Language and cognition

- Speech Perception
- Speech Production

- Lexical Access

- Grammar

- Auditory processing (for spoken languages) and articulation
Second language learning

- Perform functions in another linguistic system
- Control activation of both languages
- Switch between languages (code-switching)
- Retain L1 (vocabulary, etc) while acquiring L2
More than 50% of the world’s population is multi-lingual.
Bilingualism and cognition

Evidence that both languages are active when either language is being used
- Listening – accessing lexical representations
- Speaking – planning and producing utterances
- Reading
- Cross-language priming, Stroop tasks, etc
Activation of two languages

- Occurs at varying degrees of similarity between languages
  - English & Dutch vs. English & Mandarin

- Activation of both words and grammatical structures

- Overlapping areas of the brain

- Cognitive control required to inhibit one language
How do first and second language learning compare?

- **Factors in L1 acquisition:**
  - Maturation – stages of development
  - Learning mechanisms – innate abilities, pattern recognition
  - Input – language-specific associations

- Which of these play a role in L2 acquisition?
Factors in second language learning

- Environment and exposure
- Training (instruction)
- Age and age constraints
- Linguistic structure, transfer effects
- Individual differences
Second language assessment

Defining “fluency”

- Accuracy in producing certain consonants and vowels
- Native speaker ratings of L2 speech
- Functional: day to day needs met
L2 acquisition: syntax

- **Word order**
  - Subject-Verb-Object: *Bill ate the pizza*
  - Subject-Object-Verb: *Bill pizza ate e.g. Japanese*

- **Case systems**
  - Prepositions: *Cathy went to the store*
  - Case marker: *Cathy went store-to e.g. Finnish*
    - *Cathy meni kauppa-an*

- **Agreement – gender, verb tense**
# Syntactic errors (Flege et al, 1999)

<table>
<thead>
<tr>
<th>Sentence Type</th>
<th>Example of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Past tense</td>
<td>A policeman gived Alan a ticket for speeding yesterday.</td>
</tr>
<tr>
<td>Plural</td>
<td>Todd has many coat in his pocket.</td>
</tr>
<tr>
<td>3d person singular</td>
<td>Every Friday our neighbor wash her car.</td>
</tr>
<tr>
<td>Determiners</td>
<td>The boy is helping the man build house.</td>
</tr>
<tr>
<td>Pronouns</td>
<td>Susan is making some cookies for we.</td>
</tr>
<tr>
<td>Particle Movement</td>
<td>Kevin called Nancy for a date up.</td>
</tr>
<tr>
<td>Subcategorization</td>
<td>The little boys laughed the clown.</td>
</tr>
<tr>
<td>Wh-questions</td>
<td>Why did she put the book?</td>
</tr>
</tbody>
</table>
L2 acquisition: phonology

- Native phonological knowledge affects perception of non-native speech
- L1 categories may not correspond to L2 categories

Japanese Listener: “ROCK” “CAR/CALL”

Sensitivity to certain acoustic details

Sekiyama & Tohkura, 1993
L2 Acquisition: other aspects

- Prosody/Intonation
  - In production, stress and rhythmic patterns are often delayed, contribute to “foreign accent”
  - E.g., French learners of English have difficulties with stress patterns; even bilingual French-Spanish speakers were affected by French “stress deafness” (Dupoux, and others)

- Segmentation problem
L2 Acquisition: other aspects

- Pragmatics – contextual cues
- Social conventions – turn-taking, expression of emotion
- Language-specific expression - idioms
  - “kick the bucket”
  - “take a shower”
Factors in L2 learning: age

- Age of Arrival (AOA) in the host country – often correlated with Length of Residence

- Age affects the following:
  - Accuracy at producing vowels and consonants
  - Acquisition of morpho-syntax (e.g. plurals, verb tenses), errors in grammaticality judgment
  - Errors in writing, slower lexical decision

- Are the effects due to …
  1. Loss of motor ability to articulate?
  2. Loss of ability to auditorily perceive (e.g. sound categories)?
  3. Loss of ability to translate stored sounds into articulatory gestures?
Age: the critical period hypothesis

- Children acquire language relatively quickly and do not require conscious instruction, suggesting an innate ability to learn language before a certain age.
  - Usually considered up to puberty (~12/15 yrs)
  - Some suggest input is necessary prior to 7/9 yrs (or earlier)
  - Individual variation

- Acquired aphasias less likely to be reversible with age

- Case study: Genie (no language exposure before ~13)

- Some deaf children

- L2 words acquired earlier are remembered better than those acquired later (early bilinguals)

- Brain structure – loss of neural plasticity

- Discontinuity test
  - “critical” vs. “sensitive” period
- Nearing the end of the critical period, is there a correlation between increasing age and declining proficiency?
- Does age constrain phonological and morphosyntactically development differently?

