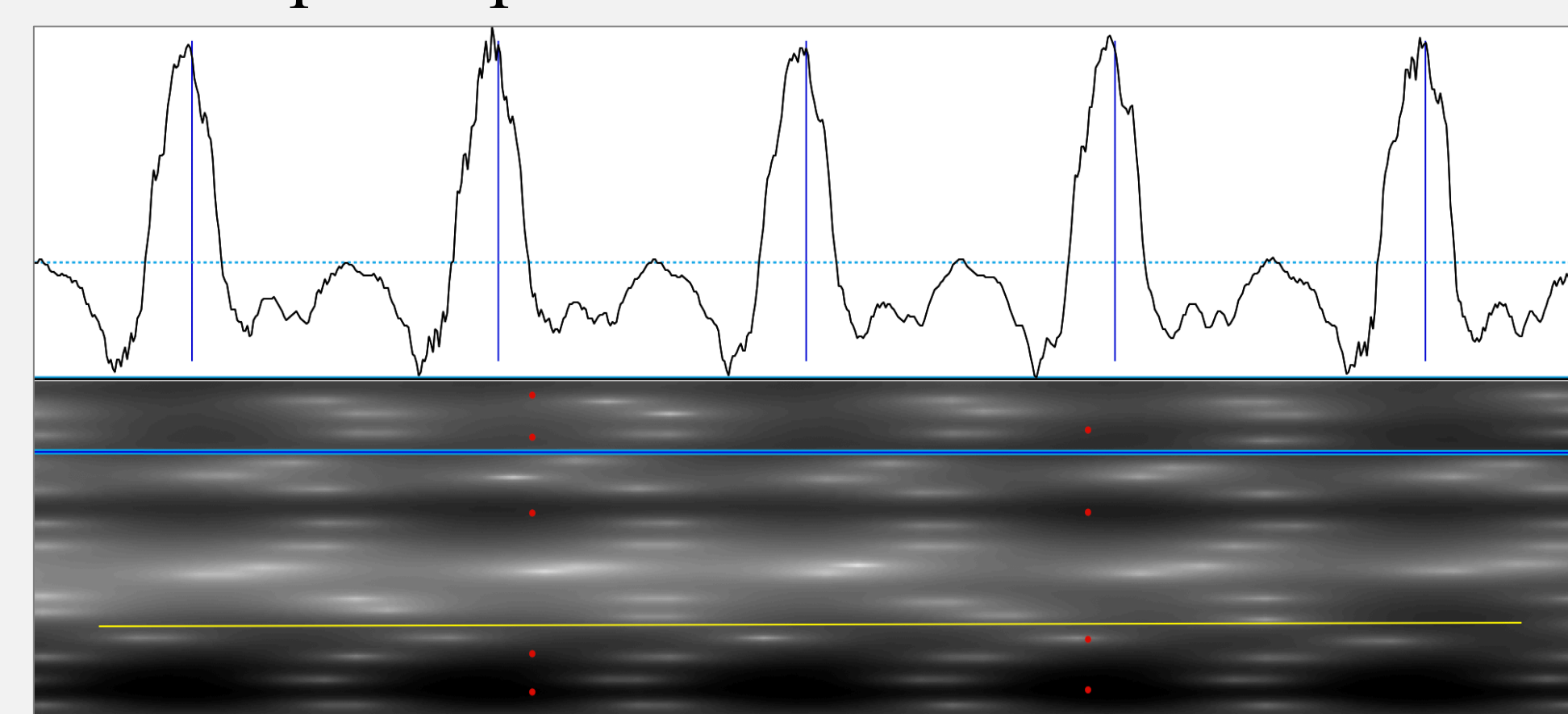
**Dynamic** stimuli had excursions of 5, 10, 15, 20, 30, 40, or 50Hz, beginning at 250 or 300Hz. **Flat** stimuli were created in 10 or 20Hz steps between 200 and 350Hz. This is identical to the method used in [1].



**Nonspeech** consisted of pulse trains generated using Praat, identical to [1].



**Speech** stimuli were created from recordings of 1- and 3-syllable nonce words (i.e. [ba], [bazagi]) produced by an informed speaker. They were resynthesized with the same pitch patterns used for nonspeech pulse train stimuli.

