A Neurological Perspective:

Development and Disorders
... Or How Do Things Look from a Neurological Perspective?
Outline

• Nature of speech acquisition
• Developmental speech disorders
• Neurological basis of treatment
• Conclusions
How Does a Child Acquire Speech?
Speech Acquisition

During language development a child learns to link together perceptual and production building blocks for purposes of communication.
A Central Challenge

A central challenge confronting a speech learner is a large mismatch between what can be perceived and what can be pronounced.
Linking Perception and Production

- Infants
- Toddlers
- Preschoolers
- School-aged students
Infants

- Vegetative sounds: 0-2 mos
- Cooing: 3-4 mos
- Vocal play: 4-6 mos
- Babbling: 7-8 mos
## Toddlers

<table>
<thead>
<tr>
<th>Category</th>
<th>Under 24 mos.</th>
<th>24 mos.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stops</td>
<td>b p m n</td>
<td>b d g p t k η</td>
</tr>
<tr>
<td>Affricates</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fricatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liquids</td>
<td>h w</td>
<td>h w</td>
</tr>
<tr>
<td>Glides</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Preschoolers

- **Deletions:** Delete speech elements that cannot be pronounced.

  *(Example: 
  `[but]` as `[bu]`.*
Repetitions

- **Repetitions**: Replace speech elements that cannot be pronounced by repeating something that can be pronounced.

*Example*: “bottle” as *[baba]*.
Substitutions

**Substitutions:** Substitute speech elements that cannot be pronounced with something more pronounceable.

Example: [sut] as [tut].
Examples

Deletions
- Consonant Cluster Reduction
- Final Consonant Deletion
- Weak Syllable Deletion

Repetitions
- Labial Assimilation
- Velar Assimilation
- Reduplication

Substitutions
- Fronting
- Stopping
- Gliding
School-aged Students

[θ]  [ð]
[s]  [z]
[l]
[r]  Vocalic [r]
[j]
[tʃ]
Why Developmental Speech Disorders?
Normal Variation

- *Example:* Developmental delay
Environmental Deficits

*Examples:* “Wild” children
Hospitalized children
Children reared in poverty
Words in One Year

- Welfare: 3 million words
- Working class: 6 million words
- Professional: 11 million words
## Encouragements and Discouragements in One Year

<table>
<thead>
<tr>
<th>Category</th>
<th>Encourage</th>
<th>Discourage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Welfare</td>
<td>26,000</td>
<td>57,000</td>
</tr>
<tr>
<td>Working Class</td>
<td>62,000</td>
<td>36,000</td>
</tr>
<tr>
<td>Professional</td>
<td>166,000</td>
<td>26,000</td>
</tr>
</tbody>
</table>
Damage

- Impairment
- Injury

*Examples:* Down syndrome  Lead poisoning
Lead Poisoning

- Lead poisoning = 10 or more micrograms of lead per deciliter
- 38 million homes built before 1950 have lead-based paint on walls
- 1 in 50 children suffer IQ decline of 7.4 points due to lead poisoning
- 1 in 10 children have 5 or more micrograms per deciliter
Multiple Causes

*Examples:* Low birth weight
Substance abuse
Low birth weight

- 8.5% of infants in U.S. are born under weight
- 70% of low birth weight babies are also born prematurely
Substance Abuse

- 36% to 41% of pregnant women in the United States abuse illicit drugs, alcohol, or nicotine

  - Illicit drugs = 11%
  - Alcohol or nicotine = 25% to 30%

- ¾ of pregnant women who abuse one substance also abuse other substances
What is the Basis of Treatment?
1. Treatment seeks to balance the equation between the brain and the environment to facilitate connections between brain cells.
Selective Elimination

2. Treatment early in life is effective because it promotes connections between brain cells before selective elimination is completed.
Growth and Elaboration

3. Throughout a person’s life treatment is effective because it promotes growth and elaboration of connections between brain cells.
Conclusions
1. A central problem in speech development is that a child must learn to link between advanced speech perception abilities and limited pronunciation skills.
Causes of Developmental Speech Disorders

2. Three reasons exist why a person may experience difficulty making cell connections for speech learning: normal variability, environmental deficits, and damage.
Treatment

3. Treatment manipulates the environment to keep speech development in tune with selective elimination and to promote growth and elaboration.