

Phonology

Introduction to Linguistics

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Phonemes are split into **consonants** and **vowels**

Vowels are sounds in which air flows through the vocal tract

Consonants are sounds in which the airflow is impeded

Consonants have three kinds of features

Voicing: Voiced; voiceless; aspirated

Place of articulation:

Bilabial, (Inter)dental, Alveolar, Retroflex, Palatal/Palato-alveolar, Velar, Uvular, Pharyngeal, Glottal

Manner of articulation:

Oral Stop, Nasal Stop, Affricate, Fricative, Glide/Approximant, Flap, Trill

Phonemes

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CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d			ʈ ɖ	c ɟ	k ɡ	q ɢ		ʔ
Nasal	m	ɱ	n			ɳ	ɲ	ŋ	ɴ		
Trill	ʙ		r						ʀ		
Tap or Flap			ɾ			ɽ					
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative			ɬ ɮ								
Approximant		ʋ	ɹ			ɻ	j	ɰ			
Lateral approximant			l			ɭ	ʎ	ʟ			

Where symbols appear in pairs, the one to the right represents a voiced consonant. Shaded areas denote articulations judged impossible.

Vowels can be specified along four different parameters

Height: High, (High-Mid), Mid, (Mid-Low), Low

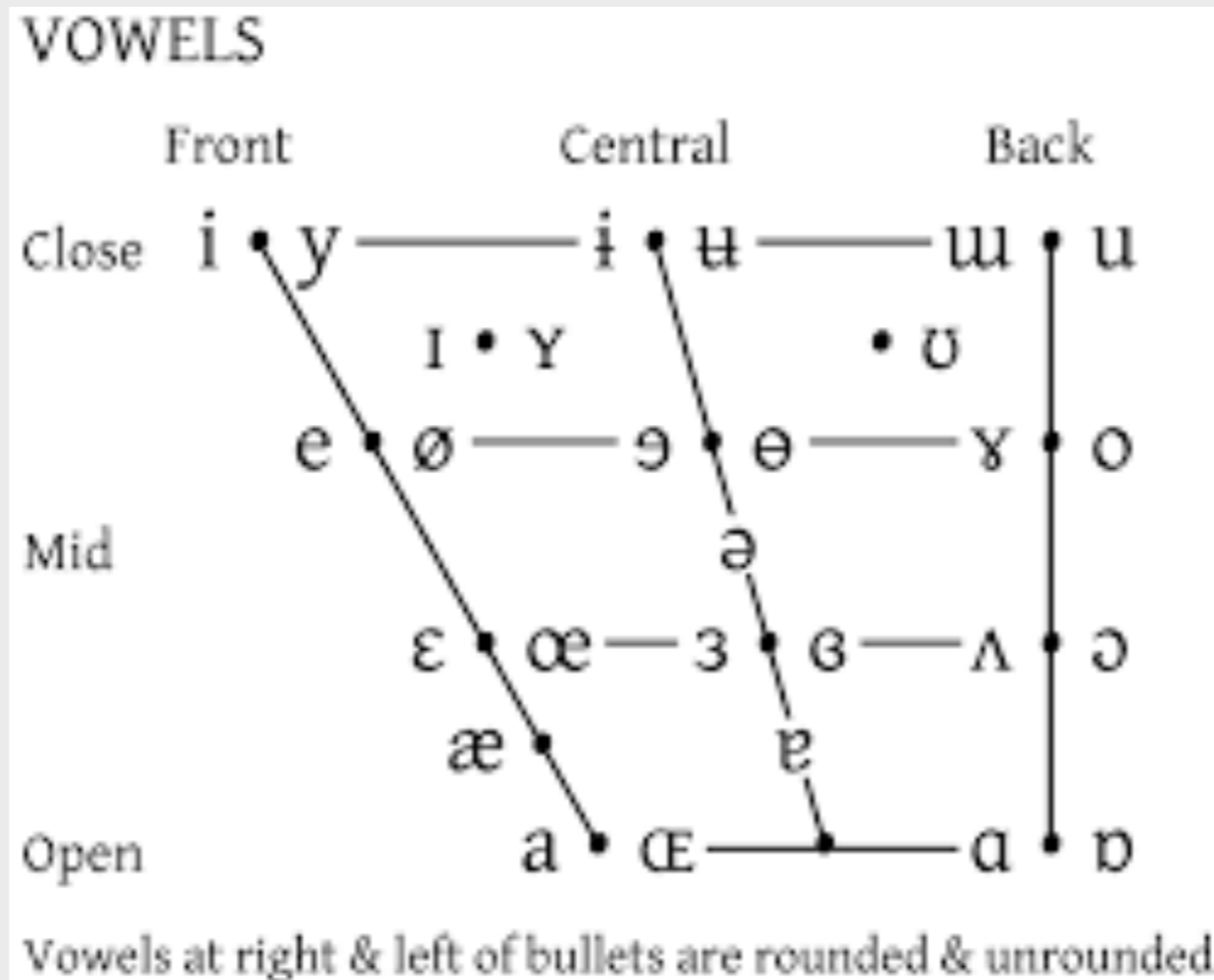
Frontness: Front, Central, Back

Tenseness: Tense; Lax

Roundedness: Unrounded, Rounded

Phonemes

Introduction to Linguistics



Each word has a **phonological representation**

'linguistics' /lɪŋwɪstɪks/

'phonology' /fɒnələdʒi/

'syntax' /sɪntæks/

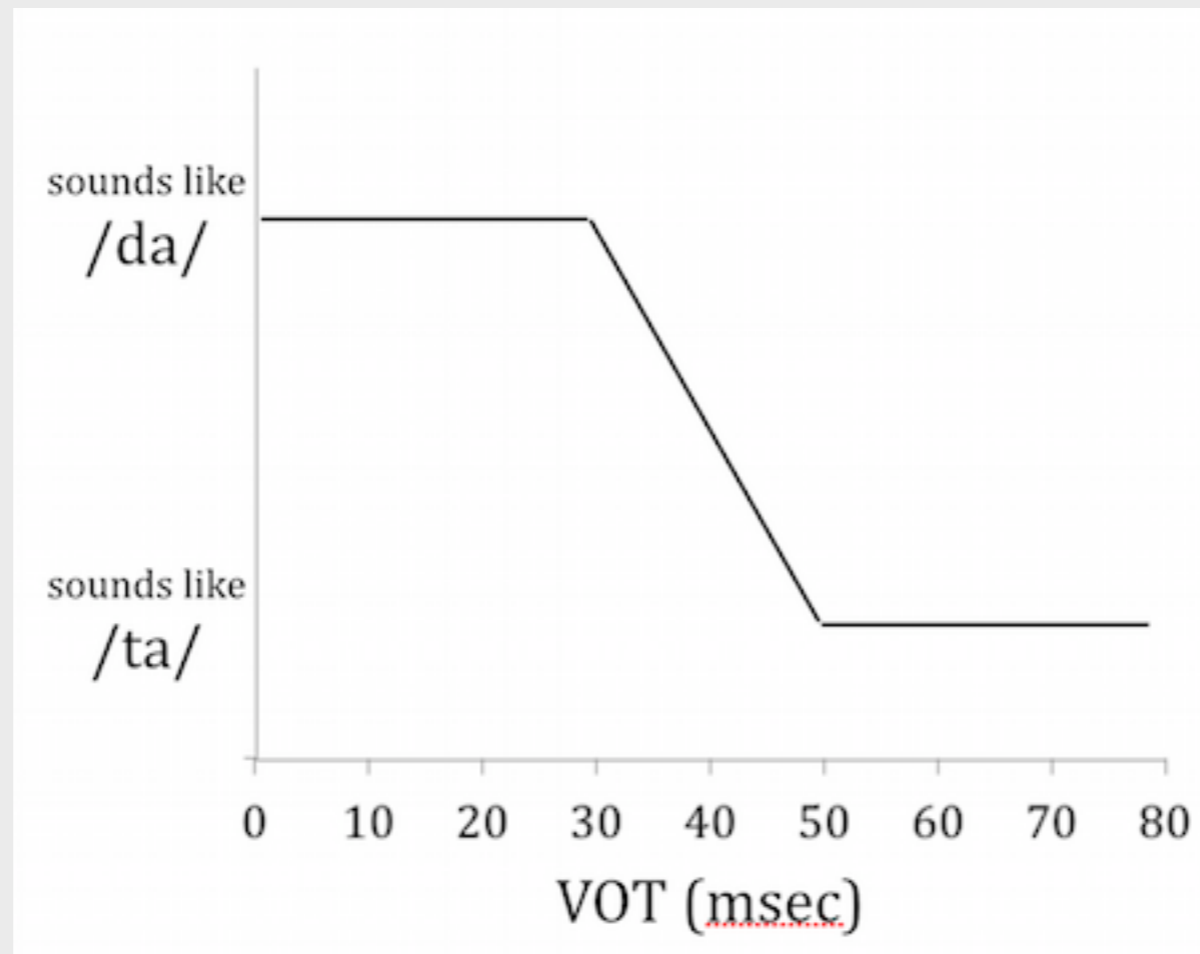
'semantics' /sɛmæntɪks/

