#D46

Shedding New Light on Reading in Bilingual and Monolingual Children

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Introduction

Much is known and is being studied about MONOLINGUAL typical/atypical reading development[1-7] However, many children are learning more than one language

NEW QUESTION **What is the neural basis of reading acquisition in typically developing bilingual and monolingual children?**

NEW HYPOTHESIS Spanish-English bilingual children will show key differences in the recruitment of classic language tissue as compared to English monolingual children. The differences are predictable from the different *linguistic structure and processing* demands of each language, aka ***"The Bilingual Signature"*** hypothesis[5-7]

NEW TECHNOLOGY - functional Near-Infrared Spectroscopy

fNIRS measures changes in the components of brain's blood oxygen level density (BOLD), both deoxy- and oxy-hemoglobin (Hb & HbO_2 respectively)

fNIRS system is quiet, portable, child-friendly, tolerates movement, and has revolutionized the study of *Language* across the lifespan[5-11]

Methods

PARTICIPANTS

2 Grades - 2nd and 3rd grades (ages 7-9)

2 Languages

Spanish – a language with "shallow" orthography

English – a language with "deep" orthography

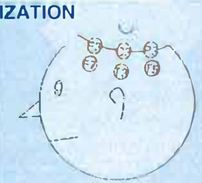
Group	N = 17	Age of English Exposure	Languages at Home	Reading at Home
Bilinguals	7	birth-5	English & Spanish	English & Spanish
Monolinguals	10	birth	English Only	English Only

WHOLE-WORD reading instruction approach in school

ANATOMICAL LOCALIZATION

3x5 Optode Array

MRI Co-registration



10 x 20 Coordinates[12]

DATA ACQUISITION WITH FUNCTIONAL NEAR INFRARED

fNIRS signals were recorded using a Hitachi 48 channel ETG-4000 with lasers set at 698nm and 830nm, with Matlab-based analyses[5-8]

ENGLISH READING TASKS

Block-Design

Read words ALOUD

Regular – ***high*** sound to letter correspondence (cat)

Irregular – ***low*** sound to letter correspondence (yacht)

Pseudo-words – no semantic meaning, English orthography (feap)

Results

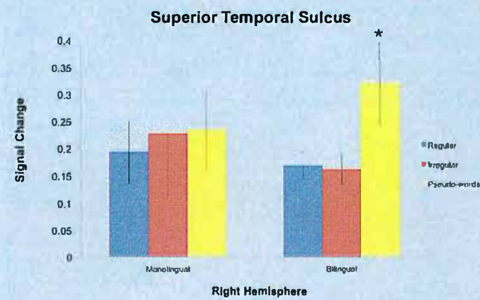
BEHAVIORAL

No Accuracy differences between Bilinguals and Monolinguals ($p > .05$)

IMAGING

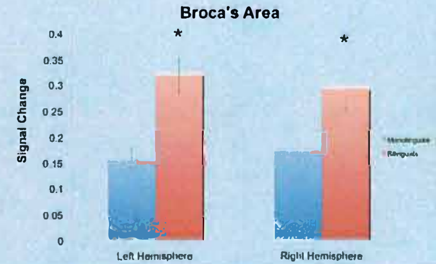
REGULAR VS. IRREGULAR VS PSEUDO WORDS

Spanish-English bilinguals showed an increase in activation of **Right Hemisphere Superior Temporal Sulcus (STS) region** when reading Pseudo Words ($p < .03$)



BILINGUALS VS MONOLINGUALS

Spanish-English bilinguals showed an increase in activation of **Bilateral Inferior Frontal Regions (IFC/ Broca's Area)** during all Reading conditions ($p < .01$)



Conclusions

Do Bilinguals and Monolinguals show activation differences when reading words? YES!

Are activation differences within the bilingual brain predictable from each language's unique language structure and processing demands? YES!

The Spanish-English bilingual children's brain reflects their acquisition of language-specific *deep/English* versus *shallow/*Spanish orthography by showing greater recruitment of the right ***STS*** region during *Pseudoword* reading, possibly reflecting more efficient shallow-language decoding strategies from Spanish

The increased bilateral ***IFC*** activation observed in bilingual children may reflect the extra, double lexical processing demands associated with the IFC's classic role in the search and retrieval of word meanings, consistent with the same observed in adult bilinguals[5-7,13] and observed here for the first time in young bilingual children

These results support "The Bilingual Signature" hypothesis[5-7]

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