EARLY LANGUAGE: THE FOUNDATION FOR DEAF CHILDREN’S DEVELOPMENT

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The “Math Gap”: What and Why

Clues from homesigners in Nicaragua
  ▪ Spoiler alert: It’s about LANGUAGE

NSF project with Deaf children in the US

Early language may boost Deaf participation in STEM fields (Science, Technology, Education, & Math)

Language deprivation happens in wealthy countries, too
Normally hearing (NH) outperformed Deaf/HH (DHH) in 24/25 studies.

Each bar represents one study that directly compared the groups.

Miller & Coppola, 2016; Coppola et al. in prep; Gottardis et al. 2015
1. Children memorize the count list by \(~2\) years but don’t understand the meanings of number words:

   “one”  “two”  “three”  “four”  “five”

2. They gradually learn which quantity each number word refers to:

   “one”  “two”  “three”  “four”  “five”
Only ~5% of deaf children have at least one signing parent (Mitchell & Karchmer, 2004)

Sensitive period: Documented negative impact inadequate/delayed linguistic input on language development

The vast majority of deaf children DO NOT receive rich linguistic input from birth
HOMESIGNERS: AN EXTREME CASE OF LANGUAGE DEPRIVATION

- Deaf people raised in families who do not know sign language:
  - Create their own visual communication systems.
  - No opportunity to go to school or learn sign language
  - Integrated into family, community, and work – not neglected/abused

Homesigners don’t receive linguistic input but have fairly typical social opportunities.
ADULT HOMESIGNER MATCHES 1 KNOCK BUT NOT 4 KNOCKS

<table>
<thead>
<tr>
<th>Target</th>
<th>4</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Response</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>

Spaepen, Coppola, Spelke, Carey, Goldin-Meadow, PNAS, 2011
HOW DOES LANGUAGE SUPPORT DEVELOPMENT OF NUMBER CONCEPTS?
NSF CAREER AWARD 2016-2021

Approach: Compare children who differ in TIMING of language exposure and TYPE of language

Early-Language
Early-Sign: Deaf/hard of hearing (DHH) children with signing Deaf parents
Early-Speech: Hearing children with hearing parents

Later-Language
Later-Sign: Deaf children with non-signing hearing parents
Later-Speech: Deaf children with Cochlear Implants/Hearing Aids

Sensitive period effects??

~2.5 years old
“one”
~4.5 years old
“two”
“three”
“four”
“five”

“one”
“two”
“three”
“four”
“five”

~2.5 years old
~4.5 years old

“one”
“two”
“three”
“four”
“five”
ASSESSING US DEAF CHILDREN’S NUMBER DEVELOPMENT

Give-N Objects
Put N fish in the bowl

Elicited Counting
Can you count these fish for me?
Language provides the foundation for basic number concepts

- In hearing children
- In Deaf/HH children? We’ll find out!!

Translation:

1. Identify the *conceptual underpinnings* of the Math Gap
2. Target number language and concepts with *interventions*
BROADER IMPACTS

1. Increase numbers of DHH children prepared to enter STEM fields
2. Build capacity by training Deaf scholars
3. Increase communication among general education, deaf education, and cognitive science
4. Broadly disseminate knowledge of DHH children’s development to teachers, educators, and parents
Maybe YOU!

People

SIGN UP TO RECEIVE UPDATES!!!
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