

Are the neural systems of reading impacted by interrupted schooling? What we can learn from Syrian Refugee children recently resettled in Canada

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Aim

Aim: To examine how individual differences in the *duration* and *age* when a child experienced interrupted schooling impact neural activation for language and reading.

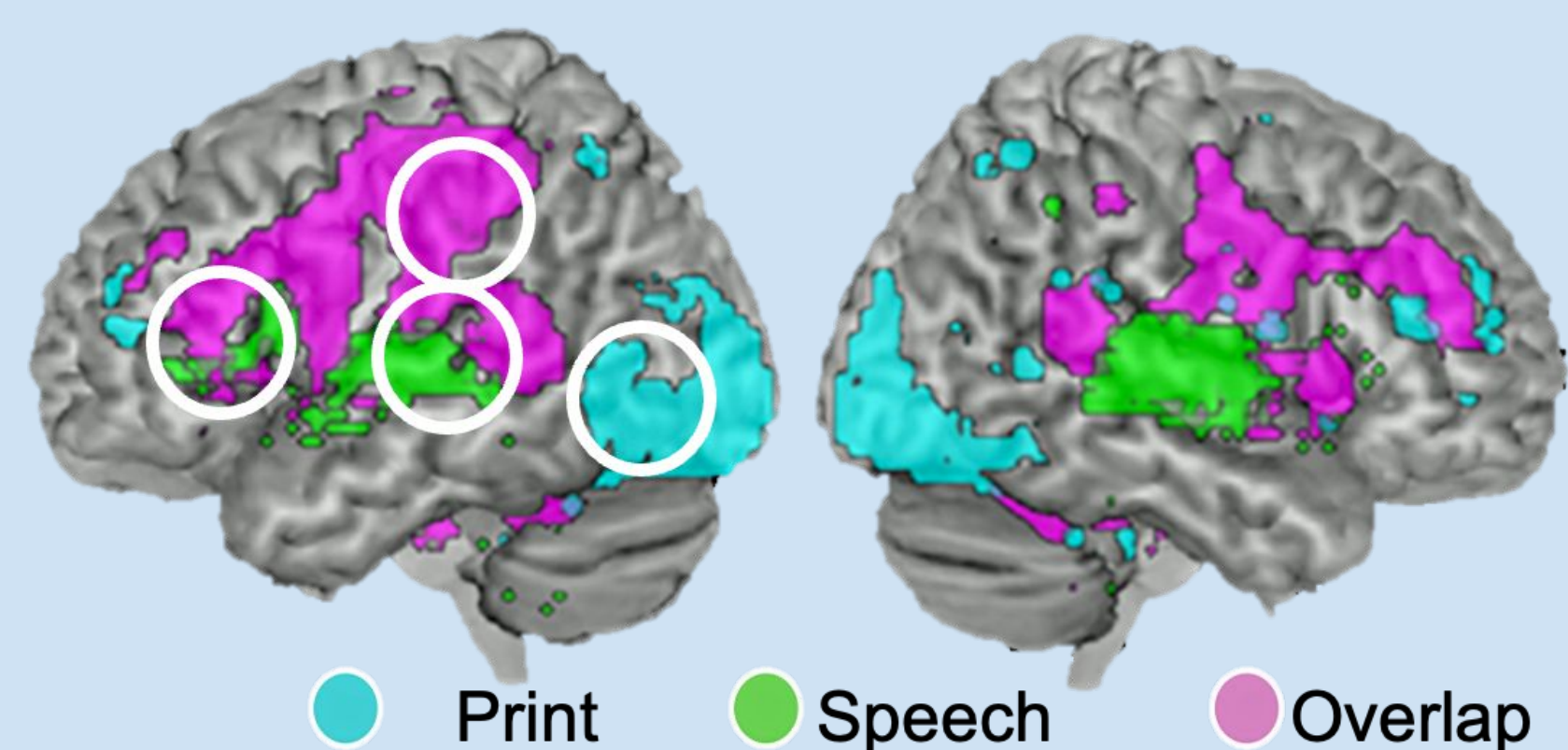
Hypothesis: Younger age of reading exposure is associated with the development of canonical neural reading network and reading skills

Background

- 75,000 Syrian refugees have settled in Canada (50% children).
- For refugee children, displacement and migration often correspond with period of interrupted schooling.
- Little is known about the specific effects of interrupted schooling across the neurodevelopmental trajectory for reading.

