Consonant Classification

<table>
<thead>
<tr>
<th>Place of articulation</th>
<th>Billedial</th>
<th>Labiodental</th>
<th>Interdental</th>
<th>Alveolar</th>
<th>Palatal</th>
<th>Velar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Manner of Production</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Oral stop voiced</td>
<td>p (pin)</td>
<td>t (tin)</td>
<td>k (kink)</td>
<td></td>
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<tr>
<td></td>
<td>b (bin)</td>
<td>d (din)</td>
<td>g (gig)</td>
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<tr>
<td>Nasal stop voiced</td>
<td>m (map)</td>
<td>n (nap)</td>
<td>ng (ing)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Fricative voiced</td>
<td>f (fin)</td>
<td>θ (thin)</td>
<td>s (sin)</td>
<td>z (zany)</td>
<td>j (jinn)</td>
<td>ŋ (inj)</td>
</tr>
<tr>
<td></td>
<td>v (van)</td>
<td>θ (thun)</td>
<td>s (sin)</td>
<td>z (zane)</td>
<td>j (jinn)</td>
<td>ŋ (inj)</td>
</tr>
<tr>
<td>Affricate voiced</td>
<td></td>
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<tr>
<td>Liquid voiced</td>
<td>l (law)</td>
<td>l (law)</td>
<td>l (law)</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Glides voiced</td>
<td>j (jew)</td>
<td>w (we)</td>
<td>w (we)</td>
<td></td>
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</tr>
</tbody>
</table>
International Phonetic Alphabet (consonants)

International Phonetic Alphabet (vowels)
Peter Ladefoged 1926-2006
http://www.linguistics.ucla.edu/people/ladefoge/
Loss of Categorical Perception

• Example: Hindi contrast

Perceptual Loss: Locus of Onset

• When does perceptual loss take place?
• Hindi contrasts tested on…
  – Hindi-speaking adults
    • Discrimination
  – English-speaking adults
    • No discrimination
  – English-exposed 7-month-olds
    (Werker, 1981)
    • Discrimination
Hindi (spoken in India): unvoiced unaspirated retroflex vs. dental stop

Dental Stop

Retroflex Stop

Retroflex - tongue curled so tip is behind alveolar ridge
Dental - tip of tongue on teeth
(English /t/ is somewhere between the two)

Conditioned Headturn Procedure

[Diagram showing the setup of the procedure with labels for Reinforcer, Speaker, Camera, Infant, Parent, Assistant, and Toys]
Hindi (spoken in India): unvoiced unaspirated retroflex vs. dental stop

Dental Stop

Retroflex Stop

Retroflex - tongue curled so tip is behind alveolar ridge
Dental - tip of tongue on teeth
(English /t/ is somewhere between the two)
Salish
(Native North American—Canadian—language): glotalized voiceless stops

Uvular

Velar

(note: they are actually ejectives - ejective is produced by obstructing the airflow by raising the back of the tongue against or behind the velum)

Velar - tongue is raised against velum
Uvular - tongue is raised behind the velum

Not-So-Special Perception

• Three main issues undermine the view that categorical perception makes speech special:
  – Some speech sounds do not evoke categorical perception (e.g., vowels)
  – It has been shown that musical sounds (non-speech sounds) of various kinds (e.g., notes, bowing, plucking) appear to have categorical properties
  – Non-linguistic animals have been shown to perceive speech sounds categorically as well
Language Processing

• Area ‘storing’ permanent information about word sounds (~Wernicke’s)
• Area for speech planning and programming (~Broca’s)
• Conceptual storage area

History of Broca’s Aphasia

• Paul Broca
  – Treating patient for leg infection; patient was an epileptic who only said “tan”
  – Found brain lesion in posterior portion of left inferior frontal gyrus
  – These sorts of patients generally showed right hemiparesis (weakness of right arm & leg)
• Speech output is slow and effortful and lacks function words (like a telegram)
• Broca’s aphasics have a hard time understanding reversible sentences, where a full understanding of the sentence depends on syntactic assignment of thematic roles (e.g., the boy kicked the girl/the boy was kicked by the girl)
• Problems with speech articulation because of deficits in regulation of articulatory apparatus
History of Wernicke’s Aphasia

- Carl Wernicke (1870s)
  - Described patients with trouble understanding spoken language following stroke
  - Damage in posterior regions of superior temporal region of Heschl’s gyrus
  - Damage to this area produced poor language comprehension due to lost word-related memories and nonsense speech resulted from patients’ inability to monitor their own output
Wernicke’s Summary

- Wernicke’s aphasics speak fluently, but make no sense; their speech is meaningless
- They make many notable semantic errors
Language in the Brain

- Broca’s area concentrates on motor memory for words; Wernicke’s area is the region concerned with sensory memory for words.
- These ideas led to a view of language in which 3 brain centers interact as foundations of language:
  - Production area
  - Comprehension area
  - Conceptual area
Lichtheim’s (1885) Model of Language Processing

- Arrows indicate direction that information flows
- (From this model it was predicted that lesions in the 3 main areas could account for 7 main aphasic syndromes; lesions indicated by line segments transecting connections between A, B, and M)

- “A” = area storing permanent information about word sounds (Wernicke’s)
- “M” = speech planning and programming area (Broca’s)
- “B” = conceptual storage

Homunculus

- Different amounts of brain real estate are devoted to different parts of the body.
Homunculus

- Different amounts of brain real estate are devoted to different parts of the body.