

Notes on Ohala (1981) & Lindblom (1990)

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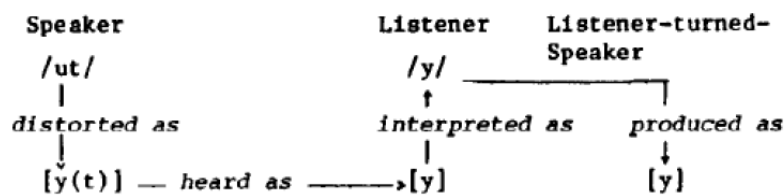
Ohala, 1981

Speech is described as ‘noisy’ by Ohala. This includes not just the environment where conversation is occurring but, also, the multiple types of variation coming from the speaker during speech production and the necessity of the listener to decode changes to the acoustic signal made by **both** the environment and the speaker.

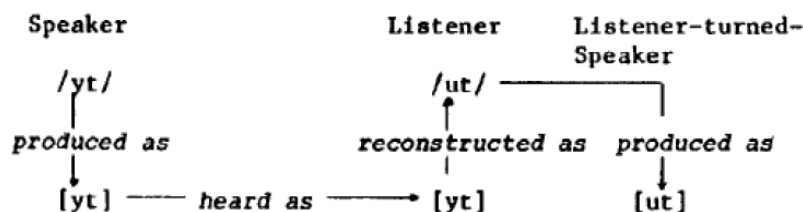
- The rise in F2 value for the vowel [u] when coarticulated with an apical stop [t] = surfaces as a vowel with more fronted articulation such as [y]

In a regular speech scenario, the listener is able to recover the lexical representation of the words and sounds being used by the speaker despite the noisiness of speech. However, Ohala argues that the listener can propagate speech change when the lexical representation is not recovered:

- *Scenario 1:* The listener perceives the speaker’s output as a new pronunciation altogether. It, then, enters the lexicon without reconstruction via “reconstructive” rules usually applied to that sound.



- *Scenario 2:* The listener over-corrects by applying “reconstructive” rules that are not required for that lexical utterance. The listener is being a faithful participant and in an effort to be accurate, produces an inaccurate utterance.



These ‘scenarios’ are based on the premise that listeners learn “reconstructive” rules throughout the use of the language and can recover varied pronunciations of a lexical item within communication. Importantly, this theory of “reconstructive” rules can be found in other sensory processes, namely **vision**! This can be seen with:

- The ability to recognize the colours of an item under different lighting; not considered a different object or colour (Scenario 1), or;
- The overapplication of visual rules with things such as camouflage or optical illusions (Scenario 2).

Though the “reconstructive” rules have their equivalencies in other functions, I found it particularly interesting that Ohala doesn’t equate these rules to phonological rules and treats them as their own kind of rule system altogether when considering speech. Thoughts?

“... reconstructive rules do not function to derive the allegedly common underlying form of different allomorphs, e.g., *profound*, *profundity*, but rather the common underlying forms of different allophones.” (p. 183)

Scenario 1

Due to the listener’s inability to apply “reconstructive” rules, the uncorrected form is reproduced. Ohala states that this may be caused by a weakening, loss, or obscuring of the conditioning environment and that these types of changes can be studied in a laboratory setting.

Importantly, the link between the conditioning environment and the targeted sound is lost in the speaker’s mind when this scenario occurs, even if the conditioning environment itself isn’t lost. For example, tonogenesis through the loss of voicing contrast in consonants occurring before the vowel.

Scenario 2

Ohala states that many existing examples of this scenario are actually cases of dissimilation that occur from the listener overapplying “reconstructive” rules when a consonantal feature spreads. He argues that instances of dissimilation in adjacent and non-adjacent segments are the same, as the intervening segments would carry the consonantal feature that spreads to its target.

Middle Indo-Aryan laḃ > *Gujarati* laḃ “benefit”
Latin quīnque > *Italian* cinque “five”

Ohala outlines a list of consonantal features that can and cannot participate in dissimilation. For those that cannot occur in dissimilation, Ohala believes that [fricative], [stop], [voice], and [affricate] do not provide significant “perceptual cues” on other segments that can be directly attributed to that consonant.

He also points out some counter-examples to this list. One particularly interesting example is that of Proto Indo-European stops which were traditionally treated as voiced stops with constraints within the root. If considered to be voiceless glottalized or ejective obstruents as opposed to voiced stops, they could be accounted for under his theory as these features can be accounted for in dissimilation.

- Ohala states that historical linguistics has a “great deal of practical applicability to work in speech recognition and speech pathology” (p. 186). This is an example of how!

I also found it interesting that while Ohala does believe that the speaker plays a role, he doesn’t view this role as an active one. Indirectly addressed by Lindblom (1990)!

“The speaker is claimed to have modified his pronunciation in order to reduce the energy expended in speaking, to have made his speech more distinct in order to make it more intelligible, to have simplified his grammar, etc. Certainly, it is true that the speaker plays an important role in sound change, although personally, I do not think any of the above-mentioned activities are important aspects of this role.” (p. 178)

Lindblom, 1990

Lindblom outlines his theory known as the ‘H&H Theory’ where the speaker adjusts and adapts their speech production to accommodate the needs of the listener. He argues that rather than the listener attempting to find invariant features within the speech signal to understand speech, the speaker either:

- Employs compensatory movements oriented towards output (hyper-articulation), or;
- Engages in low-cost behaviour that would still allow the listener to engage lexical access and glean what is being said (hypo-articulation).