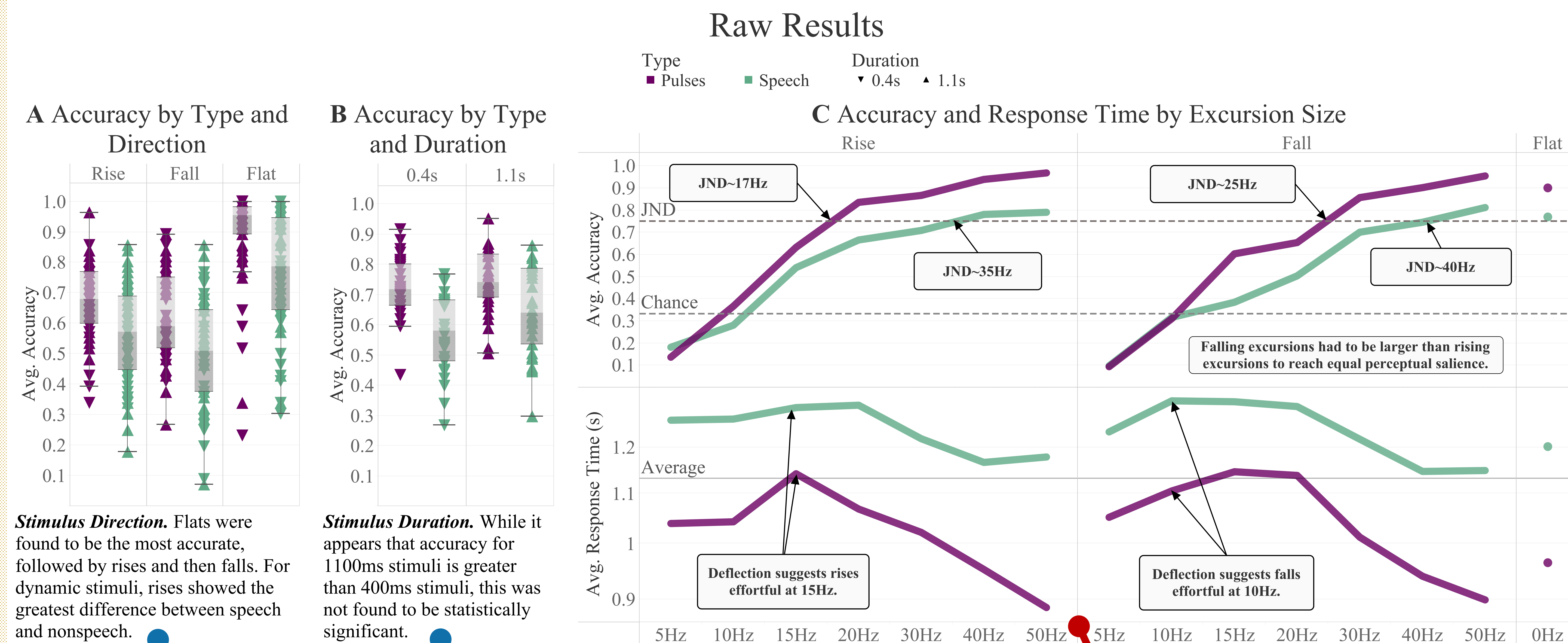


## Dynamic pitch perception in speech &amp; nonspeech

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## RESEARCH QUESTION #1

## What is the perceptual difference between dynamic pitch over speech &amp; nonspeech?



## CONCLUSIONS

- ❖ The threshold for the perception of dynamic pitch is higher for speech than for its nonspeech analogs.
- ❖ Mapping from nonspeech to the speech domain is not straightforward...
- ❖ ...so speech analogs, including pulse trains, should be used with caution for speech research.

## FINDINGS

1. Pitch excursions in speech are less accurate and slower to classify than those in nonspeech.
2. Generally, pitch excursions had to be greater than 10Hz to be categorized above chance.
3. For RT, Speech > Nonspeech and deflection patterns suggest falls may require more effort to judge.

