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The rhythms of an ageing brain

Scientists at National Brain Research Center (NBRC), Manesar, analyzed MEG data collected from 650 individuals at the Cambridge Center for Ageing neuroscience (CAM-CAN), and found distinct differences in the properties of neural oscillations between younger and older individuals. They sought to characterize age-related changes in various properties of neural oscillations. Specifically, the authors borrowed ideas from the Physics of non-equilibrium systems to elucidate how brain areas coordinate with each other via syncing their inherent oscillations and how this neural coordination changes as people age.

Interestingly, scientists found that communication strategies in oscillations at slower frequencies evolve differently as compared to faster oscillations. On the other hand a measure of intermittency - "metastability" used in physics in context of laser theory can provide a paradigmatic framework to quantify the brain state changes that can be linked to higher order cognitive function. All in all, the study illustrates how the confluence of basic science and big-data can revolutionize research and ultimately solve the age-old puzzle of ageing.

According to a UN estimate, the fastest growing age group in the world comprises those who are 65 years and older. Older individuals are more vulnerable to diseases as compared to younger people- a fact that is reflected by the disproportionately high number of older casualties in the on-going COVID-19 pandemic. The brain is no exception, as it is also well known that ageing is accompanied by cognitive decline and that older individuals are more prone to devastating neurodegenerative disorders like Alzheimer's and Parkinson's disease, counterintuitive to the phrase "Older and wiser". Therefore, a thorough understanding of the process of ageing is needed to devise treatment strategies that can preserve cognitive function in older individuals particularly in pathological scenarios.

Decades of research has revealed that many neuro-cognitive diseases that affect older individuals involve a break-down of the inherent rhythmicity of the brain. These brain rhythms, or oscillations, support diverse mental functions like memory, language, decision-making, motor planning and execution. Just as a music conductor directs the orchestra by rhythmically moving his baton, brain oscillations direct the smooth progression of mental events in the performance of a task. Consequently, a break-down of neural oscillations results

in impaired cognition. Many scientists believe this to be the underlying cause of age-related decline in motor skills, language comprehension and other cognitive functions.

Contact details:
Anagh Pathak (anagh.b16@nbrc.ac.in)
Drs Arpan Banerjee(arpan@nbrc.ac.in)
Dipanjan Roy (dipanjan.nbrc@gov.in)