Linguistic Interdependence and the Educational Development of Bilingual Children

James Cummings, 1979
Presented by Francesco Tombini
Research Question

Can bilingualism produce cognitively and academically beneficial effects?

Need for new theoretical framework
Linguistic Factors

Balance Effect Hypothesis (Macnamara, 1966)
Linguistic Mismatch Hypothesis (UNESCO)
Socio-Cultural Factors

No Balance Effect in many immersion program studies (Bowen)

Bowen & Tucker reject Vernacular Advantage Theory in favour of social factors
School Program Factors

Immersion vs Submersion Programs
The Need for a Theoretical Framework

Socio-Educational Factors

- School Program Factors
- Socio-Cultural Factors

Child Input Factors

- Conceptual-Linguistic Knowledge
- Motivation to learn L2 and maintain L1
Linguistic Factors Revisited

The Threshold Hypothesis

The Developmental Interdependency Hypothesis
The Threshold Hypothesis

*Observation:* Studies on successful programs usually involved forms of additive bilingualism
The Threshold Hypothesis

Levels of competence bilingual children attain in their two languages are a crucial factor for cognitive development.

A twofold version of the hypothesis best fits empirical observations.
### Types of Bilingualism

- **Additive Bilingualism**
  - High levels in both languages

- **Dominant Bilingualism**
  - Native-like level in one of the languages

- **Semilingualism**
  - Low level in both languages

### Cognitive Effects

- **Positive cognitive effects**
- **Neither positive nor negative cognitive effects**
- **Negative cognitive effects**
The Developmental Interdependency Hypothesis

L2 competence strongly correlates with L1 levels when intensive exposure to L2 begins.

Immersion programs are successful because L1 literacy skills are already established.

Literacy skills are easily transferred between languages.
L1 Development

Which L1 aspects are crucial for successful L2 instruction?

1. Vocabulary-concept knowledge (Becker, 1977)

2. Metalinguistic insights about written texts

3. Ability to process decontextualised language
Interaction Model of Bilingual Education

Background Variables:
a. Nature of child’s linguistic interaction
b. Community and parental attitudes towards participation in L2 culture and maintenance of L1

Child Input Variables:
a. Conceptual-linguistic knowledge
b. Motivation to learn L2 and maintain L1

Child Process Variables:
a. Competence in L1 and L2
b. Motivation to learn L1 and L2

Educational Treatment Variables:
a. Pattern of program language usage
b. Teacher attitudes and expectations

Educational Outcomes:
a. Cognitive, academic and linguistic outcomes
b. Affective outcomes
Interaction between Linguistic and Motivational inputs and Educational Treatments
# Hypothesised Interactions Between Child Input and Educational Treatment Variables

## Educational Treatments

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<tr>
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<th>Submersion</th>
<th>L2 Immersion/L1 Maintainance</th>
<th>Transitional Bilingual</th>
<th>Maintainance Bilingual</th>
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## Child Inputs

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<th>High Language</th>
<th>Low Language</th>
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<tr>
<td>High Motivation</td>
<td>Low Motivation</td>
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### High Language
- Submersion: +
- L2 Immersion/L1 Maintainance: ++
- Transitional Bilingual: +
- Maintainance Bilingual: ++

### Low Language
- Submersion: -
- L2 Immersion/L1 Maintainance: -
- Transitional Bilingual: -
- Maintainance Bilingual: +

### High Motivation
- Submersion: +
- L2 Immersion/L1 Maintainance: +
- Transitional Bilingual: -
- Maintainance Bilingual: -

### Low Motivation
- Submersion: -
- L2 Immersion/L1 Maintainance: -
- Transitional Bilingual: +
- Maintainance Bilingual: ++
Conclusions

Cognitively and academically, beneficial forms of bilingualism are achieved only through adequate development of L1.

According to the Threshold Hypothesis, certain threshold levels of competence in both language must be attained to ward off cognitive disadvantages and potentially reap some cognitive benefits.