At the time of this theory’s inception, the major approach to speech production/perception and how information is recovered was that of the invariance problem.

What is the invariance problem?

This is the idea that to recover information from speech, the listener must find some features that are unchanging (invariant) within the signal itself. This problem was the framework that many theories and linguists at the time worked within, such as the Motor Theory by Liberman & Mattingly (1985). Though there were different approaches as to how the invariance problem would be solved, they all believed that the solution would be found within the speech signal.

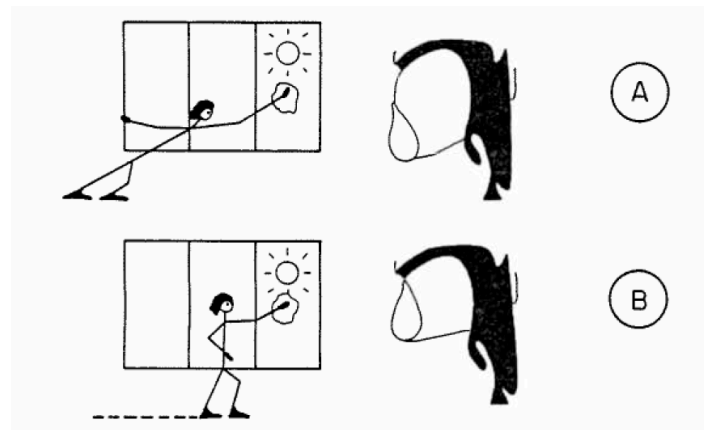
Lindblom’s approach was not in direct contrast to the invariance problem per se, but it did propose the notion that speech production was engaged as a way such as to *sufficiently differentiate* sounds and allow the listener to access the lexical representation of what the speaker was conveying.

Sufficient differentiation → The speaker, through the mediation of hypo- and hyper-articulation, produces speech that is easily distinguishable by the listener and allows them to access their lexical representations associated with that speech item. Lindblom argues that it cannot solely be the signal that provides this information.

- Support for this with the Neighbourhood Activation Model (NAM) and the concept of the “neighbourhood”. Depending on a word’s frequency, words that are acoustically similar to it, and how distinct the word sounds, a word may be identified more accurately.

H(yper-) & H(ypo-articulation) Theory

The crux of the H&H theory can be summed up in the diagram below (seen on p. 413):



These sets of images in (A) and (B) illustrate equate the speech processes undertaken by the speaker to other motor processes, namely ‘plasticity’ which is equivalent to ‘hyper-articulation’ in (A) and ‘economy’ which is equivalent to ‘hypo-articulation’ in (B).

These notions of ‘plasticity’ and ‘economy’ are very common with regards to motor function and speech is no exception. While it is automatic in other processes, Lindblom argues that speakers have a **choice** whether to employ these notions.

- *Undershoot* is a product of economy in speech where the articulators do not reach the intended destination and produce a sound closer to the previously articulated sound; recall [u] to [y] when coarticulated with [t] in Ohala!

Lindblom provides different examples that support the H&H theory in real-life scenarios, showing that the speaker’s adaptation can be **quantifiable**:

- Operatic singers tend to engage the “singer’s formant” by lowering their larynx to adjust their F3, F4, and F5 formats and increase audibility over an orchestra. However, sopranos don’t engage this as they are already audible over an orchestra (Sundberg, 1987); contrast shows this as hyper-articulation geared towards the listener!
- Coarticulation between vowels and consonants is argued to be an example of hypo-articulation where “locus pattern variations” are caused by the tongue staying

within the general area in which the vowels are being produced when producing an apical stop. They are a result of the articulator exhibiting “low-cost behaviour”.

- The existence of clear speech also lends itself to the H&H; compared to spontaneous speech production, clear (hyperarticulated) speech was found to exhibit formants closer to the reference values.

Lindblom highlights that even if the invariance problem were to be solved, the H&H theory would still be needed to deal with the various types of differentiation in speech and how they are perceived by the listener. He also highlights that the H&H theory might explain the “typology of sound systems” via sufficient differentiation (p. 432 – 433).

Typology of sound systems → The classification of sound within different language systems into different categories.

He posits that as sound systems grow larger, they will exhibit more complex speech sounds in an effort to maintain sufficient differentiation. If a system is smaller, it will exhibit more basic sounds with larger degrees of contrast.

- Similar to the speech production outlined above where we will *hypo-articulate* if there is a higher likelihood of the listener being able to retrieve the lexical representation or *hyper-articulate* if the speaker needs to compensate for the noise in the environment.

Discussion Questions

1. Can you think of any colloquialisms that come from the active application of economy to speech?
 - One that comes to mind for me is the ‘Toronto Mans’ way of saying “You know what I’m saying?”
2. Do you lean more towards one theory over the other? Or do you believe that these theories work in tandem to explain speech production and perception work?

3. How do these theories relate to the 'ease of articulation' premise that we discussed last week? Is it in support of or does it oppose that notion?
4. The papers above, especially Lindblom, help us understand that there are methods that can be employed in the laboratory to test out our experiment on Proto-Greek labiovelars. What are your thoughts on this? Do you have any ideas as to how this change could have occurred?