Flexibility and context in phonetic variation: evidence from bilingual speech

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Structure

- Relating multilingual speech and adaptive behaviors
- Results from previous study
- Current study
  - Design and issues
  - Results from pre-experiment
  - Issues, questions, feedback?

Phonological categories and speech acoustics

- Listening and speaking = mapping between continuous acoustics and discrete categories
- Mapping: not fixed; shifts with context; optimizes communication
- Multilingual settings: multiple mappings, affecting each other
- If the mapping system is optimized/biased for communication, then is this flexibility exploited for optimizing the system?

Research question

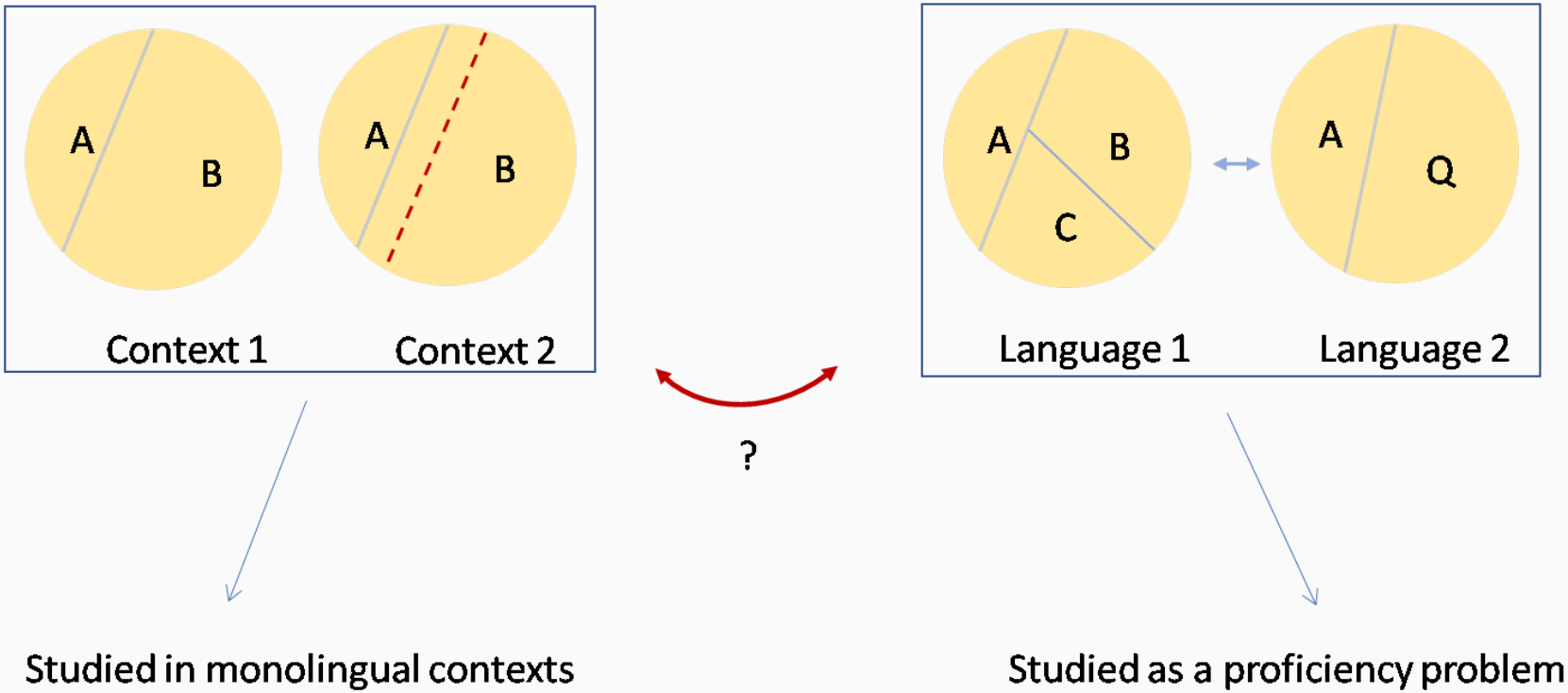


Figure 1

This study: Is cross-language interaction greater when it is more (communicatively) useful in a specific context, and lesser when it is not?

- L1-L2 interaction is not fixed
- Cross-language influence changes as a function of linguistic context; Mitra et al.(2019), Mitra&Dutta(forthcoming):

