Effects of Autistic Traits on Acoustic Measures of Vowel Dispersion
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Abstract
The present study explored the effects of autistic-like personality traits on the acoustic realization of vowels in American English. Here we present a preliminary analysis of acoustic data collected from 17 female English speakers from the NYC area who completed the Broad Autism Phenotype Questionnaire, a standard measure of autistic traits in neurotypical adults. We explored the question of whether the acoustic clarity of speakers’ vowels is systematically related to the speakers’ individual autistic traits. Acoustic clarity was defined by the size of an acoustic (F1xF2) space, based on the vowels /i, e, a, u/. Results show that speakers with more robust autistic traits produced smaller vowel spaces, i.e. less acoustically clear vowels.

1. Introduction
- Deficits in language and communication are defining characteristics of autism spectrum disorders (ASDs).
- Differences in speech perception and language comprehension have also been reported in neurotypical populations in relation to autistic traits.
- Autistic traits: measurable personality traits that resemble mild versions of behavioral and information processing patterns associated with ASDs.
- While less is known about speech production, speakers with higher levels of autistic traits may produce less communicative/less clear speech.

RESEARCH QUESTION
- Do autistic traits influence vowel production?

HYPOTHESIS
- Speakers with higher levels of autistic traits will produce vowels that are less distinct acoustically.

2. Methods
- The data we present here are from a study in which 78 speakers of American English produced words or pseudowords with different vowels.
- The words were read in low-predictability sentence contexts, occurring either early or late in the sentence:
  - E.g. The first word is “head...”, or “Head is the first word...”
- The words contained the vowels at the extremes of the vowel space: [i], [e], [a], [u]. The basic idea is that speakers with more distinct/extreme vowels have larger spaces; speakers with less clear, less distinct vowels have smaller spaces.

![Figure 1: Acoustic space based on the first and second formant frequencies of four American English vowels.](image)

- We then measured the frequencies of the first and second formants (F1 and F2) for each vowel produced using the acoustic analysis software PRAAT.

3. Results
- For these 17 female speakers, autistic traits predict vowel space area:
  - As total BAP scores go up, vowel space area goes down
  - This indicates that healthy, neurotypical speakers with more severe autistic traits produce less distinct vowels
  - This relationship was strongest for the BAP scores related to Pragmatic Language use

Further research is needed to know whether the relationship between autistic traits and vowel realization:
- Differs in male speakers (since only female speakers were tested here)
- Is confirmed by a larger sample of speakers (here we tested only 17)

4. Discussion & Conclusion
- We then measured the frequencies of the first and second formants (F1 and F2) for each vowel produced using the acoustic analysis software PRAAT.

5. References