Bilingualism & Cognitive Flexibility

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Cognitive Flexibility

- Executive processes
- Uniquely human?
- Ability to avoid a prepotent response in favor of the currently relevant one
- Proposed mechanisms:
  - Inhibition?
    - Conceptual? Neural?
  - Competition/Activation/Working Memory?
  - Hot debate! :)

Plan

- DCCS (+ Bilingualism)
- Simon Task
- Ambiguous Figures

- Creativity

- Implications for understanding how (whether?) bilingualism affects cognitive flexibility

DCCS

- Video goes here
DCCS & Bilingualism

- Bialystok, 1999; Bialystok & Martin, 2004
- Bilingual advantage - bilingual kids switch easier between sorting rules
- Mechanism - inhibitory control/conceptual inhibition
- My bias - not as clear-cut, does not get at the *underlying* mechanisms

Aging Gracefully

- Bilingual advantage in kids established; what about adults? What about elderly?
- Representation (analysis) & Control
- Aging:
  - Representation - constant
  - Control - declines
- Bilingual kids are better at control, so maybe bilingual adults don’t show as much decline?

Simon Task

- Right button for red; Left for green
- Congruent & incongruent trials
- Bilingual advantage for kids

Study 1

- 20 younger (30-54 years old)
- 20 older (60-88 years old)
- In each group, half English monolingual, half Tamil-English bilingual
- Bilingual since 6 years old; ~50% daily use of English
- Age-matched, similar SES
Study 1 Tasks

- Language background questionnaire
- PPVT
- Raven’s Standard Progressive Matrices
- Simon Task
  - 8 practice trials, 28 experimental trials (half congruent, half incongruent; randomized order)

Study 1 Results

<table>
<thead>
<tr>
<th>Measure</th>
<th>monolingual</th>
<th>bilingual</th>
<th>monolingual</th>
<th>bilingual</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (in years)</td>
<td>44.0 (7.3)</td>
<td>49.6 (7.9)</td>
<td>70.6 (7.5)</td>
<td>72.6 (8.7)</td>
</tr>
<tr>
<td>PPVT-R</td>
<td>91.0 (4.5)</td>
<td>91.5 (4.5)</td>
<td>91.5 (4.5)</td>
<td>91.0 (4.6)</td>
</tr>
<tr>
<td>Raven</td>
<td>1.4 (0.2)</td>
<td>1.5 (0.3)</td>
<td>1.3 (0.2)</td>
<td>1.3 (0.2)</td>
</tr>
</tbody>
</table>

Study 2

Converge!

Monolinguals improve
Implications for aging gracefully….  

• “Bilingualism **reduced** the age-related increase in the Simon effect, implying that lifelong experience of managing two languages attenuates the age-related decline in the efficiency of inhibitory processing”

• Working memory vs. Inhibition

Ambiguous Figures

• Kids can’t see both images until ~ age 5
• Similar to the card-sorting task
• Bilinguals have better control, so would bilingual children be better at seeing it?
• A nonlinguistic task?!
• Used bilinguals of many languages

Bilingualism & Ambiguous Figures

• “Bilingualism reduced the age-related increase in the Simon effect, implying that lifelong experience of managing two languages attenuates the age-related decline in the efficiency of inhibitory processing”

• Working memory vs. Inhibition

Results

Study 1

Study 2

Added DCCS and Opposite Worlds Game
Questions/Concerns - Bialystok
- Is Bialystok advocating inhibition at the behavioral level or the mechanistic level?
- Are there different benefits bilinguals have depending on what languages they are bilingual in?
- Autistic children & ambiguous figures? Are there fewer bilingual autistic kids?
- PPVT
- Managing 2 languages & code-switching? Does age of acquisition matter? Practice effects and explicit training?
- “cold, wet, raw” - not as uncommon?
- Weak semantic links in bilinguals?

Bilingualism & Creativity
- Whorf vs. Chomsky
- 2 “windows or corridors through which to view the world” --> bilingual children may be more creative
- Definition of bilingualism
- Definition of creativity

Method
- 9-11 year old kids
- Bilinguals: Yoruba/English (N=62) & Welsh/English (N = 86)
- Monolinguals were all English-speaking

Tasks
- Verbal Creativity tests
  - Word meaning
  - Uses of objects
  - Instances tests
- Nonverbal Creativity tests
  - Picture construction
  - Picture completion
Tasks, cont’d

- Intelligence tests
  - Verbal: VTE, VTY, Thornton-Hagen Cognitive Abilities Test
  - Nonverbal: Raven’s
- Language Proficiency tests
  - Yoruba & English
  - Welsh & English
- General Information Inventory
  - General information questionnaire + linguistic background scale (language status of parents, etc.)

Results

- Total Verbal Creativity Score (41.9; 44.4 pts)
- Verbal Originality Score (11.3; 8.2 pts)
- Therefore, bilingual kids are more creative
- “Group” (bilingual or not) is a significant factor in multiple regression
- Critical factors: # of languages spoken, verbal IQ, language proficiency

Questions/Concerns - Okoh

- Construct validity?
- Creativity = flexibility?
- Bilinguals are better at verbal, but not nonverbal creativity
- English monolinguals - problematic?
- Should we be surprised that Yoruba/English speaking children can come up with multiple meanings easier than English-speaking children?
- Mechanisms?