Research Questions

- How does interrupted education at different ages:
- 1) Impact reading?
 - 2) Impact the neural systems that support reading?

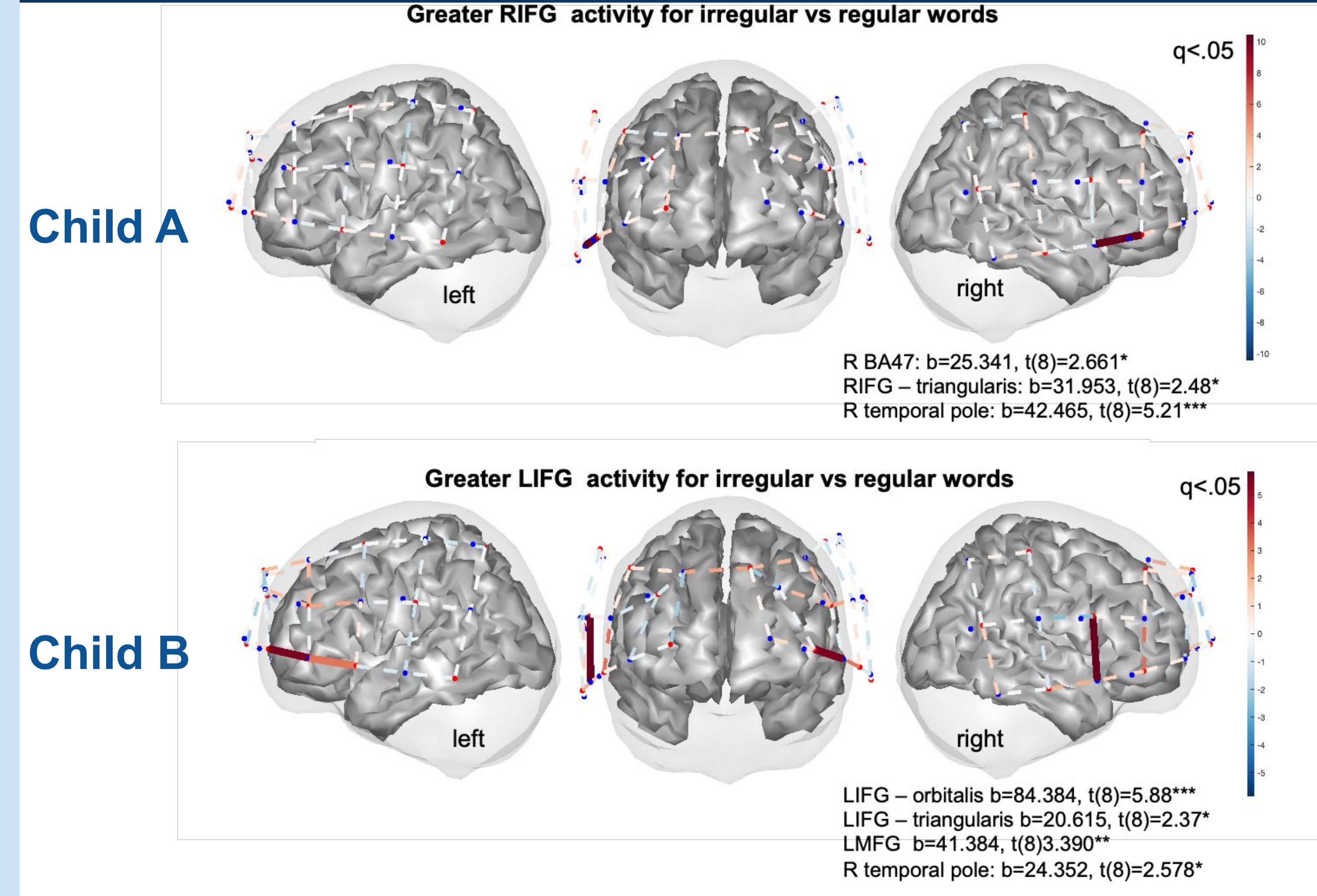


Continuous formal literacy instruction at school

Interrupted literacy instruction resumes in a new language

● Print ● Speech ● Overlap

Preliminary Neural Findings: 2 Case Studies



Measure	Child A	Child B
Age	13y	11y
Grade	7	5
Age of Resettlement	8y	6y
Behavioral Measures	Raw; SS	Raw; SS
WIAT	12; 88	10; 85
CTOPP Elision	29; 95	30; 105
Letter-Word ID	63; 97	65; 110
Word Attack	21; 88	25; 105
Reading Comprehension	37; 93	30; 81

Next Steps

- ⊕ Analyses (contrasts, conjunction, connectivity)
- 🔍 Decoding skills better for children who resettled younger?
- 🔍 Younger resettlement linked with characteristic reading circuit activity?

Participants

- Syrian refugee children between ages 10-16
- Resettled in Canada between 2014-2017
- Resumed schooling between ages 6-11

Methods

Imaging Tasks

Modality:

Lexicality:

Condition	Example
Regular	start / قرا
Irregular	bouquet / NA
Pseudoword	nobkey / جَرَقْ
False Font / Vocoded Speech	نہکت / یکتینہ

Behavioural Measures

- English & Arabic Language and Literacy
- Phonological Awareness (CTOPP)
- Vocabulary (WIAT)
- Decoding (WJ-IV)
- Reading Comprehension (WJ-IV)
- Nonverbal IQ (K-BIT)
- Background questionnaire with migration and education histories (ALEQ)

Discussion

The case studies suggest interrupted reading leads to a different or delayed neurodevelopmental trajectory and poorer performance.

These results, though preliminary, are in line with the idea of a sensitive period for reading development

References