- Results:
  - effects in both morphosyntax and phonology
  - non-linearity between 12 and 15 years (grammaticality judgments)
Factors in L2 learning: environment and individual factors

- Language of education
- Language of home
- Language of place of employment
- L2 media input

- Importance of L1
- Importance of L2
- “Integrative motivation”
- Sound processing ability
Individual differences

- **Language aptitude**
  1. Analytic capacity
  2. Memory
  3. Phonetic coding ability

- **Working memory**
  - Larger WM capacity – more successful L2
  - Larger WM capacity – faster L2 acquisition

  Effects found for sentence parsing, ambiguity resolution
  - *Louisa killed all of the ants eating the honey with poison*
Factors in L2 learning: training

- **Formal language instruction**
  - Often correlated with Age of Acquisition and Length of Residence
  - Improvement in perception of phoneme categories
    - Japanese acquisition of [l] [r] contrast
    - Improvement in tone discrimination
    - Training in L2 can improve novel word learning in a 3rd language

- **Language of education**
  - Evidence that immersion is more effective
    - Inhibition of L1
    - Frequency of exposure to language
Neural correlates of training: case study
(McLaughlin, Osterhaut & Kim, 2004)

- High amplitude N400 (ERP) for non-words with legal orthography and pronunciation
- When will this occur in L2 acquisition?

- 3 conditions in lexical decision task
  - semantically related: *chien* - *chat*
  - unrelated: *maison* – *soif*
  - word and non-word: *mot* – *nasier*

- Learners vs. Non-learners
Results (McLaughlin et al)

- Behavioral: word-learning over three sessions
- ERP responses as predicted
- By session 3, similar to native responses
- Correlation between hours of instruction and brain activity
- ERPs might reflect “implicit learning”
Factors in L2 learning: L1 transfer effects

- **Similarities and differences between languages**
  - English-----German--Dutch-----------------------Korean

- **Syntax**
  - Determiners (“the,” “a”), gender (“el,” “la”)

- **Phonology, prosody**
  - stress patterns
  - phonotactics (Spanish and s-initial words)
Factors in L2 learning: learning mechanisms

- **Statistical learning**
  - Evidence from artificial languages – **MA-LI-PU-LA-MA-LI-NO**

- **Interactions between statistical learning and previous linguistic experience**
  - Intonation patterns, phrasal patterns
  - English learners of artificial language learned initial-stress pattern words more accurately than medially stressed words
Memory for Words

- Words learned earlier in life remembered better
- Tested with lexical decision, semantic categorization, picture naming, word naming, word reading, sentence reading
- Lexical representations vs. conceptual representations
- Proficiency may depend on the links between lexical and conceptual representations
Revised Hierarchical Model (Kroll and others)

1. conceptual representation
2. lexical representation for L1
3. lexical representation for L2

- More time require to translate from L1 to L2 than vice versa
- “Categorical interference” occurs when translating from L1 to L2

L1:
- HORSE
- donkey
- cow

L2:
- ?
Native language attrition

- Increased use of L2 is associated with inhibition of L1

- What does this mean for long-term retention of L1?
  - Lexical attrition: *picture naming, lexical diversity, change in semantic meaning*

L1: cow
- feed a cow
- eat beef

L1: beef
- eat beef

L2: “cow”
- feed a cow
- eat a cow
Attrition

- Grammatical attrition
  - loss of fluency in production

- Age and attrition
  - early life immigrants, adoptees
  - critical period
Language memory & pathologies

- Case studies of post-stroke individuals
- Aphasias can affect grammatical processing or lexical access, or both
- Aphasia can affect either L1 or L2 or both languages
- Recovery may occur in either or both (or neither) language, contrary to Pitres’ rule
- Blended recovery (involuntary switching between languages)
Language learning & cognitive function

- Bilingual children perform better at tasks requiring attentional control
  - language tasks (metaphonological manipulations)
  - spatial and quantity problems
  - problems solving
- Adults have also shown these effects
- Ability to ignore irrelevant perceptual cues
  - e.g. Simon task (right key if blue square, left key if green square)
  - bilinguals show advantage even on congruent trials, compared to monolinguals

(Bialystok and others)
Bilingualism and word learning

- Improved selective attention & inhibitory control
- Does it matter what the languages are?

Kaushanskaya & Marian (2009)
Articles for 9/22:

Lemhöfer et al (2010)
Linck et al (2009)
Bowers & Kennison (2011)

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