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An fMRI-based structural equation model for natural language processing shows age-dependent changes in brain connectivity

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Structural Equation Modeling (SEM) or path analysis is a multivariate analytic tool that is used to test hypothesis about causal influences among measured or latent variables. When applied to functional neuroimaging (fMRI) data, SEM combines interregional covariance and neuroanatomy to investigate brain connectivity and the dynamic flow of information across neural networks. We have investigate Linear SEM or LSEM as a first step in estimating connection strengths from fMRI data in children during acoustic stimulation with stories in English.
An average LSEM was constructed based on the concatenated fMRI data from N=313 children, age 5 to 18, listening to stories. Time courses from the fMRI data is used as input to the LSEM as computed in AMOS (v.5.1, SmallWaters, Corp. Chicago, IL) to yield an average model for the entire group. The LSEM path coefficients were examined between brain regions involved in auditory speech perception and language processing. Connectivities estimated by LSEM are significantly age dependent in some brain areas, while the connectivity coefficient between other brain regions is not a function of age.