Phonemic representations are ways of representing how we **perceive** a word to sound

Perception is **categorical**, but acoustic signals are not

In English, **voiceless/voiced** stops tend to differ in their **voice onset time (VOT)** by about 20 ms

There is a VOT “threshold” under which all sounds are categorized as /t/, over which all sounds are categorized as /d/



How do linguists determine what the phonemes of a language are?

Minimal pairs: two words that differ in meaning and in only one phoneme

/bit/	/but/
/bɪt/	/pʊt/*
/bet/	/bot/
/bɛt/	/bʌt/ /bɔt/
/bæt/	/bat/

This minimal DECUPLET shows that i/u/ɪ/e/o/ɛ/ʌ/ɔ/æ/a are all distinct phonemes

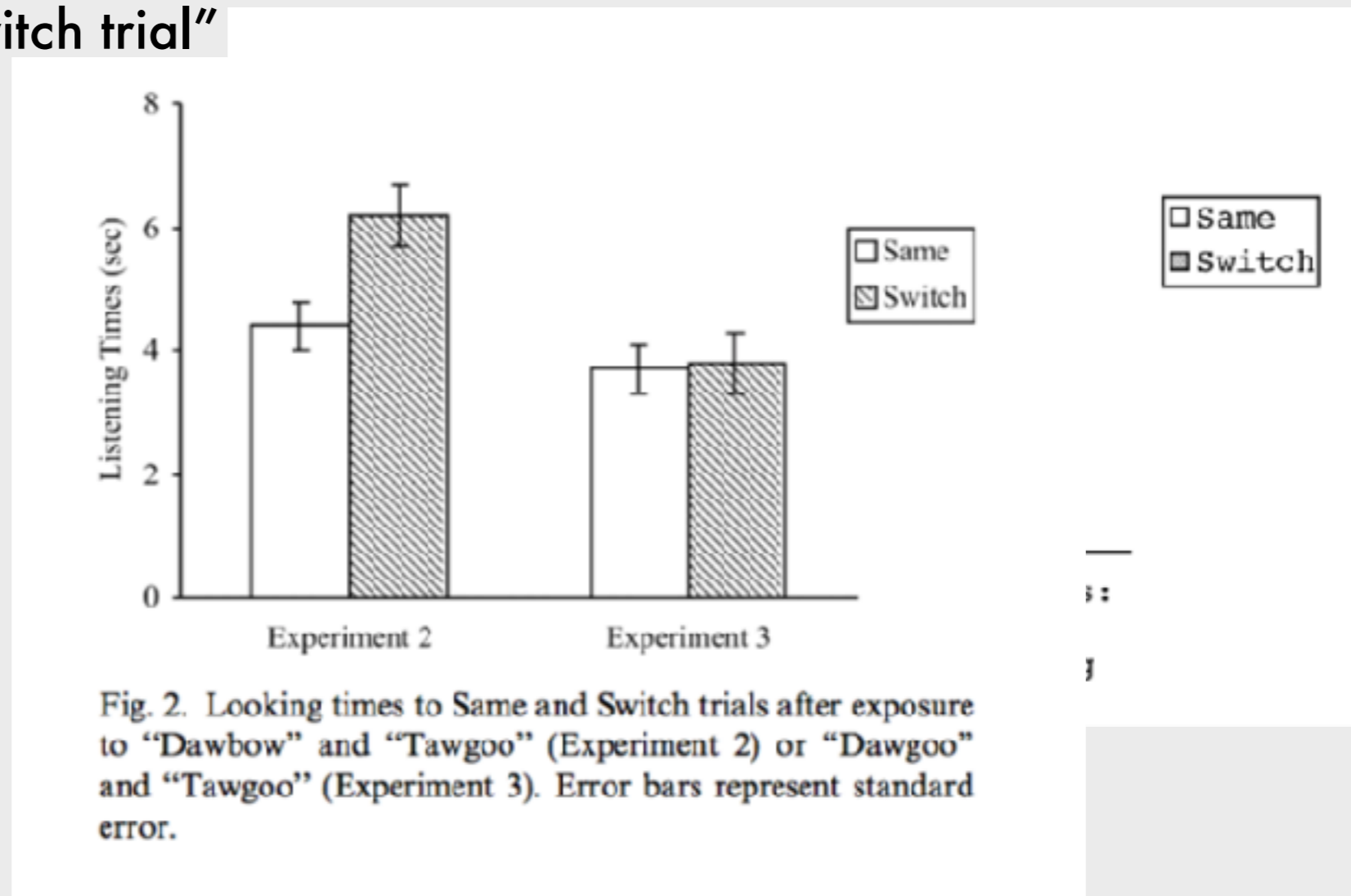
Are minimal pairs used by children to learn the phonemes of a language?

