Psych 56L/ Ling 51: Acquisition of Language

Lecture 6
Phonological Development I

Announcements

HW1 due at the end of class today

Review questions for phonological development available

HW2 available (not due till 2/18/10), but helpful for studying for the midterm

All kinds of useful sound charts available

Sounds of Language

Forget Spelling!
Sounds ≠ Spelling
Our Strange Lingo, by Lord Cromer (1902)

When the English tongue we speak,  
Why is break not rhymed with freak?  
Will you tell me why it's true  
We say sew but likewise few?  
And the maker of the verse,  
Cannot rhyme his horse with worse?  
Beard is not the same as heard  
Cord is different from word.  
Cow is cow but low is low  
Shoe is never rhymed with foe.  
Think of hose, dose, and lose  
And think of goose and yet with choose  

... 

One Sound - Many Characters

- he: e, seas, ea
- believe: ie, amoeba, oe
- Caeser: ae, key, ey
- see: ee, machine, i
- people: eo, seize, ei

International Phonetic Alphabet: [i]

One Sound - Many Characters

- too: oo, threw, ew
- to: o, lieu, ieu
- clue: ue, shoe, oe
- through: ough, beautiful, eau

IPA: [u]
### One Character - Many Sounds

<table>
<thead>
<tr>
<th>Word</th>
<th>Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>dame</td>
<td>e</td>
</tr>
<tr>
<td>dad</td>
<td>æ</td>
</tr>
<tr>
<td>father</td>
<td>a</td>
</tr>
<tr>
<td>call</td>
<td>õ, a</td>
</tr>
<tr>
<td>village</td>
<td>i, o</td>
</tr>
<tr>
<td>many</td>
<td>ë</td>
</tr>
</tbody>
</table>

### One Sound - Multiple Letters

<table>
<thead>
<tr>
<th>Word</th>
<th>Sound</th>
</tr>
</thead>
<tbody>
<tr>
<td>shoot</td>
<td>ñ</td>
</tr>
<tr>
<td>either</td>
<td>ð</td>
</tr>
<tr>
<td>character</td>
<td>k</td>
</tr>
<tr>
<td>deal</td>
<td>i</td>
</tr>
<tr>
<td>Thomas</td>
<td>t</td>
</tr>
<tr>
<td>physics</td>
<td>f</td>
</tr>
<tr>
<td>rough</td>
<td>f</td>
</tr>
</tbody>
</table>

### One Letter - 0, 1, 2 Sounds

<table>
<thead>
<tr>
<th>Word</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>mnemonic</td>
<td></td>
</tr>
<tr>
<td>psychology</td>
<td></td>
</tr>
<tr>
<td>resign</td>
<td></td>
</tr>
<tr>
<td>ghost</td>
<td>= no sound!</td>
</tr>
<tr>
<td>island</td>
<td></td>
</tr>
<tr>
<td>whole</td>
<td></td>
</tr>
<tr>
<td>cute</td>
<td>[kjuwt]</td>
</tr>
<tr>
<td>debt</td>
<td>= 2 sounds!</td>
</tr>
</tbody>
</table>

### Differences across Languages

<table>
<thead>
<tr>
<th>Language</th>
<th>Words</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>judge, juvenile, Jesus</td>
</tr>
<tr>
<td>Spanish</td>
<td>jugar, Jesus</td>
</tr>
<tr>
<td>German</td>
<td>Jugend, jubeln, Jesus</td>
</tr>
<tr>
<td>French</td>
<td>Jean, j'accuse, jambon</td>
</tr>
</tbody>
</table>

[d3] [b] [j] [3]
How you look to a phonetician

- Palate
- Tongue
- Glottis
- Lips, teeth etc.
- Velum

Sounds: Speech Production

- Nasal Cavity
- Oral Cavity

International Phonetic Alphabet
Major division: consonants vs vowels

Consonantal sounds: narrow or complete closure somewhere in the vocal tract.

Vowels: very little obstruction in the vocal tract. Can form the basis of syllables (also possible for some consonants).

Describing Speech Sounds

Where/how is the air flowing? nasal/oral, stop, fricative, liquid, tap/flap etc.

Where is the air-flow blocked? labial, alveolar, palatal, velar etc.

What are the vocal folds doing? voiced vs. voiceless

Where does the air flow?

Your vocal tract again
Block it at the velum

Now raise the velum to block the air....

