Targets: articulatory or acoustic/auditory?

Notes

- A lot of this is stolen from my teacher's (John Kingston) lecture notes. See also Kingston (2007), "the phonetics-phonology interface".

- Not all original references have been checked.

- 先週議論した北山陽一さんの問題意識。合わせているのは、調音運動なのか音響（知覚）結果なのか。

What's the speaker's goal?

- To achieve a particular vocal tract configuration. This is probably the standard view, also taught in an introductory phonetics course. "We shape our vocal tract in such and such ways to produce the sound [X]."

- To achieve particular acoustic/auditory results. "We produce [X] so that it sounds like [X]."

- There has been a heated debate on this topic.

A bite-block experiment

- e.g. Fowler & Turvey (1980)

- Speakers were asked to speak with a bite block, which would prevent from free jaw moving.

- Speakers retained their "usual" constriction locations.

- Evidence that what matters is articulatory configurations?

Hindering the lower lip movement

- Abbs, Gracco & Cole 1984

- Speakers were randomly "perturbed" their lower lip when they make a bilabial closure.

- Speakers simply exerted a stronger force to overcome the perturbation.

- Again, evidence that targets are articulation-based?

Compensation by other gestures

- Riordan 1977

- When the speakers were prevented from rounding their lips when they produce rounded vowels, they lowered their larynx (more than usual).

- This compensatory gesture would guarantee that the vocal tract is long enough to produce sufficiently low F2.

- But this can still mean that the speakers were aiming for a "long vocal tract".

The mystery of English [r]
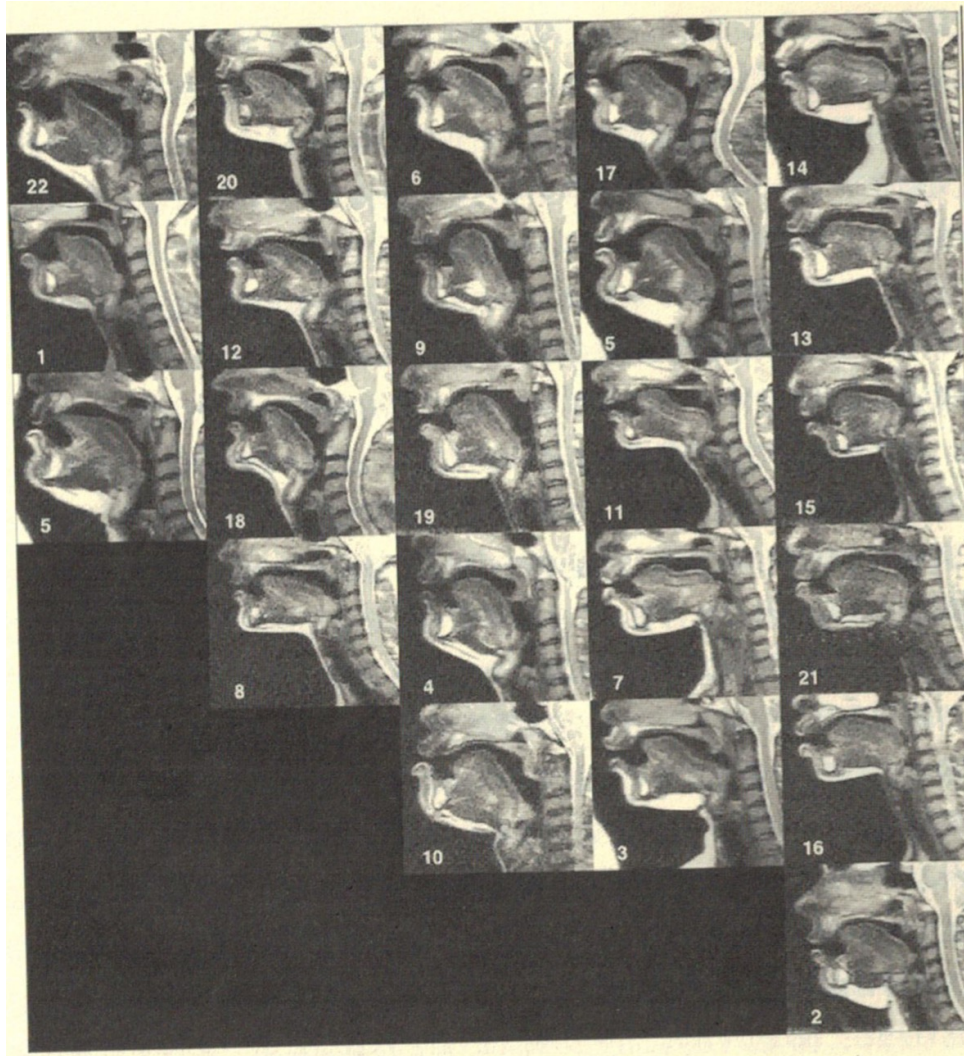
- Figure taken from Fujimura (2007).

- The gist of the observation: different speakers use different strategies (mainly, lip rounding, retroflection, tongue body bunching).

- But they all result in similar acoustic/auditory qualities.

- This variation can be observed on a token-by-token basis (Moore et al. 2015).

- So speakers are not "stuck" with one particular articulation strategy. As long as they result in low F3, that's fine.

Delayed & deceptive feedback

- Houde & Jordan (1998)

- Speakers produced [ɛ], but the experimenter altered the sound so that it sounds like [i] to the speaker.

- Speakers changed their articulations so that it sounds more like [a].

- Speakers wanted to sound like [ɛ], so they lowered their tongue further.

Multiple gestures working together

- Lips are spread for fronted vowels; they are rounded for back vowels.
- Lip spreading raises F2, an acoustic property that results from tongue fronting.
- Lip rounding lowers F2, an acoustic property that results from tongue backing.

- Lip rounding is also observed for [ʃ] in English, which has lower frication energy than [s], the difference of which can be exaggerated by lip rounding.

F0 perturbation by voiced stops

- F0 is often lowered in vowels next to voiced stops. This may be because of the larynx lowering required by an aerodynamic demand.

- But F1 is also lowered. Why would this have to be the case?

- Lowered F0 and low F1 together create "low acoustic energy concentration", which functions well with the acoustic consequence of vocal fold vibration as well.

- If this is the right story, speakers are trying to "sound low" for voiced stops.

Caring what listers would hear

- Baese-Berk & Goldrick 2009

- In English, "cod" and "god" are a minimal pair; "cop" on the other hand does not have a minimal pair correspondent.

- VOT is usually longer for voiceless stops for items that have a corresponding minimal pair item.

- Speakers don't want to be misunderstood.

The take-away

- I (Shigeto) don't think that we have to take a black-or-white view about this debate.

- We no doubt control our articulators, and there have to be particular articulatory targets that speakers deploy in their daily speech.

- But at the same time, we are flexible enough to achieve particular acoustic/auditory targets as well.