Thiessen (2007): "Switch trial"

Expt 1: *daw* vs. *taw*

Expt 2/3:

dawbow/tawgoo
dawgoo/tawgoo



Recent work in computational linguistics suggests that minimal pairs make the learning problem harder; distinct words make learning easier (Feldman, Myers, White, Griffiths, Morgan 2013; Dillon, Dunbar, & Idsardi, in press)

Phonemic categories tell you which sounds “go together”

Phonological determine which **allophones** are pronounced when

Example: [p] and [p^h] in English

[p^hɪn] 'pin'
* [pɪn]
[spɪn] 'spin'
* [sp^hɪn]
[p^hat] 'pot'
* [pat]
[spat] 'spot'
* [sp^hat]

[splæʃ] 'splash'
* [sp^hlæʃ]
[pleɪ] 'play'
* [p^hleɪ] 'play'

[k^hʌp] 'cup'
* [k^hʌp^h]
[k^hʌps] 'cups'
[k^hʌp^hs]
[k^hʌsp] 'cusp'
* [k^hʌsp^h]

No minimal pair between [p] and [p^h]; they appear in **complementary distribution**

[p^h] appears in a proscribed environment; [p] appears elsewhere

We can write a rule that says “the phoneme /p/ becomes the allophone [p^h] at the beginning of a word and before a vowel”

/p/ → [p^h] / # _ V

= “beginning of word”

V = “vowel”

_ = “in this position”

Is this rule just about /p/ and [p^h]?

[k^hæt] 'clat'

[skæt] 'cat'

[klæp] 'clap'

[sɪlk] 'silk'

[sɪkl] 'sickle'

[t^hæp] 'tap'

[stæt] 'stat'

[sɪlt] 'silt'

What do /p/, /t/, and /k/ have in common?

We can write a more general rule that covers the broadest set of data:

$[-\text{Voi}, \text{Stop}] \rightarrow [+ \text{Asp}] / \# _ V$

How does English compare with Bengali?

[stʰan] 'place'

[tɔbe] 'but'

[tʰaka] 'to stay'

[pɔtʰ] 'path, way'

[spɔstʰo] 'clear'

[stri] 'wife'

[hɔsto] 'hand'

[stupa] 'stupa'