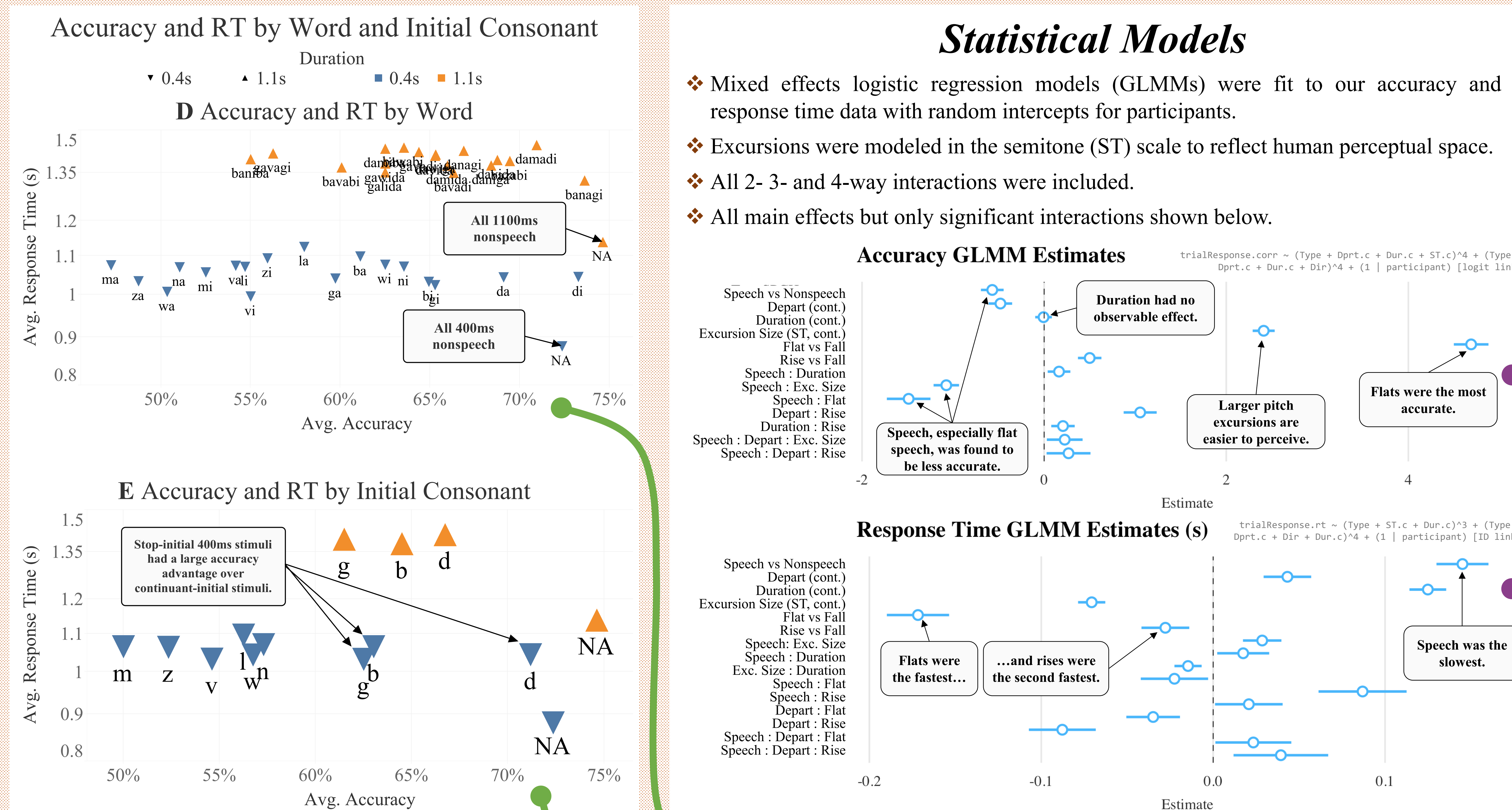
4. Judgements of flat vs. dynamic are more accurate than rise vs. fall.
5. Rising excursions show greater differences between speech and nonspeech than falling ones.
6. For accuracy, Flat > Rise > Fall and 400ms  $\approx$  1100ms.

7. Speech was less accurate and slower than nonspeech.
8. For accuracy, cline Flat > Rise > Fall is statistically significant.
9. Duration (and, by extension, pitch slope) had no observable effect.
10. For RT, Falls > Rise > Flat.

11. Pitch events in monosyllabic syllables with voiced stop onsets were more accurately categorized than those with continuant onsets.

## RESEARCH QUESTION #2

## What are the properties of the speech signal that best predict perceptibility for dynamic pitch movements?



All data and materials needed to reproduce this experiment (and this poster!) are available free of charge through the Open Science Framework:

<https://osf.io/umq9j/>

