Bilingualism in Education: Implications for Bilingual Education and Minority Language Students

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Bilingual Education: What do we Know?

What is bilingual education?
- heritage language
- submersion
- 90-10 program
- transitional language
- immersion
- minority language
- two-way immersion
- majority language

US students in bilingual education
- low SES
- low proficiency English
- Hispanic
- English language learners
- poor
- low family education
- at-risk for academic failure
- Spanish speakers
Any discussion of “bilingual education” requires considering details about the program and description of the children and context.
<table>
<thead>
<tr>
<th>Bilingualism and Bilingual Education</th>
<th>Home Language</th>
<th>School Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilingualism</td>
<td>Other</td>
<td>English</td>
</tr>
<tr>
<td>Immersion Education</td>
<td>English</td>
<td>Other</td>
</tr>
<tr>
<td>Dual Language Education</td>
<td>Spanish</td>
<td>English</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Spanish</td>
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</table>
## Bilingualism and Bilingual Education

<table>
<thead>
<tr>
<th></th>
<th>English proficiency</th>
<th>At-risk factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bilingualism</td>
<td>???</td>
<td>No</td>
</tr>
<tr>
<td>Immersion Education</td>
<td>High</td>
<td>No</td>
</tr>
<tr>
<td>Dual Language Education</td>
<td>Low</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Bilingualism and Bilingual Education

- Home bilingualism different from school-related bilingual education
- Bilingual education programs differ in important ways, so cognitive and educational outcomes will be different
- Underlying questions:
  1. What are the effects of these language configurations on children’s cognitive development and academic success?
  2. How do the factors that differ across individuals and groups impact these effects?
Bilingual Minds

- Intense experiences lead to modifications of brain and cognitive processes (music, video gaming, etc.)
- For bilinguals, joint activation of languages requires a selection mechanism
- Lifelong need to select target language modifies brain and cognitive networks
- Main consequences of bilingualism:
  - Language acquisition and processing more effortful
  - Executive control (EC) more efficient
- Consider these consequences in the context of bilingual education
Linguistic Consequences: Bilingualism and Vocabulary

Bialystok et al., 2010, B:LC
Differences Between Languages and Words

**Graph 1:**
- **Group:** English Monolingual (n = 772), East Asian bilingual (n = 329), Non-Asian bilingual (n = 255)
- **PPVT std. score**

**Graph 2:**
- **Percent correct**
  - Home: Monolingual (n = 75), Bilingual (n = 87)
Language Proficiency in Immersion: How Bilingual?  
English vs. French in Private French Immersion School

Vocabulary

Verbal Fluency

Bilingualism and bilingual education associated with lower vocabulary

Grammaticality Judgment
Cognitive and Brain Effects Across the Lifespan

- **Visual Language**
- **Facial Scanning**
- **Visual Attention**

- **Conflict & other EF tasks** RT/Acc
- **Response inhibition**
- **Flexibility/shifting**
- **Nonverbal working memory**

- **ERP in EF tasks**
- **Structural MRI grey and white**

**Group differences**

**No group differences**
Emergence of Bilingual Effects Through Education

Bialystok & Barac, 2012, Cognition

- Use continuous estimates of bilingualism and other factors
- Children in immersion programs becoming bilingual
- Study 1: 100 children, 7- to 9-years old, Hebrew education
- Study 2: 52 children, 10- to 11-years old, French education
- Metalinguistic (linguistic representation + EC) and EC tests
- Regression Model:
  1. Child’s age
  2. K-bit nonverbal IQ
  3. PPVT English vocabulary
  4. Balance between two languages
  5. Time spent in program
More language proficiency → Metalinguistic outcomes
More bilingual experience → Executive control outcomes
Individual Differences in Effects of Bilingualism on Children’s Executive Control

- Cognitive and academic outcomes multiply determined; bilingualism only one potential factor
- Other factors work in either direction (+ or -) on EC outcomes. Do they interact with bilingualism?
- Consider
  1. Attentional disorders/difficulties
  2. Socioeconomic status
  3. Sociocultural and socioeconomic risk factors
1. Attention Disorders in Education

- Symptoms of ADHD include inattention, hyperactivity, impulsivity
- Children with clinical diagnosis constitute 5.9% to 7.1% of population
- Strong association between presence of symptoms and academic achievement
- Symptoms vary as well in typically-developing population
- Interaction with bilingualism?
Bilingual Education and Special Needs

- Concern about outcomes for children with challenges such as language and cognitive disabilities, ADHD, etc.
- But compared to what?