The Developmental Interdependency Hypothesis states that the development of competence in the L2 is partially a function of the type of competency already developed in L1 when intensive exposure to L2 begins.
Consequences of Bilingualism for Cognitive Development

Ellen Bialystok, 2005
Research Question

Study the possible cognitive effects of bilingualism on non-verbal skills in children

Focus on three cognitive domains:
1. concept of quantity
2. task switching
3. theory of mind
Background

Beware of political and societal biases:

In earlier studies, claims about the effects of bilingualism were used to reflect societal attitudes towards immigration and to reinforce preconceptions about language
Mixed results in previous literature

"mental confusion " (Saer, 1923)
Disadvantages in verbal and performance tests (Darcy, 1963)

Mental flexibility (Peal & Lambert, 1962)
Creativity (Ricciardelli, 1992)
Divergent thinking (Torrace et al. 1970)

Verbal & non-verbal advantages, but disadvantage in vocabulary (Ben-Zeev, 1977)
MacNab (1979) is sceptical of felicitous studies, but supports claims on improved creativity
Current Research

Peal & Lambert’s idea that bilingualism fosters flexibility of thought has persisted.

Bilingualism is often found to promote the rapid development of metalinguistic concepts.

Vocabulary development is usually delayed in bilingual children.
What about Non-verbal Cognitive Development?

Assumption:

Linguistic and nonlinguistic knowledge share resources in a domain-general representational system and can influence each other.
Quantative Concepts and Abilities

Many studies have shown that bilingualism does not alter children’s ability to construct mathematical mental representations.

Verbal mathematical problems that exceed their linguistic sophistication may impose a barrier to accessing those representations.
Quantitative Concepts and Abilities

Solving mathematical problems in a weak language is more difficult for bilinguals than it is either for monolinguals or for bilinguals in their strong language:

1. Longer reaction time for adults
2. Increased errors in children
3. (According to some studies) longer time for both languages
The Concept of Cardinality: the Lego Tower Experiment
The Concept of Cardinality: Sharing Task
The Concept of Cardinality: Results

Sharing Task: no difference between mono- and bilinguals
Tower Experiment: significantly better performance of the bilingual children
Task Switching (Zelazo et al.)
Task Switching: Results

Bilingual children are able to adapt to the new rule and solve the problem earlier than monolingual children.

Bilingual children are better able to inhibit irrelevant information and refocus their attention onto the updated rules.
Theory of Mind

Theory of Mind is the knowledge that beliefs, attitudes and perceptions are constructed by individual minds that have a particular point of view.

Bialystok & Senman (2004) used appearance-reality tasks to test for differences between mono- and bilingual children.

Accepting reality requires the suppression of misleading information (i.e. the appearance of the object).

As expected, bilinguals outperformed monolinguals.
Bilingualism: What’s the Difference?

By and large, bilinguals do not display exceptional cognitive advantages. They do however excel in tasks that require inhibition of misleading information. This comes at a cost: an area of consistent bilingual disadvantage is receptive vocabulary.
What is the Significance of Inhibition?

This ability crosses both verbal and nonverbal domains of problem solving.

Attention has three components:
1. Inhibition
2. Selection
3. Habituation

Unlike selection and habituation, inhibition develops slowly and declines with age.
What is the Significance of Inhibition?

The brain areas involved in selective attention and inhibitory control are located in the frontal lobes, the seat of highly generalised forms of intelligence.

The implications that bilingualism might have on intelligence are vastly premature, but enticing nonetheless.
The Bilingual Brain

Recent research shows activation of both languages during processing of either language. (No switching, as previously posited)

To avoid unwanted intrusion of either language an executive system for activating or inhibiting linguistic representations is required
The Bilingual Brain

The Bilingual Brain

If Green’s model is correct, bilingualism will result in greater use of inhibitory control

Bilingualism may provide more rapid development in areas of the prefrontal cortex, influencing the development of a wide range of cognitive activities
Bilingualism & Intelligence

Fluid vs. Crystallised Intelligence (Cattell, 1963)

The effect of bilingualism on intelligence is most likely confined to fluid intelligence, which correlates with those aspects of performance most dependent on executive control.
Conclusions

Bilingualism does not produce striking cognitive advantages, nor does it hinder regular cognitive development.

Bilingualism appears, however, to positively affect the development of specific executive functions concerned with attention and inhibition, which are useful in tasks involving misleading or irrelevant information.
Compare/Contrast

Cummins’ paper:

i. Very influential (2752 citations)

ii. Very broad and theoretical

iii. More geared towards scholars working in education

iv. Many of the cited (older) studies are based on anecdotal evidence rather than rigorous scientific evidence
Compare/Contrast

Bialystok’s paper:

i. Rather influential (231 citations)

ii. Focuses on very specific aspects of the subject matter

iii. Targeted more specifically at psycholinguists, but also suitable for educators and education scholars

iv. The cited studies are backed by sounder scientific evidence coming from neuroimaging and better controlled experiments
Comments? Questions?
Thank you!