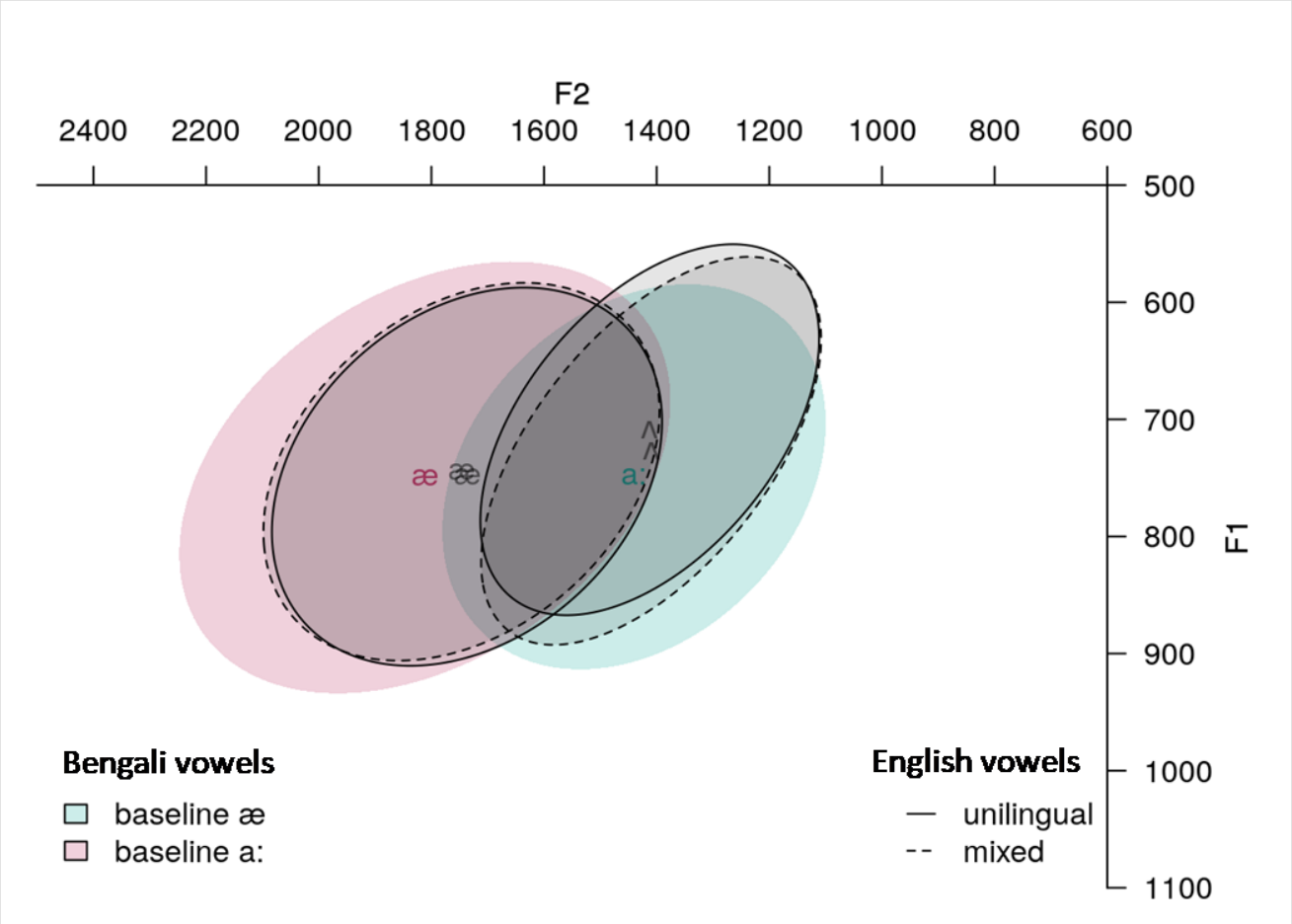


Figure 2: English vowels show more "L1-influence" in a code-switching context

Current study

- Perceptual adaptation: shift in category boundaries depending on linguistic context — clear communicative relevance
- Language pair: Bengali and Indian English
- Vowel contrast: [a]–[ʌ] (STAFF–STAFF)— divided differently in the two languages
- Does perceptually adapting the [a]–[ʌ] contrast in English automatically cause a parallel shift in the Bengali [a]? Or is this moderated by communicative need?

Research Questions

- Do listeners adapt to speech in L2?
- If so, does this “automatically” affect a related L1 category?
- Dimensions of individual differences?

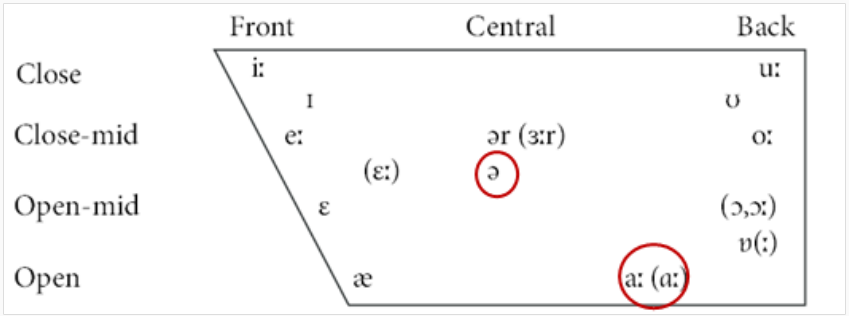
Design

Participants

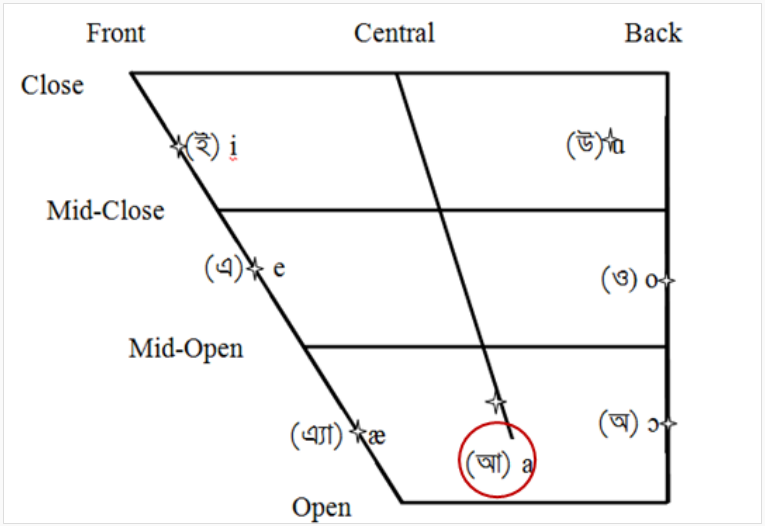
- Multilingual speakers of Bengali and Indian English
- Multilingual setting, Indian English used as a link language
- Ecological validity

Stimuli

- Contrasts:
  - English: [a]—[ʌ]
  - Bengali: [a]—*[ʌ]



