Presentation at 19th Annual Meeting of the Society for the Scientific Study of Reading, (Montreal, July 2012).

Brain differences in kindergarten children with and without behavioral risk for dyslexia: Toward finding fMRI and EEG predictors of reading difficulties

Elizabeth S. Norton[1,2], Sara D. Beach[2], Abigail B. Cyr[2], Olga Ozranov-Palchik[3], Tyler K. Perrachione[2], Maryanne Wolf[1], John D.E. Gabrieli[2], & Nadine Gaab[3]

[1]Tufts University, [2]MIT, [3]Children's Hospital Boston

Purpose: Despite the importance of early identification for remediating reading difficulties, behavioral assessments alone have yet to successfully predict which children will develop dyslexia. However, recent studies have utilized neuroimaging measures to predict later reading ability in struggling school-age readers and in children at familial risk for dyslexia. Two brain measurements have been shown to predict later reading: 1) fMRI activation for phonological awareness (PA) and 2) EEG/ERP mismatch negativity (MMN). We examined whether these brain measures differed in kindergartners who demonstrated risk for dyslexia based on commonly used behavioral measures.

Method: Kindergartners were identified as typical or at-risk based on measures of PA, rapid automatized naming (RAN), and letter knowledge. During 3T fMRI, children performed phonological first-sound matching and control voice matching auditory tasks. During EEG, children passively listened to natural speech syllables (90% standards/10% deviants) in an auditory oddball MMN paradigm.

Results: *fMRI*: Typical children exhibited significantly greater activation in left temporo-parietal areas than those at risk for dyslexia ($p<0.001$, cluster-level corrected). *ERP*: At-risk children had significantly attenuated MMN difference wave amplitude at frontal electrode sites compared to typical children.

Conclusions: We observed differences between groups of kindergarteners based on behavioral risk of dyslexia in reading-related brain areas and ERP components. These findings provide a step toward using neuroimaging in order to more accurately predict dyslexia in kindergarten.

Contact:
Elizabeth S. Norton, Ph.D
esn@mit.edu

Citation:
Norton, E.S., Beach, S.D., Cyr, A.B., Ozernov-Palchik, O., Garel, K.A., Perrachione, T.K., Wolf, M., Gabrieli, J.D.E., & Gaab, N. (2012) "Brain differences in kindergarten children with and without behavioral risk for dyslexia: Toward finding fMRI and EEG predictors of reading difficulties." *19th Annual Meeting of the Society for the Scientific Study of Reading*, (Montreal, July 2012).