NETWORK INTERACTIONS BETWEEN AUDITORY AND VISUAL SPATIAL ATTENTION AND WORKING MEMORY

Outcome: Researchers at Boston University in CELEST, an NSF Science of Learning Center, have identified human brain networks that support short-term memory for space and for time. These networks are interleaved within the frontal lobes and are linked to attention networks tied to a sensory modality – vision for space and auditory for time. However, these networks can be flexibly recruited by the non-preferred sensory modality. A purely visual task with high temporal demands recruits the auditory/time network, while a purely auditory task with high spatial demands recruits the visual/space network.

Impact/benefits: The organization of the frontal lobe is fundamental to understanding how we pay attention, hold information in short-term memory, learn new information, and generate complex ideas. The mapping of these two networks and demonstration of their flexible functionality can help us understand cognition in both healthy populations and groups with attention or short-term memory deficits.

Explanation: Our senses differ in their resolution of time and space. Our hearing system provides a high-fidelity information about time but coarse information about space. The visual system offers excellent spatial resolution but is limited in dealing with complex timing information. Our results support the hypothesis that the network biased for auditory attention is adept at processing complicated timing information; while the network biased for visual attention is organized to hold spatial information. Our brains are able to flexibly recruit different networks in order to compensate for the weakness of one sensory modality.