(a) English vowel system



(b) Bengali vowel system

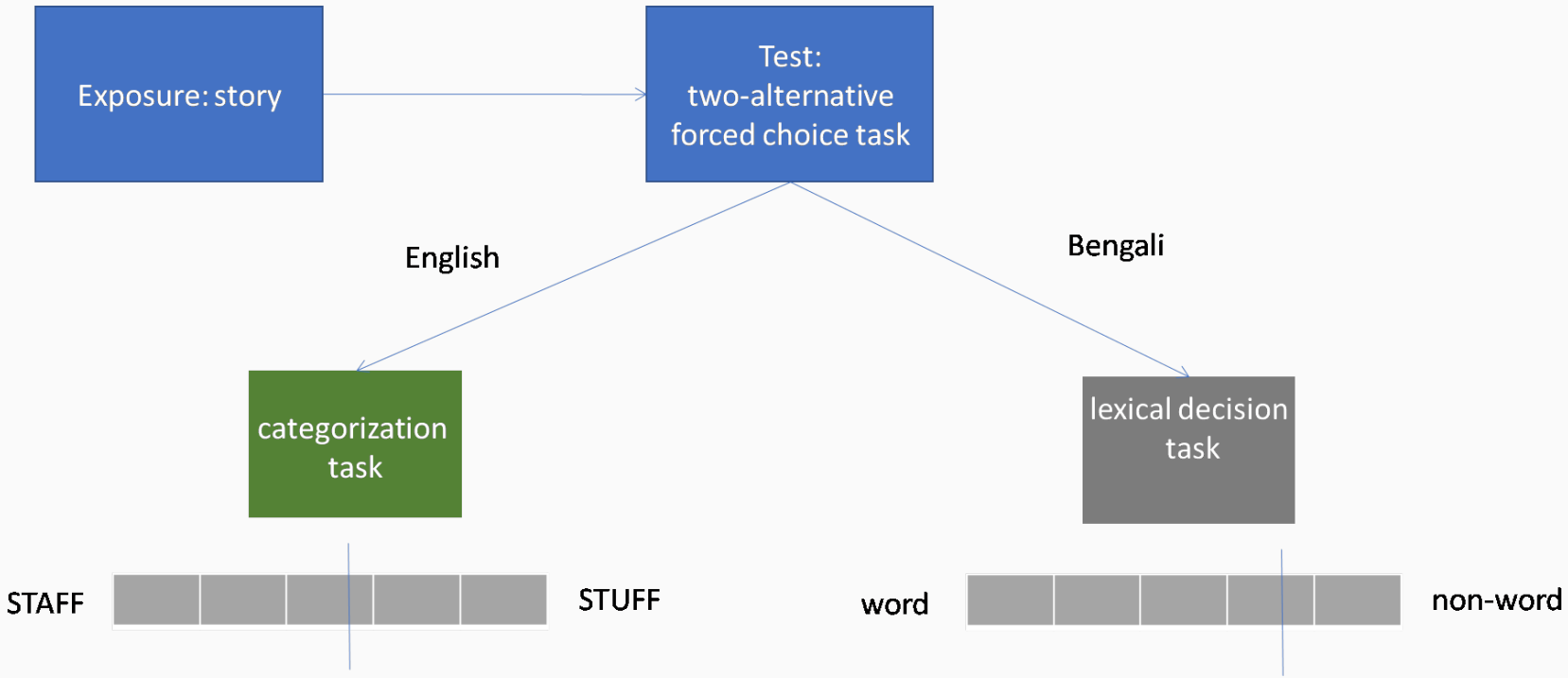
Figure 3: Contrasts used in study

Stimuli

- Exposure stimuli: Extract from “Alice in Wonderland”, 8 min, read by bilingual speaker, target vowels manipulated
- Test stimuli: 11-step continuua between endpoints of contrast
  - English: monosyllabic minimal pairs: STAFF—STUFF, CALM—COME
  - Bengali: monosyllabic word–nonword pairs: [gal] “cheek”— *[gʌl], [kat^{h}] “wood” — *[kʌt^{h}]

Paradigm

Paradigm: task types



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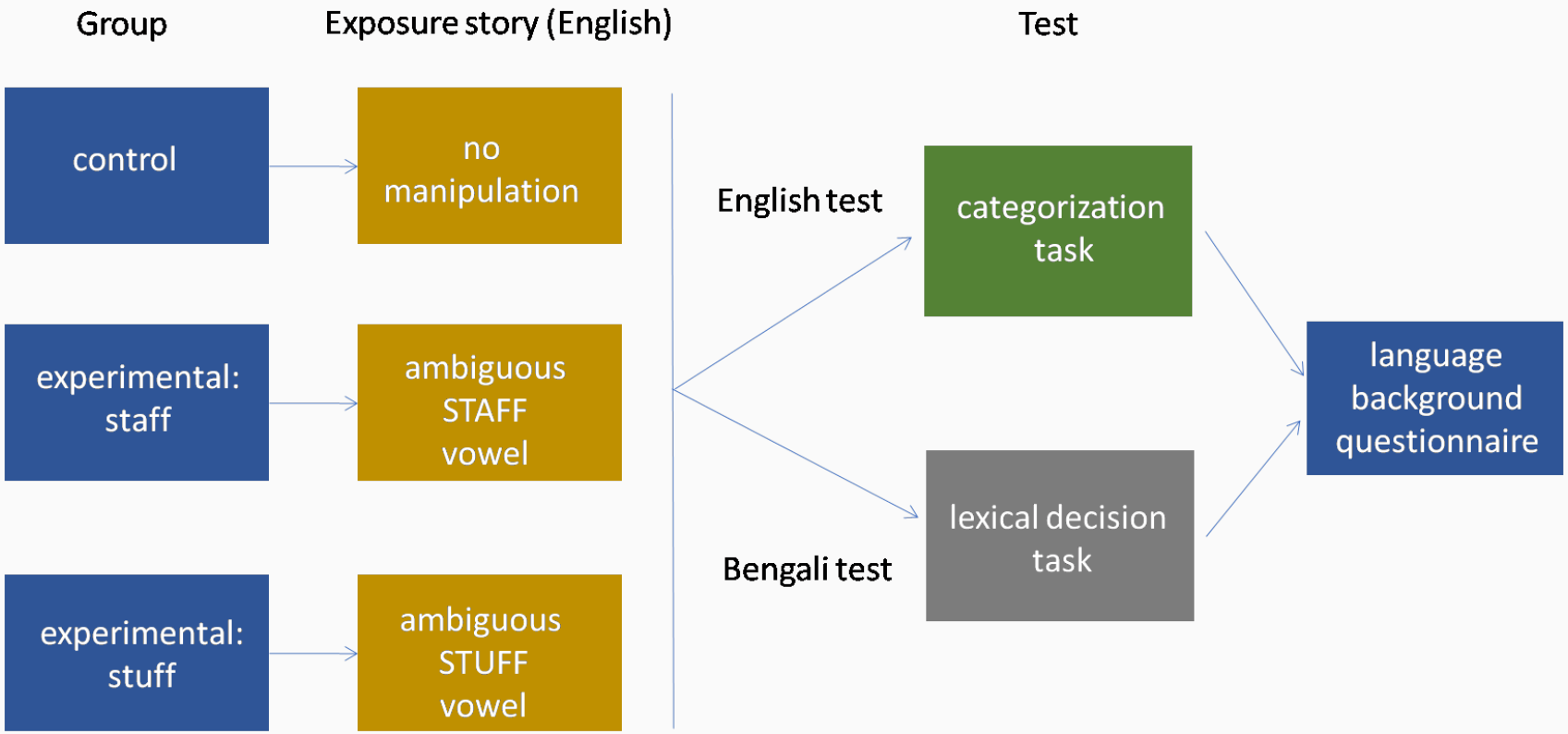
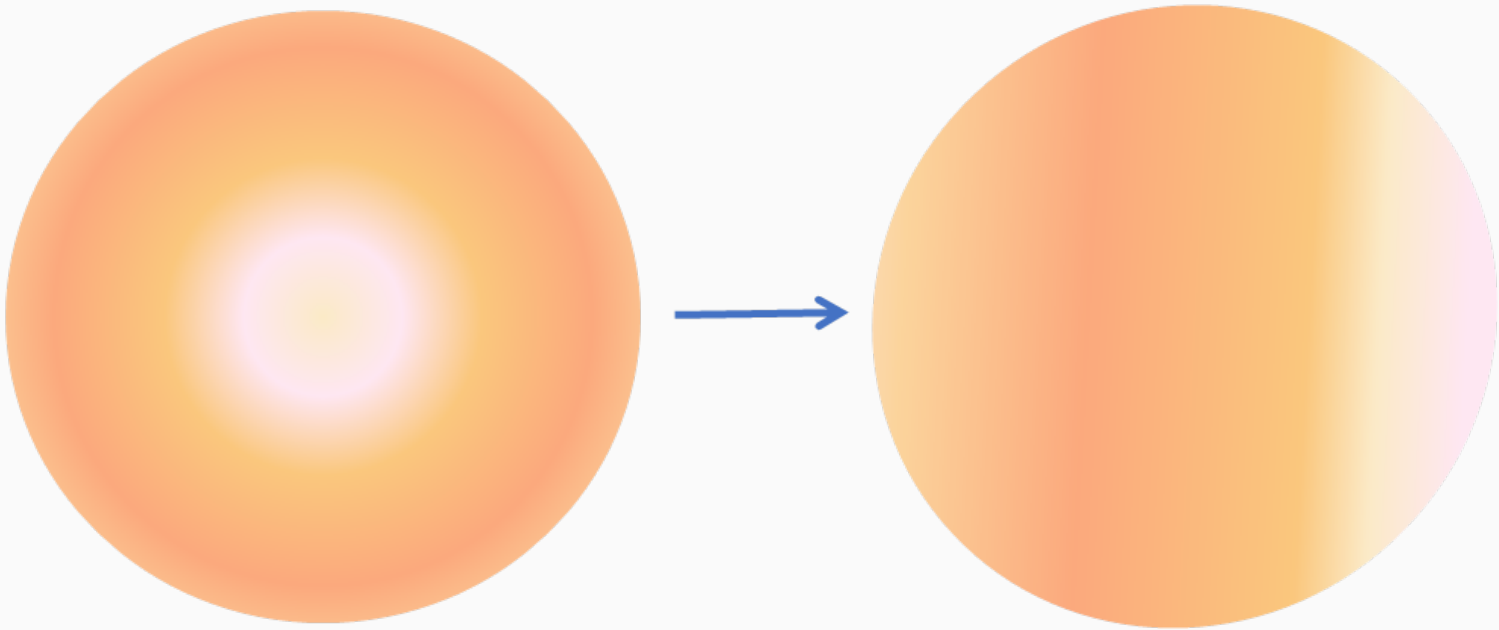

