Neural and Behavioural Predictors of Successful Second Language Perception
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BACKGROUND

Individual differences among healthy young adults, in
- Native phonetic perception (e.g., on 2AFC and VAS tasks)1,2
- Non-native phonetic perception3
- Frequency-following response (FFR)4
Do these differences relate to each other? If so, how?

Hypotheses:
1. Different native perception tasks (2AFC and VAS) may measure different constructs but be related through consistency of responses.
2. More fine-tuned native perception may predict more accurate non-native perception.
3. A more consistent FFR may predict more fine-tuned native perception and more accurate non-native perception.

METHODS
Participants. 73 English monolinguals (behavioural data for all, FFR data for 33)

Behavioural tasks.
Native perception: 2AFC and VAS tasks (stimuli: bet-bat and dear-tear continua, made by varying 2 acoustic cues)

What did you hear?

Non-native perception: Oddity task (stimuli: German minimal pairs with ç /ʃ /, y /ɨ /, and ø /ɑ /)

Control tasks: AX-CPT (attention) and Backwards Digit Span (memory)

FFR Recording. 150 ms /da/ stimulus (F0 = 98 Hz) presented 4000 times in alternating polarities. Vertical electrode montage (Cz referenced against avg. mastoids). Bandpass filtering 80-2000 Hz; ±35 µV artifact rejection; segmentation from 0-160 ms post-stimulus onset.

Measures. 2AFC: random slopes from mixed-effects models.
VAS: slope and consistency from rotated logistic5. Oddity: A sensitivity. FFR: response consistency (bootstrapping, 200 iterations)


RESULTS

Hypothesis 1: Supported. (also corroborated by a larger dataset of 139 online participants)
- Identification slopes on the 2AFC task were not predicted by VAS slopes, but were predicted by consistency of VAS responses to dear-tear (p = .004)

Hypothesis 2: Partially supported. Performance on one native perception task (2AFC) predicted non-native perception (p = 0.005)

Hypothesis 3: Not supported.
- FFR consistency was not related to native perception (p > 0.1 for all predictors) or non-native perception (r = 0.02, p = 0.91)

CONCLUSIONS

- Different phonetic perception tasks measure different constructs; shallow VAS slopes reflect gradient perception while shallow 2AFC slopes reflect inconsistency of responses
- The ability to clearly categorize native speech sounds seems to relate to better non-native perception; possible tool for identifying who would benefit from more support during language learning
- No evidence that neural consistency of sound encoding relates to behavioural consistency of phonetic perception; could be due to a variety of factors

REFERENCES

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