Speech perception: Categorical perception [Overview of March 27, 2014]

- Some things vary gradually along a physical continuum of values, e.g. loudness, color, VOT
- Some things vary categorically e.g. car brand

  - Some physical phenomena are perceived continuously but we do not necessarily perceive all physical changes as gradual/continuous
  - **Categorical perception** = Perceiving a continuous range of stimuli as members of discrete categories (Harnad, 1987).

  - English VOTs: 0 ms [b] or 60 ms [p]
    - What about a sound with a VOT of 30ms?

  [see class handout, which is also downloadable from Blackboard, for graphs]

\[
\begin{array}{cccccccc}
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8 \\
\text{Acoustic input on a continuum} \\
\hline
\text{Perceptual Representation is divided into two categories} \\
1 & 2 & 3 & 4 & 5 & 6 & 7 & 8
\end{array}
\]

  - VOT in English is perceived *categorically*, with the category boundary at 30ms
    - (i) Good between-category discrimination
    - (ii) Poor within-category discrimination

**What is Categorical Perception Good For?**
- *Stable perception of a variable signal*: Good discrimination between categories, not hindered by variation within a category.
- Helps compensate for the lack of invariance in speech

**One way of assessing categorical perception (more later):** Forced choice identification
  - A participant hears a sound, asked to categorize it (e.g., is it [pa] or [ba]?).

**Categorical Perception in Infants** - Are we born perceiving speech categorically?
*High Amplitude Sucking (HAS)*, sucking rate is the dependent variable.

- Each time infant sucks → speech stimulus
  - Infants get *excited* when they hear sounds
  - Infants get *bored* after a while when sounds are repeated
  - Infants *perk up* again when a new sound is presented
    - *Is a particular sound treated as a new different sound, or the same as the preceding sounds?*

- FIRST = Habituation Phase
- THEN = Switch to playing a new stimulus at predetermined sucking-rate threshold
  - What happens?
  - Dishabituation (increase sucking rate) OR Continued decrease in sucking rate

**Eimas et al reading (downloadable from Blackboard)**

- 1-month-old and 4-month-old infants habituated to an adult [pa] or an adult [ba].
- Switched stimulus is either:
  - **Acoustic Change**: different VOT from same adult category
  - **Phonemic Change**: different VOT from different adult category
  - **Control**: no change in stimulus

![Diagram](image)

**Results**: Dishabituation in Phonemic Change condition; no dishabituation in Acoustic Change or Control. Infants as young as 1-month perceive VOT changes categorically.

[see class handout, which is also downloadable from Blackboard, for important graphs]