Motor performance decline observed during aging is linked to changes in brain structure and brain function, however, the precise neural reorganization associated with these changes remains largely unknown.

Larivière et al., investigated the neurophysiological correlates of this reorganization by quantifying functional and effective brain network connectivity in elderly individuals (n = 11; mean age = 67.5 years), compared to young adults (n = 12; mean age = 23.7 years), while they performed visually-guided unimanual and bimanual handgrips inside the magnetoencephalography (MEG) scanner. Through a combination of principal component analysis and Granger causality, they observed age-related increases in functional and effective connectivity in whole-brain, task-related motor networks. Specifically, elderly individuals demonstrated (i) greater information flow from contralateral parietal and ipsilateral secondary motor regions to the left primary motor cortex during the unimanual task and (ii) decreased interhemispheric temporo-frontal communication during the bimanual task. Maintenance of motor performance and task accuracy in elderly was achieved by hyperactivation of the task-specific motor networks, reflecting a possible mechanism by which the aging brain recruits additional resources to counteract known myelo- and cytoarchitectural changes. Furthermore, resting-state sessions acquired before and after each motor task revealed that both older and younger adults maintain the capacity to adapt to task demands via network-wide increases in functional connectivity. Collectively, our study consolidates functional connectivity and directionality of information flow in systems-level cortical networks during aging and furthers our understanding of neuronal flexibility in motor processes [1].

1)
Larivière S, Xifra-Porxas A, Kassinopoulos M, Niso G, Baillet S, Mitsis GD, Boudrias MH. Functional and effective reorganization of the aging brain during unimanual and bimanual hand movements. Hum Brain Mapp. 2019 Mar 13. doi: 10.1002/hbm.24578. [Epub ahead of print] PubMed PMID: 30866155.