Diagram:
- Single language (TD)
- Bilingual education (ADHD)
Bilingualism

Executive Function
- Inhibitory Control
- Conflict Resolution
- Working Memory

Attention Disorder (ADHD)
Levels of Attention and Degree of Bilingualism

*Sorge, Toplak, & Bialystok, in press, Dev Sci*

- Children vary in degree of bilingualism and degree of attention ability (excluding clinical ADHD)
- Examine relation between bilingualism and attention level
- Participants: 208 children, 8 to 11 years (M = 9.2)
- Typically developing population in public schools
- Diverse communities (33 different home languages)
- Three tests of executive function
Flanker Task
Conflict resolution

Stop Signal
Response inhibition

Frog Working Memory
Spatial working memory
Summary of Results

- Bilingualism and attention both explain performance on tasks
- Greater bilingualism beneficial at all levels of attention ability
- Effect of bilingualism limited by integrity of attention system: In clinical ADHD (adults), bilinguals poorer than monolinguals on EF tasks
2. Do Bilingual Outcomes Depend on SES?

*Calvo & Bialystok, 2014, Cognition*

<table>
<thead>
<tr>
<th>Group</th>
<th>N</th>
<th>Maternal Education (1-5)</th>
<th>Age (mo)</th>
<th>K-BIT (std.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Working Class (WC) Monolingual</td>
<td>22</td>
<td>1.9</td>
<td>80</td>
<td>101.4</td>
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<tr>
<td>Working Class (WC) Bilingual</td>
<td>44</td>
<td>1.7</td>
<td>82</td>
<td>101.0</td>
</tr>
<tr>
<td>Middle Class (MC) Monolingual</td>
<td>52</td>
<td>3.5</td>
<td>81</td>
<td>102.2</td>
</tr>
<tr>
<td>Middle Class (MC) Bilingual</td>
<td>67</td>
<td>3.7</td>
<td>80</td>
<td>106.6</td>
</tr>
</tbody>
</table>

**Cognitive Ability**
- K-bit matrices
- Visual search

**Language Ability**
- PPVT

**Executive Control**
- Frog working memory
- Flanker
### Results of Factor Scores

<table>
<thead>
<tr>
<th>EF Tasks</th>
<th>Language Tasks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Z-score</td>
<td>Monolingual WC</td>
</tr>
<tr>
<td>-0.8</td>
<td>-0.6</td>
</tr>
</tbody>
</table>

**Legend:**
- Red: Monolingual WC
- Blue: Bilingual WC
- Red Diagonal: Monolingual MC
- Blue Diagonal: Bilingual MC
Effect of Bilingualism in Low SES Children

Engel de Abreu et al., 2012, Psych Science

- 80 8-year-olds
  - 40 Portuguese monolingual in Portugal
  - 40 Portuguese-Luxembourgish bilingual in Luxembourg
- Matched on school, family, income, education etc.
- Battery of language tasks and executive function tasks
- Bilinguals performed lower than monolinguals on language
## Factor Analysis

<table>
<thead>
<tr>
<th>Measures</th>
<th>Representation</th>
<th>Executive Control</th>
<th>Factor Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Monolingual</td>
<td>Bilingual</td>
<td></td>
</tr>
<tr>
<td>Raven</td>
<td>.71</td>
<td>.01</td>
<td>.14</td>
</tr>
<tr>
<td></td>
<td>- .01</td>
<td>-.14</td>
<td>-.14</td>
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<tr>
<td>Odd-one-out</td>
<td>.66</td>
<td>-.14</td>
<td></td>
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<tr>
<td>Dot matrix</td>
<td>.77</td>
<td>-.06</td>
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<tr>
<td>Sky search</td>
<td>-.09</td>
<td>.83</td>
<td>.41</td>
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<tr>
<td></td>
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<td>-.41</td>
</tr>
<tr>
<td>Flanker</td>
<td>-.06</td>
<td>.85</td>
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</tr>
</tbody>
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**Representation**
- Bilingual = Monolingual
  - $d = 0.3$

**Executive Control**
- Bilingual > Monolingual
  - $d = 0.9$
3. Degree of Bilingualism in Low SES At-Risk Children

Thomas-Sunesson, Hakuta, & Bialystok, in press, IJEBEB

- Children in central California, low SES, various degrees of bilingualism and bilingual education
- Largely children of Mexican immigrants
- 64 typically-developing children, mean age = 8.8 years

- Design:
  - Background measures: age, parents education, IQ
  - English proficiency: PPVT scores
  - Bilingualism: ratio of English and Spanish proficiency

- Same three tasks from Attention study
Flanker Task
Conflict resolution

Stop Signal
Response inhibition

Frog Working Memory
Spatial working memory

Stop-Signal Task

Working Memory Task
Conclusion: Minority Language Children in Bilingual Education

- Bilingualism leads to poorer language proficiency (vocabulary) and better executive control
- Same pattern found for bilingual education
- Language and executive control outcomes also determined by SES, attentional control, and other at-risk factors
- These factors do not reverse or compromise the overall effects of bilingualism or bilingual education
- Education has important role in both creating and harnessing the positive effects of bilingualism for all children
THANK YOU