Group
Exposure story (English)
Test
control
no manipulation
experimental: staff
ambiguous STAFF vowel
experimental: stuff
ambiguous STUFF vowel
English test
Bengali test
categorization task
lexical decision task
language background questionnaire

Paradigm: category boundaries and internal structure

Within a category, not all parts of the acoustic space are equal:

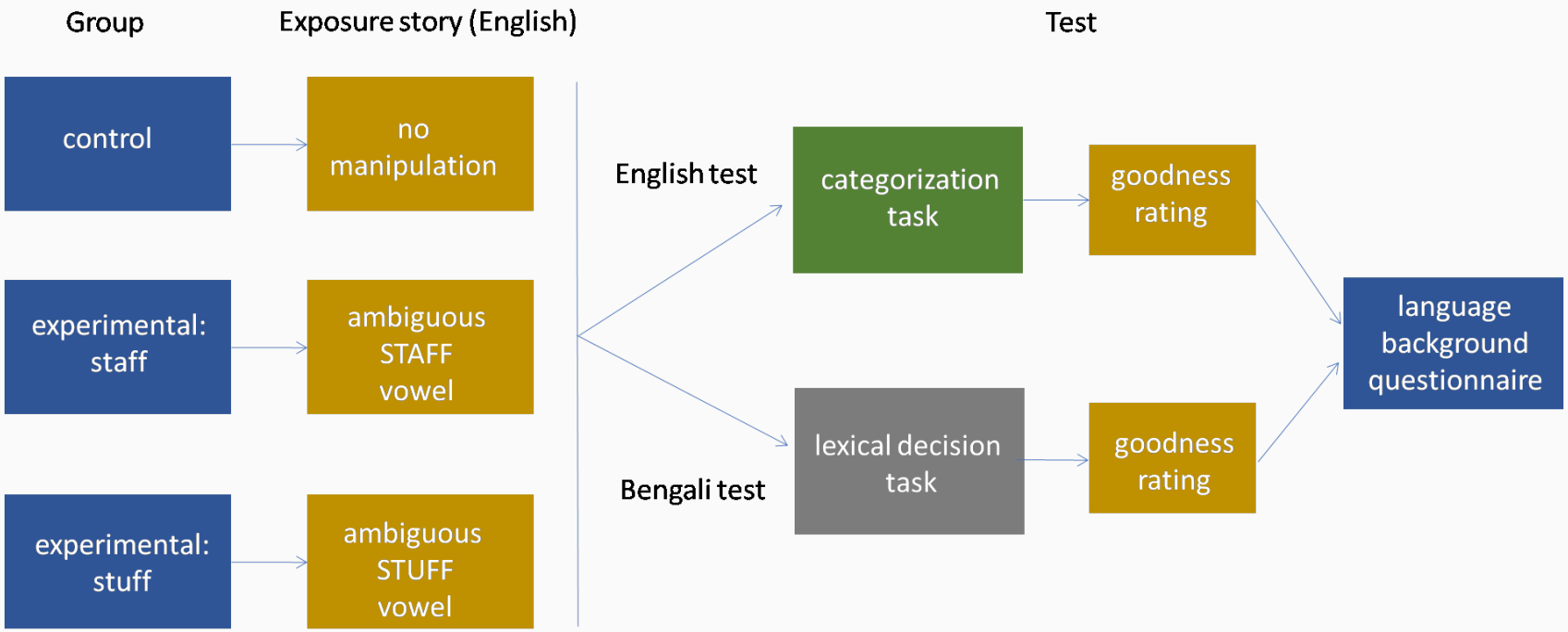


Goodness rating task:

