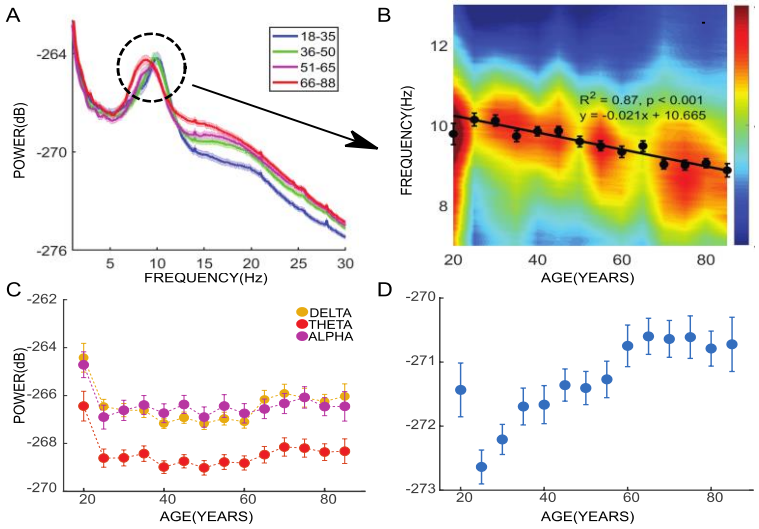
Age related global patterns of coherent communication using neural oscillations

Study carried out by scientists at National Brain Research Centre (NBRC), Manesar, Haryana, for the first time demonstrated age related changes in coherence and metastability which is responsible for dynamic coordination in different areas of brain. Team also observed marked frequency dependence in changes in global coordination dynamics, which coupled with the long-held view of specific frequency bands sub serving different aspects of cognition, hints at different functional processing roles for slower and faster brain dynamics. Current study also replicated the previous observations made in this direction.



Previously it was reported that a reduction in peak α-frequency (8-12 Hz) and increased β-band (15-25 Hz) power in older adults are reflective of changes at individual sensors (during rest and task), global coherence and metastability truly pinpoint the underlying coordination dynamic across multiple brain areas across the entire lifespan.

Cognitive processes are mediated by communication among different brain areas using frequency specific interactions. These frequency specific interactions are essential for attention, perception, learning and memory as highlighted by many previous findings. Individually, brain areas exhibit oscillatory neuro-electromagnetic signals emerging from a cascade of complex physiological processes. Efficient cognition needs sound interaction between these different oscillatory modules of the brain. Recent models of large-scale spontaneous brain activity have underscored the importance of brain-wide coherence in bringing about facilitative patterns of activity.

Additionally, the allied but independent concept of global metastability casts the understanding of the transient nature of stability of brain connectivity patterns within a dynamic framework. Since healthy ageing is accompanied by changes in large-scale spontaneous electromagnetic oscillations, we asked if the variability and complexity of communication between brain areas with aging could be quantified with global coherence and metastability.

Finding such neural patterns and signatures using resting state experimental paradigm using Magnetic Electroencephalography (MEG) would naturally pave the way for tracking task and task context (motion versus action) relevant changes in metastability and coherence dynamics that could crucially determine cognitive flexibility and performance in elderly individuals.

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