Tongue against velum again
Now raise the velum to block the air....

Quickly drop your tongue again...

Where does the air go this time?
Where does the air go this time?

So far we have:

- Nasal stop: 
  - [m]
- Non-nasal (oral) stops:
  - [g] [k]

Where is the air flow blocked?
Where is the air flow blocked?

(bi)labial
[b] [p] [m]

labiodental
[v] [f]

interdental
[θ] [ð]
Where is the air flow blocked?

Alveolar
[d] [t] [n] [s] [z] [l]

Palatal
[z] [s] [ʃ] [ʒ] [tʃ]

Velar
[g] [k] [ŋ]

Uvular
Where is the air flow blocked?

Manner - How the Air is Flowing

Stops
[p] [t] [k] [b] [d] [g] [m] [n]

Fricatives
[f] [s] [θ] [ʃ] [s] [ʃ] [ʒ] [ʒ]

Approximants/Glides
[w] [j] (Like in “water” and “you”)

Liquids
[l] [ɾ]

Tap/Flap
[r] (Like in “water” and “butter”)

Fricatives & Affricates

Palatal sounds [z] [ʃ] [ʣ] [ʧ]

Palatal Fricatives - [z] [ʃ]
[ote: according to IPA chart these are strictly ‘post-alveolar’]

Affricates - combination of stop + fricative - [ʣ] [ʧ]. as in judge, church

(ex: affricate in fast speech: “What shoes?”)

[tʃ]

Said fast, this sounds like “Whachoos?”

What are the vocal folds doing?
Voiced & Voiceless Consonants

Consonants either voiced or voiceless.

English pairs:

b p v f d t
z s ʒ θ ʃ s tʃ dʒ

Describing Sounds

Features

Ways of describing sounds
e.g., [t] = voiceless, alveolar, stop

Stronger claim: features are the smallest building blocks of language, used to store sounds in the mind

Atoms of Speech

Roman Jakobson, 1896-1982

Features

Prediction: by combining a small number of atomic features, it should be possible to create a larger number of speech sounds

Goal: a set of universal features should make it possible to describe the speech sounds of all of the languages of the world

Different languages choose different feature combinations
IPA full(er) chart

The parts we care about for this class
What can you do to alter the shape of your vocal tract?
You can....

(1) Raise or lower your tongue
(2) Advance or retract your tongue
(3) Round or spread your lips
(4) Tense or not tense your mouth
So what vowels do you have?

- i
  - “sheep, sleep”
  - “ship, slip”

- I
  - “laid, spade, trade”
  - “led, sped, tread”

- æ
  - “bat, lad”

- u
  - “Luke, who’d, suit”
  - “look, hood, soot”
So what vowels do you have?

- **o**
  - coat, wrote, hoed

- **ç**
  - caught, wrought, hawed

- **I**
  - metallic, Texas

- **æ**
  - but, putt, rut

- **u**
  - father, cot, Don

- **æ**
  - metallic, Tex
So here they are!

The full(er) vowel chart

The parts we care about for this class

Cross-language Differences

Feature Combinations

- English: back vowels are rounded, others are not
- German/French has high, front, rounded vowel [y]
- Russian has high back unrounded vowel [u]

Many languages don’t make the tense/lax distinction found in English (ex: Spanish [i])
Many languages distinguish short and long vowels (unlike English), ex: Japanese [i] vs. [ii]
Languages carve up the acoustic space in different ways. Children find these categories, based on the distributions of sounds they hear in their linguistic environment (statistical learning).

Diphthongs: Two vowel-ish sounds together

“side, my, kind”

aj or ai

a
Diphthongs: Two vowel-ish sounds together

“loud, brow, hour”

aw or au

Diphthongs: Two vowel-ish sounds together

Diphthongs: Two vowel-ish sounds together

“boy, annoy, toil”

cj or ic

More details of American English pronunciation

http://en.wikipedia.org/wiki/General_American
Speech Production - Summary

Airflow set in vibration by vocal folds
Airflow modified by vocal tract
Consonants: narrowing or blocking of oral/nasal cavity
Vowels: shaping of oral cavity
Different languages choose different selections of these

Speech Perception

Speech production processes must be undone by the ear
Motions of articulators must be reconstructed from patterns of air vibration
Requires extremely precise hearing, possibly a system specialized for hearing speech
Substantially developed at birth

Questions?