STAFF  STAFF

Q: How good does this pronunciation of the STAFF vowel sound? (1=awful; 5=perfect)

Paradigm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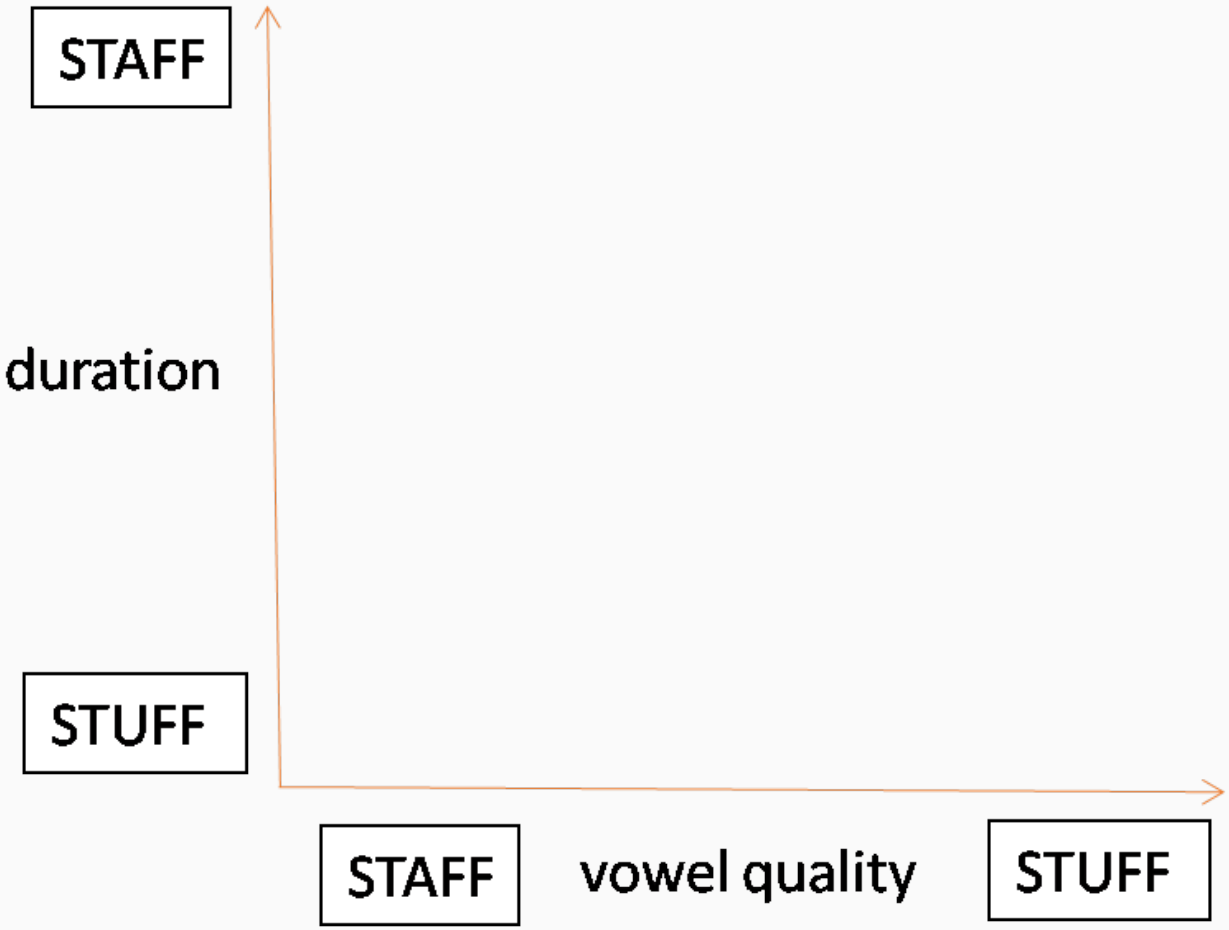
Issues

STAFF-STUFF contrast in IE

- In IE phonology, STAFF—STUFF vary in quality and duration
- Two-dimensional contrast:



