Shedding New Light on Reading in Spanish-English and French-English Bilingual School Children: an fNIRS Investigation
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RESEARCH QUESTIONS
How does a bilingual’s two languages impact the neural circuitry for reading?

Mapping letters (orthography) to sounds (phonology) is key for learning to read¹. In the monolingual brain, a left-lateralized reading network processes the relationship between orthography, phonology and meaning².

Is there a “neural signature” in the young bilingual brain for reading³,⁴⁵? If so, can it be predicted from linguistic features of each language? The relationship of orthography to phonology differs among languages⁶,⁷,⁸.

HYPOTHESIS
Specific features of the orthography to phonology relationship in each language predictably recruit the brain’s reading network.

METHOD

Participants
Spanish-English Bilingual N = 7
French-English Bilingual N = 6
English Monolingual N = 11

Task
Word Reading²,⁴,⁵ in English, Spanish, French Near Infrared Spectroscopy (fNIRS)⁶

Orthography
Shallow Regular one-to-one mapping between orthography and phonology e.g. /dog/ ⇒ “dog”

Deep Irregular mapping between orthography and phonology e.g. /s/ & /k/ ⇒ “c” “circus”

Phonology
Spanish French English

RESULTS
Orthography-Phonology Mapping Impacts Neural Activation

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CONCLUSION
Language experience can change how the young bilingual brain reads

Specific differences in orthography-phonology mapping in Spanish, French and English yield differences in neural activation patterns

Shallow orthographies ⇒ Greater recruitment of STG
Deep orthographies ⇒ Greater recruitment of LIFG

Neural activation patterns for reading are associated with the specific linguistic features of a bilingual’s two languages

Supports Bilingual Neural Signature Hypothesis:²,⁴,⁵,⁶,⁷,⁸

Translational Impact

Added to the importance of a young bilingual’s Age of Exposure (AoE) to its two languages²,⁴,⁵.

new here is the observation that differences in the orthographic structure of a bilingual child’s two languages can predict reading outcomes.

When at least ONE of a young bilingual reader’s two languages has shallow orthography, the child may benefit most optimally from reading instruction focusing on phonological processing.

REFERENCES
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