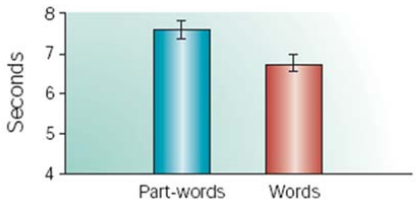
Lecture 3 - Principles of Word Recognition

Spoken word recognition

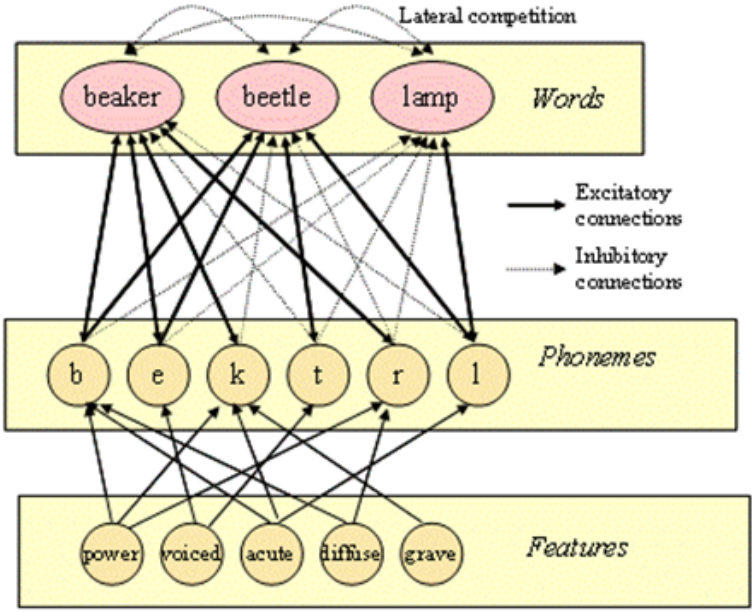
1. Prosodic cues
    a. Metric rhythm
        i. Help identify potential words within speech stream
        ii. Infants tune to regularities in stress-patterns of native language
            1. 7.5 month
                a. English-learning infants
                    i. Segment trochaic words, not iambic words
        iii. Trochaic
            1. Strong-week pattern
            2. 90% of English multi-syllabic words
        iv. Iambic
            1. Weak-strong pattern
            2. Polish
        v. All languages contain words of both kind, one pattern typically predominates
2. Transitional probabilities
    a. The likelihood that any given syllable follows another differs within words, and across word boundaries
    b. Saffran et al. (1996)
        i. 8-month-old infants
        ii. Learn word-like, 3-syllable, unit
            1. Play 2-minute strings of computer synthesised speech that contained no prosodic units
                a. Breaks
                b. Pauses
                c. Stress differences
                d. Intonation contour
            2. Transitional probability were 1.0 among the syllable contained in 4 pseudo-words
            3. Transitional probably of adjacent syllables = .33
        iii. Tested for listening preferences using head-turn procedure
            1. Blink lights above speakers attract infant's attention
            2. Infant's head turns towards light
                a. Word/part-word repeated until infant look away
            3. Total looking time measured



            4. Prefer part-words
                a. Unfamiliar
3. Pre-lexical cues summary
    a. Prosodic cues & transitional probabilities
    b. Provide information regarding likely word boundaries prior to lexical access
    c. Based on the ability of our brains to tutne into the statistical properties of speech stream

Lexical cues

1. The TRACE model of spoken word recognition



   a. Nodes
      i. Elements of information within the system
      ii. Hold a resting level & threshold for activation
      iii. Input consistent with node
         i. Activation level of node rises from resting state towards threshold
      iv. Highly interconnected
         i. When a node reaches threshold, it may influence other connected nodes
   b. Layers
      i. Phonetic features
      ii. Phenoemic level
      iii. Word level
   c. Active node
      i. Excitation
         i. Raise level of activation of nodes that are consistent with it
      ii. Inhabitation
         i. Lower level of activation of nodes that are consistent with it
   d. Excitatory activation
      i. Bottom-up
         i. Flows upwards through layers of system
      ii. Top-down
         i. Feedback
         ii. Flow back down through layers of system
   e. Lateral inhibitory
      i. Inhibitory connection
      ii. Enable a node to supress activation of a competing node
2. Lexical feedback
   a. Co-articulation of phenomes
      i. Causes the same phenome to be pronounced differently depending on the context of the surrounding phonemes
   b. Feedback from lexical level
      i. Provides mechanism to resolve ambiguity in spoken word recognition
3. Parallel activation

a. Lexical access process began when previous word is not finished
b. Speech evaluated & re-evaluated continuously against numerous potential lexical candidates, activated in parallel

4. Lateral inhibition
    a. Parallel activation
        i. Causes multiple lexical 'candidates' to be activated as words are identified
        ii. Gradually building activation for a set of lexical candidates in parallel over time
    b. As activation accumulates in multiple lexical nodes
        i. Nodes compete via lateral inhibitory mechanisms

Written word recognition

1. Phonemic awareness
    a. Ability to perceive & manipulate the sounds of spoken language
    b. Explicitly knowledge of phonemic structure of spoken language
    c. Reading alphabetic orthography
        i. Requires explicit analysis of spoken language into its smallest components - phoneme
    d. Distinguished from implicit knowledge
        i. Underpins ability to recognised spoken words that differ by a single phoneme
    e. Learnt in conjunction with alphabetic principle
        i. Letters used to represent speech sounds
        ii. Grapheme-phoneme correspondence
2. Phonological recoding
    a. Reading
    b. Phonemic awareness + alphabetic principle
        i. Enable reader to pronounce a word they have not seen in print before
    c. Enables a beginning read to
        i. Decode the orthographic forms to gain access to the thousands of words already in their phonological lexicon
3. Orthographic depth
    a. Regular words
        i. Follow spelling-sound correspondence rules
    b. Irregular words
        i. Break the usual spelling-sound rules
        ii. Must be recognised on the basis of their unique spelling pattern
    c. Novel words
        i. Must use the rules, or an analogy to a similar word, to produce a candidate pronunciation
4. Frequency effect
    a. Frequently encountered words are read more quickly
5. Regularity effect
    a. Irregular words are read more slower
6. Frequency × regularity interaction
    a. Regularity affect low frequency words more than high frequency words
7. The Dual-route model of reading
    a. Lexical route
        i. Recognising familiar words rapidly
            1. On the basis of a stored lexical orthographic representation for the whole word
        ii. Necessary for irregular words
    b. Non-lexical route
        i. Knowledge of rules for translating letter into sounds

        1. Grapheme-phoneme-conversion rules
    ii. Phonological recoding of unfamiliarly words
    iii. Irregular words regularised / mispronounced
8. Dual-route-cascaded model
    a. Dual-route model implemented as computational model by Coltheart et al.
    b. When word encountered in print
        i. Automatically analysed in parallel by both routes
        ii. Familiar
            1. Faster lexical route
        iii. No match in lexical route
            1. Regularised pronunciation
    c. Regularity × frequency interaction
        i. Low frequency irregular words
            1. Slower in lexical route
            2. Gives time for a competing "regularised" pronunciation generated by non-lexical route
        ii. High frequency irregular words
            1. Faster in lexical route
            2. Avoid significant interference from non-lexical route