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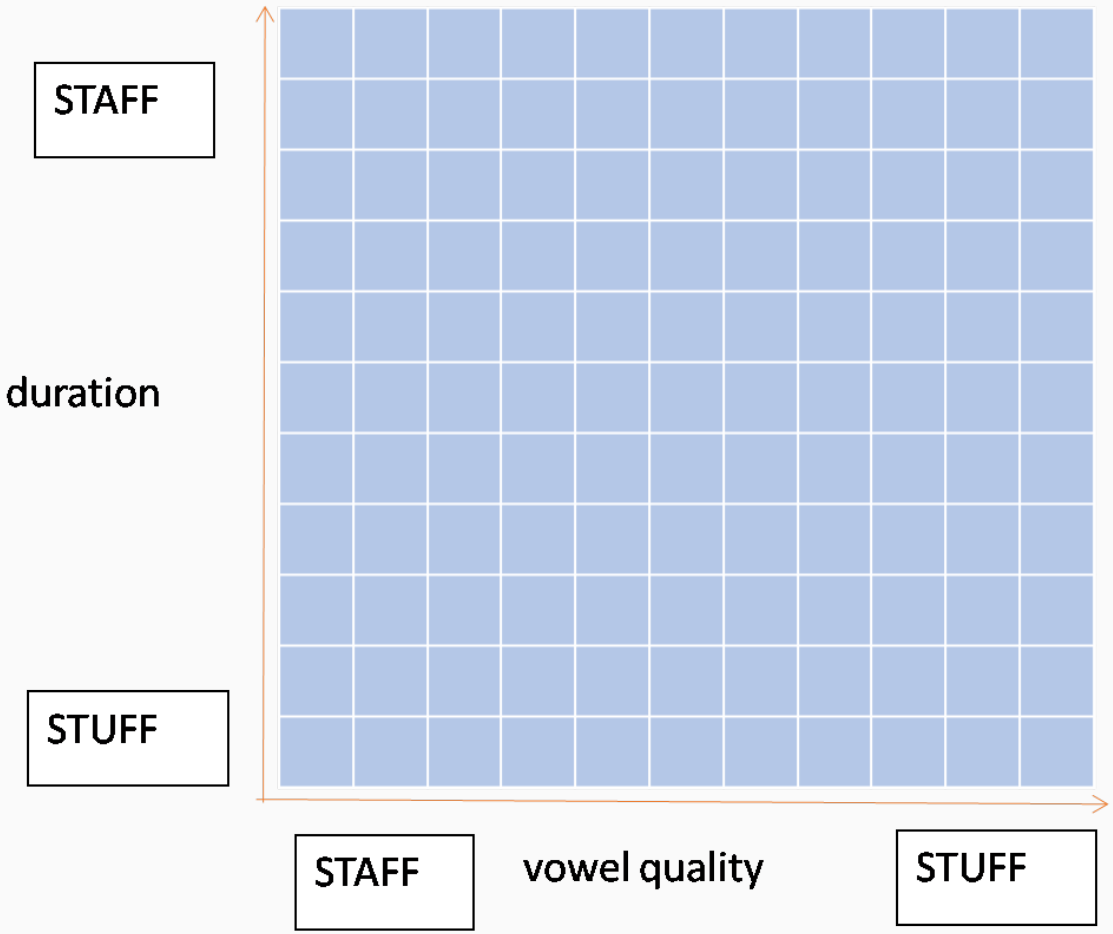
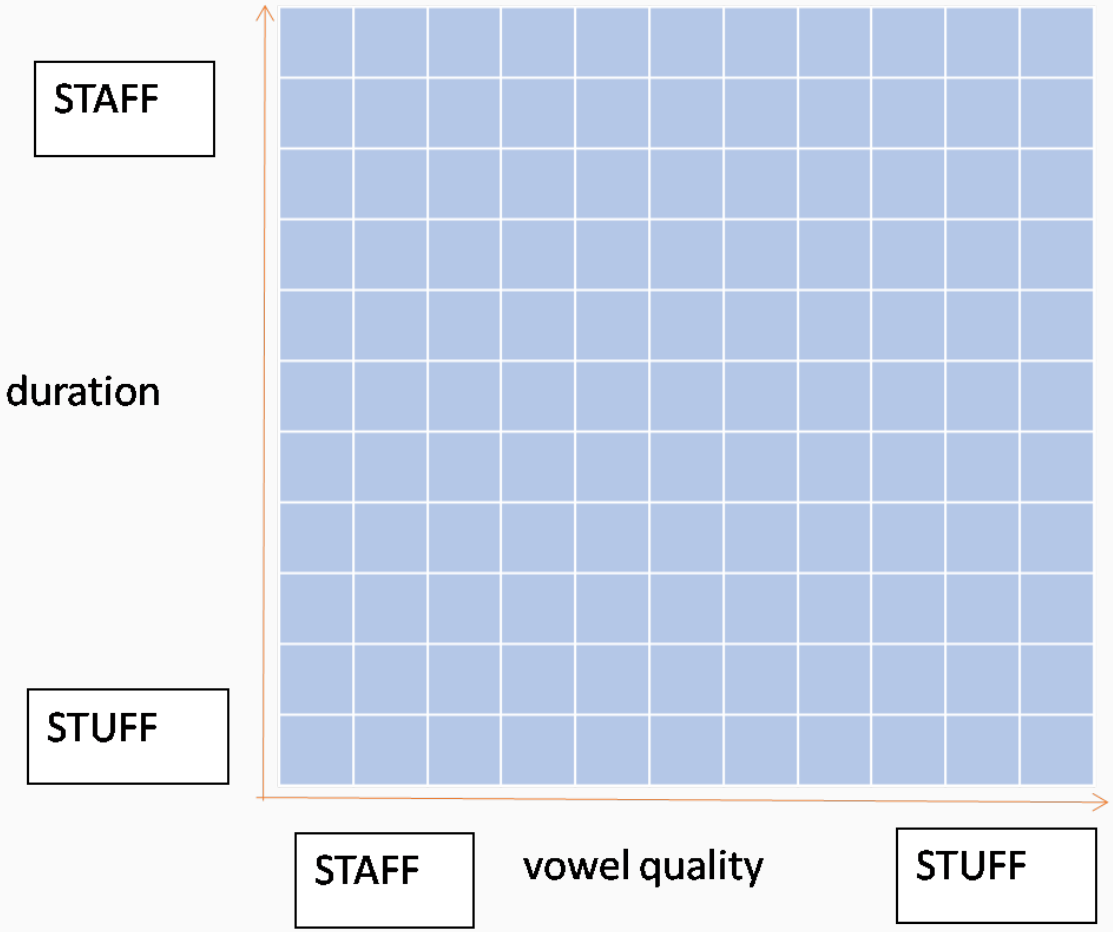


Issues for experiment



- Issue: what counts as ambiguous?
- Two acoustic cues: relative importance?
- Cue-weighting

Questions

- Design: between-participant vs within-participant <spoiler: HUGE individual variability>
- Experiment length
- Criteria for screening participants?
- Ambiguous vowels in exposure and test: what dimensions to manipulate?

Thoughts/suggestions about these would be very helpful!

Cue-weighting experiment

Research questions

- Do listeners use both spectral and duration cues to distinguish between [ʌ] and [a] in Indian English?
- If so, what is the relative importance of these cues in perceiving the contrast?

Methods

- Contrast: A single minimal pair of Indian English: staff—stuff
- Paradigm: categorization task
- Stimuli: 2-D vowel continuum between STAFF and STUFF

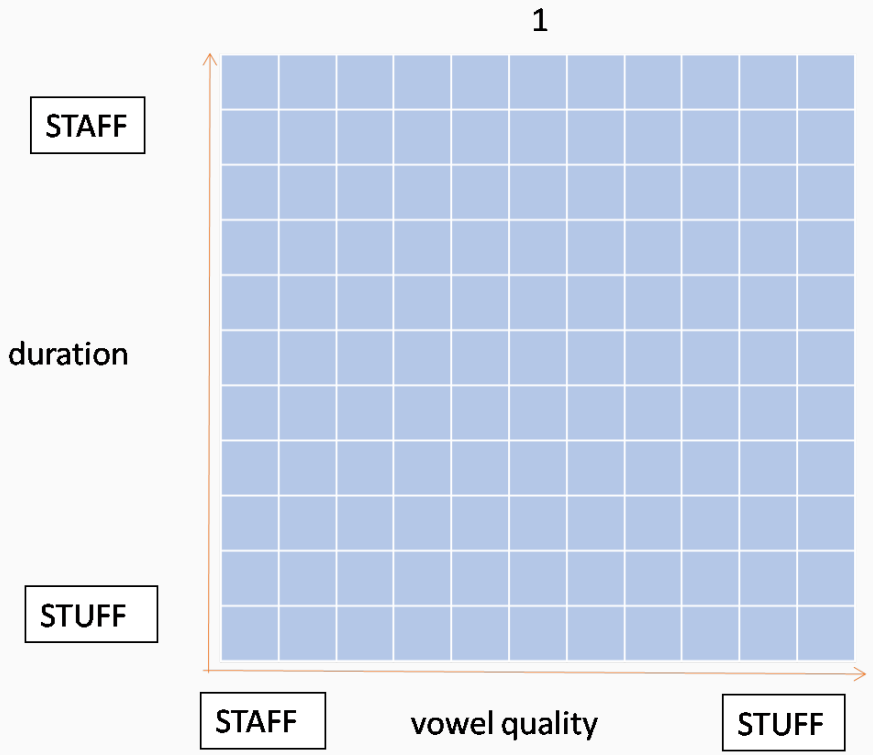


Figure 4: spectral midpoint in continuum between STAFF and STUFF: .

