Title
Individual differences in speech production: What is "phonetic substance"?

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Individual differences in speech production: What is "phonetic substance"?
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**Phonetic Substance**
Phonological patterns are based in part on the phonetics of speaking and listening.

**Mechanism**
Phonological patterns emerge historically from phonetically motivated, natural sound changes; based on a "pool of synchronic phonetic variation." [2]

**Research question**
Is phonetic variation speaker-independent?

**The study**
- X-ray microbeam data [3] - point tracking
- 42 talkers
- Read speech - words, sentences, stories
- Anatomical measures, palate, vocal tract
- Articulatory vowel space:
  * Range of motion of each pellet on x and y
  * Verticality of cloud of variation
- Coronal fricatives:
  * Tongue shape (T1y-T2y)
  * Tongue fronting (T1x) or raising (T2y)
- Canonical Correlation Analysis (CCA)

**What is CCA?**
"CCA is a method for finding linear correlational relationships between two or more multidimensional datasets. CCA finds a canonical coordinate space that maximizes correlation between projections of the datasets onto that space." [1]

Here we seek to find correlations between patterns in the anatomical features, and patterns in the articulatory features of vowels and fricatives combined.

**Results**
Two canonical components - example speakers score positive or negative on one component and close to zero on the other.

**CC1 - Long vocal tract** is associated with big vertical range of tongue in vowels.

**CC2 - Shallow palate** is associated with big vertical range of jaw in vowels.

**Fricatives**

**Conclusion**
The pool of variation is tied to talker anatomical variation. Different speakers contribute differently to the pool of phonetic variation, so phonetic substance is speaker-specific.

Perfect imitation may not be possible, so a process of phonetic approximation may play a pervasive role in shaping phonology.