



Investigating the Relationships between Home Literacy Environment, Early Language Skills and White Matter Organization from Infancy to Toddlerhood

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Introduction

- The first two years of life are characterized by rapid development of language abilities, coinciding with the most rapid period of white matter development^{1,2}
- The home literacy environment (HLE) in infancy is linked with emerging language abilities in toddlerhood and preschool⁴
- The neural pathways that correspond to this relationship between HLE and language has yet to be examined
- The arcuate fasciculus (AF) connects frontal and temporoparietal brain regions, which are both important for language processing⁵

Present Study

To what extent does the white matter organization of the arcuate fasciculus relate to HLE and emerging language abilities from infancy to toddlerhood?

Methods

Infant → Toddler

n = 27 (to date)
4 – 12 mo.

- Language
 - Mullen Scales of Early Learning
 - Receptive language
 - Expressive language
- MRI
 - MPRAGE
 - DTI
- HLE
 - StimQ-Infant
 - Reading-Verbal Scale

n = 27 follow-ups*
14 – 24 mo.

- Language
 - Mullen Scales of Early Learning
 - Receptive language
 - Expressive language
- MRI (n = 10)
 - MPRAGE
 - DTI

Processing of MRI/DTI Data:

- DTIPrep: artifactual volume removal
- Vistasoft: head motion and eddy current correction
- Automated Fiber Quantification (AFQ): tractography
- Fractional Anisotropy (FA) estimated for left AF and right AF
- Acquired on a 3T Siemens Trio scanner

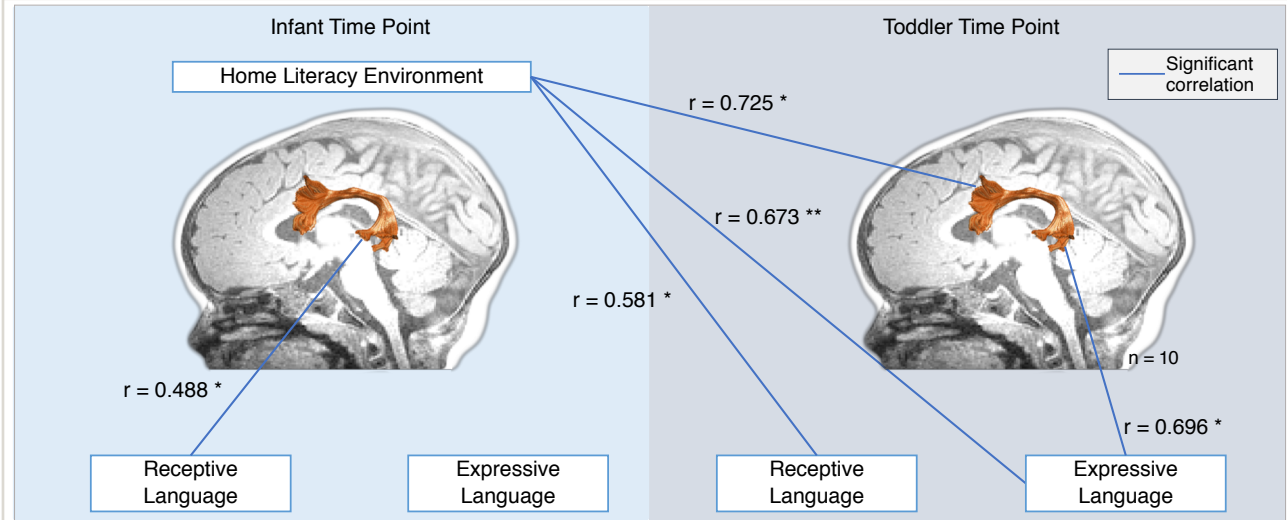
Statistical Analyses:

- Bivariate correlations between StimQ scores, Mullen scores and FA values of AF
- Controlled for age



* Not all measures have 27 data points

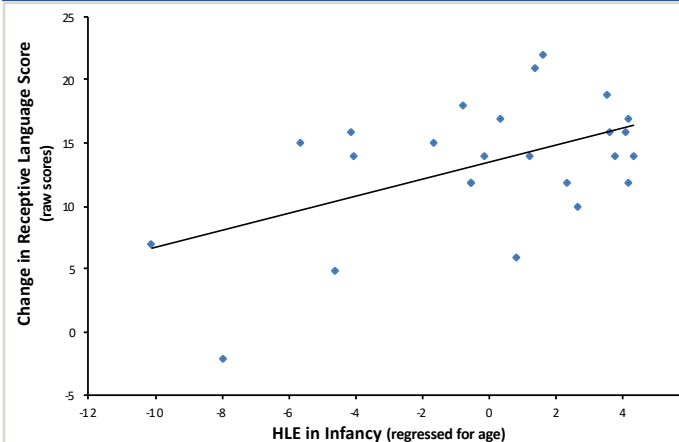
Results: HLE in Infancy Relates to Left AF FA and Language Abilities in Toddlerhood



** p < 0.01; * p < 0.05

No significant correlation between HLE and R AF or Mullen at either time point

Results: HLE Relates to Language Increase



Conclusions

- HLE in infancy relates to structural organization of left hemispheric AF and language abilities in toddlerhood
- HLE in infancy also relates to longitudinal change in receptive language abilities between infancy and toddlerhood
- Suggests that HLE in infancy plays an important role in shaping language acquisition in early childhood
- Future directions:
 - Continue longitudinal follow-up for more participants to age up as preschoolers and toddlers
 - Consider other environmental contributing factors to HLE

References

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