Results: group

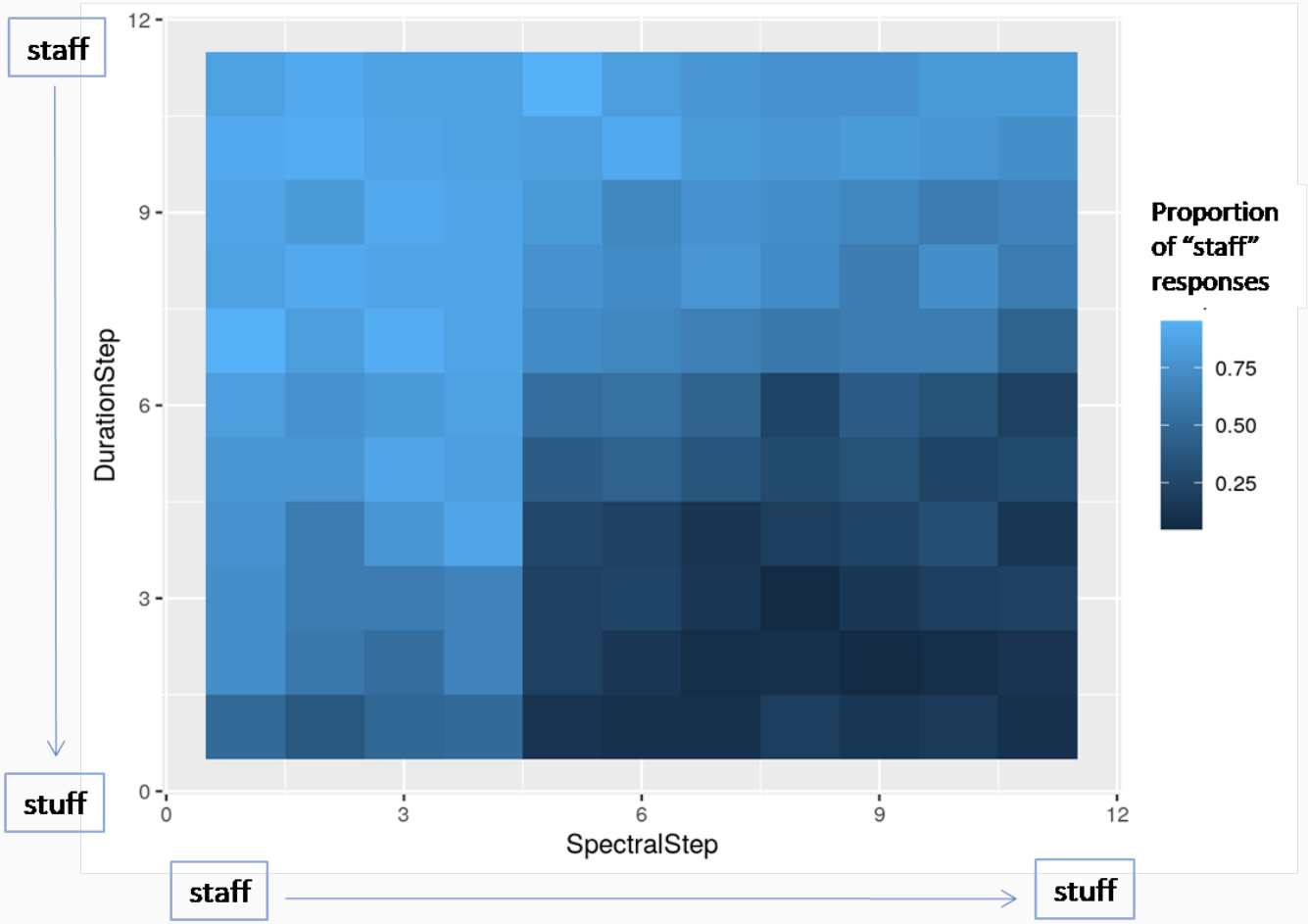


Figure 5: Proportion of STAFF responses at each point in the continuum

Results: spectral cue

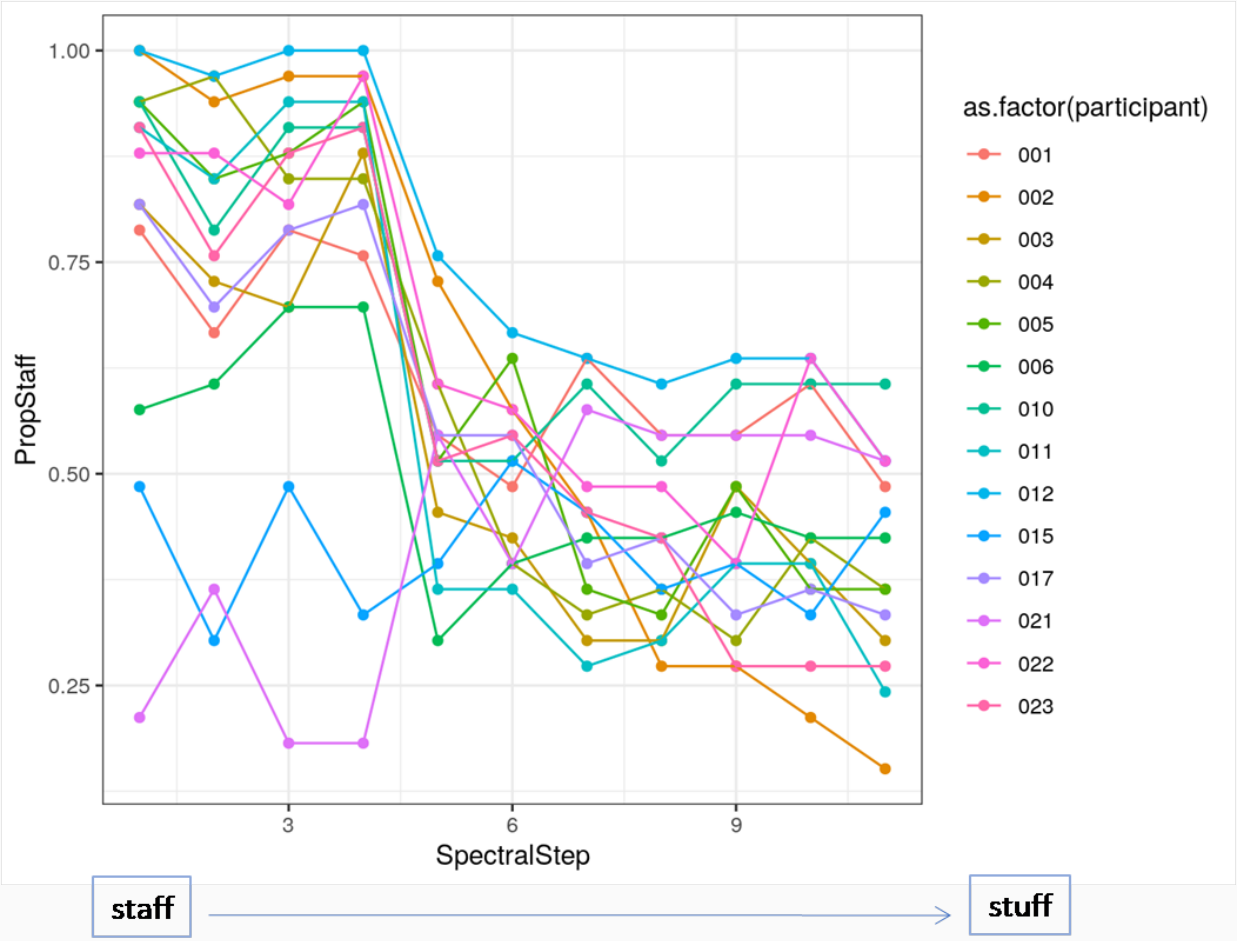


Figure 6: Participant-wise use of spectral information

Results: duration cue

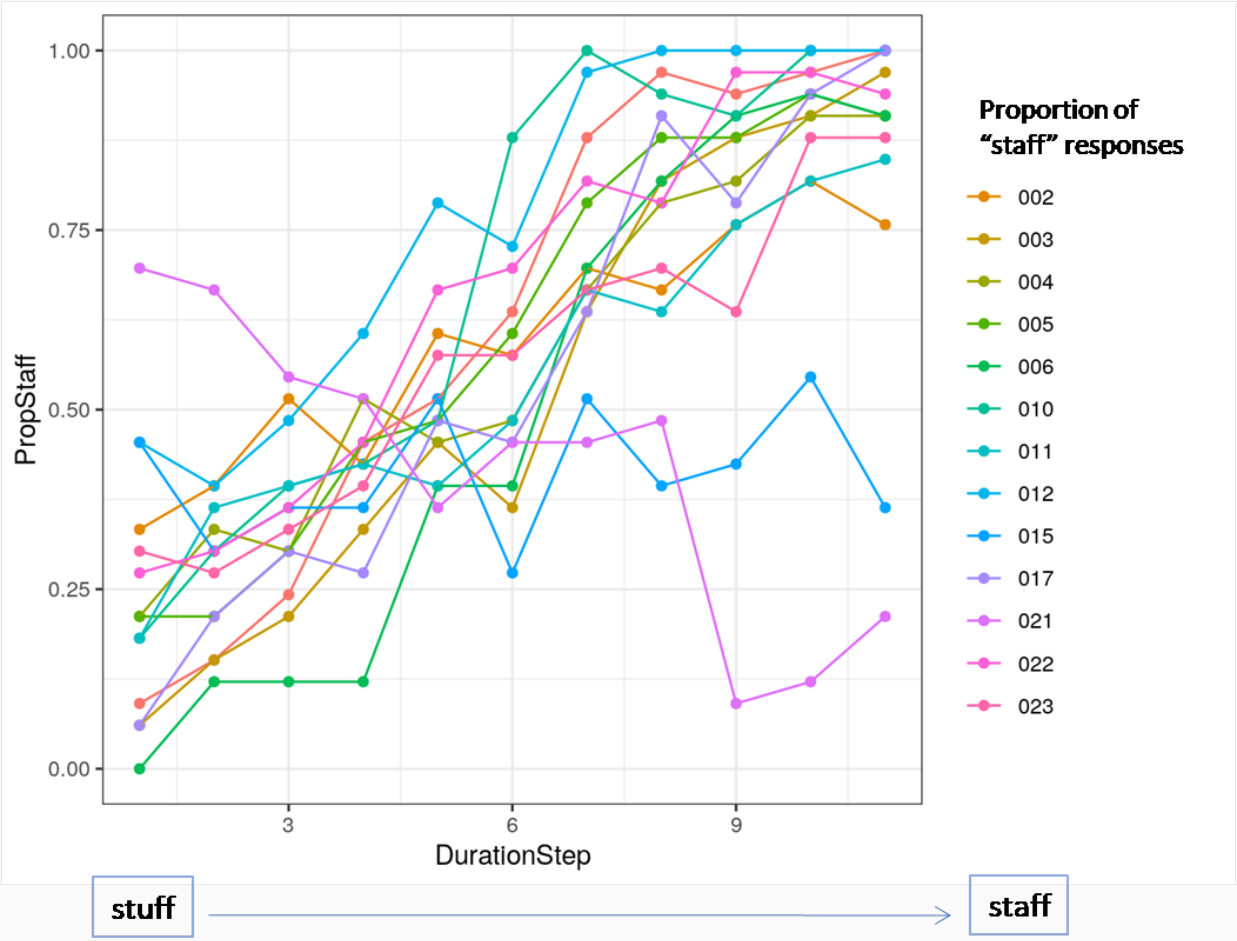


Figure 7: Participant-wise use of duration information

Observations

- Both cues are salient
- Categorization curves differ across individuals, suggesting differences in cue-weighting strategy
- Outliers?

Back to main study

Issues and questions again

- Design: between-participant vs within-participant
- Test continuua: individualized to each participant?
- Experiment length
- Criteria for screening participants?
- Ambiguous vowels in exposure and test: what dimensions to manipulate?
- Thoughts?

Acknowledgments

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