Al Janaideh, R., Gottardo, A., Tibi, S., Paradis, J., & Chen, X. (2020). The role of word reading and oral language skills in reading comprehension in Syrian refugee children. *Applied Psycholinguistics*, 41(6), 1283-1304. doi:10.1017/S0142716420000284

Chyl, K., Kossowski, B., Dębska, A., Luniewska, M., Banaszekiewicz, A., Zetechowska, A., Frost, S. J., Menci, W. E., Wypych, M., Marchewka, A., Pugh, K. R., & Jednoróg, K. (2018). Prereader to beginning reader: changes induced by reading acquisition in print and speech brain networks. *Journal of child psychology and psychiatry, and allied disciplines*, 59(1), 76-87. <https://doi.org/10.1111/jcpp.12774>

Dehaene, S., & Cohen, L. (2007). Cultural recycling of cortical maps. *Neuron*, 56(2), 384-398. <https://doi.org/10.1016/j.neuron.2007.10.004>

Dehaene, S., Cohen, L., Morais, J., & Kolinsky, R. (2015). Illiterate to literate: behavioural and cerebral changes induced by reading acquisition. *Nature reviews Neuroscience*, 16(4), 234-244. <https://doi.org/10.1038/nrn3924>

Jasińska, K. K., & Petitto, L. A. (2014). Development of neural systems for reading in the monolingual and bilingual brain: New insights from functional near infrared spectroscopy neuroimaging. *Developmental Neuropsychology*, 39(6), 421-439. <https://doi.org/10.1080/87565641.2014.939180>

Jasinska, K., Shuai, L., Lau, A., Frost, S., Landi, N., & Pugh, K. (2020). Functional connectivity in the developing language network in 4-year-old children predicts future reading ability. *Developmental science*, 24. e13041. doi:10.1111/desc.13041

McCandliss, B. D., Cohen, L., & Dehaene, S. (2003). The visual word form area: expertise for reading in the fusiform gyrus. *Trends in cognitive sciences*, 7(7), 293-299. [https://doi.org/10.1016/s1364-6613\(03\)00134-7](https://doi.org/10.1016/s1364-6613(03)00134-7)