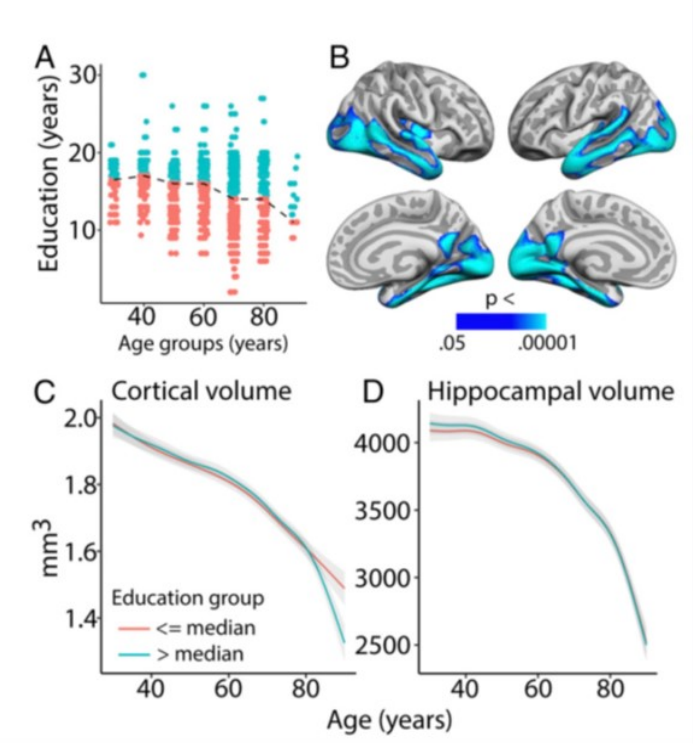
Cam-CAN Newsletter 2021

Level of Education Does Not Affect Rate of Brain Change

Rik Henson

You may have heard stories that higher levels of education "protect" against dementia. While it is true that associations have been found between education level and brain health in old age, these associations are usually found in "cross-sectional" analyses of different people at different ages. In such studies, it is difficult to separate the effects of true ageing from differences that relate to year of birth, e.g., education itself has tended to improve over the decades, as has general health. Moreover, the direction of causality is nearly always unclear, e.g., some people may have always had larger brain volumes, regardless of the age at which they are tested, and this may have helped them obtain higher education levels. Some of these problems are addressed by "longitudinal" studies, in which the same person is tested repeatedly as they grow older. In some of the CamCAN volunteers, we acquired two brain scans several years apart, so could also look at *changes* in brain structure. When combined with data from other European cohorts in the "LifeBrain" project, we found no evidence that education level affects the rate of change of grey matter volume in people's brains (see Figure). Thus while associations exist between individual differences in education and brain health, greater education does not appear to slow, i.e., "protect against", normal brain ageing.



Reference: Nyberg et al. (2021). Educational attainment does not influence brain aging. PNAS, Vol. 118, No. 18.

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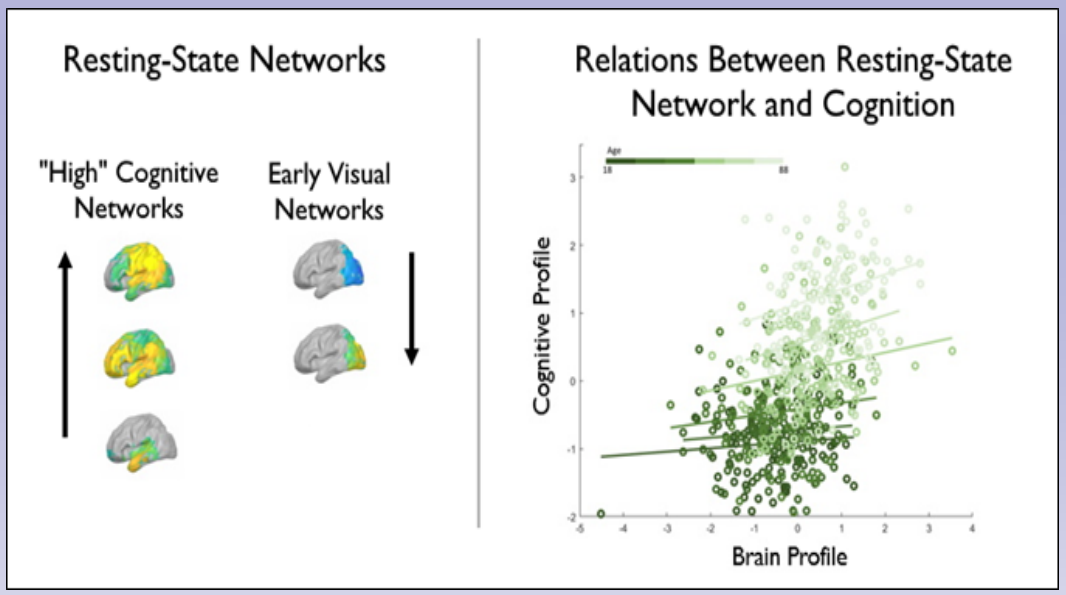
Transient Neural Network Dynamics in Cognitive Ageing

Roni Tibon

What does our brain do while we're not doing anything? Apparently – a lot, and quickly!

It is known for some time now that many stereotypical patterns of activity across brain regions occur when we sit back and do not engage in any particular task. Groups of brain regions that are co-activated in these situations are termed "resting state networks", and until recently, activation in these networks was believed to last for a relatively long time.

More recently, however, it was shown that the activity of resting state networks is shorter lived than previously thought: they appear to be stable for less than 1 sec (typically around 200 milliseconds), and there is constant switching between the various resting-state networks of the brain. In other words, while we're resting, our brain continues to work hard - rapidly switching between or "visiting" different networks.



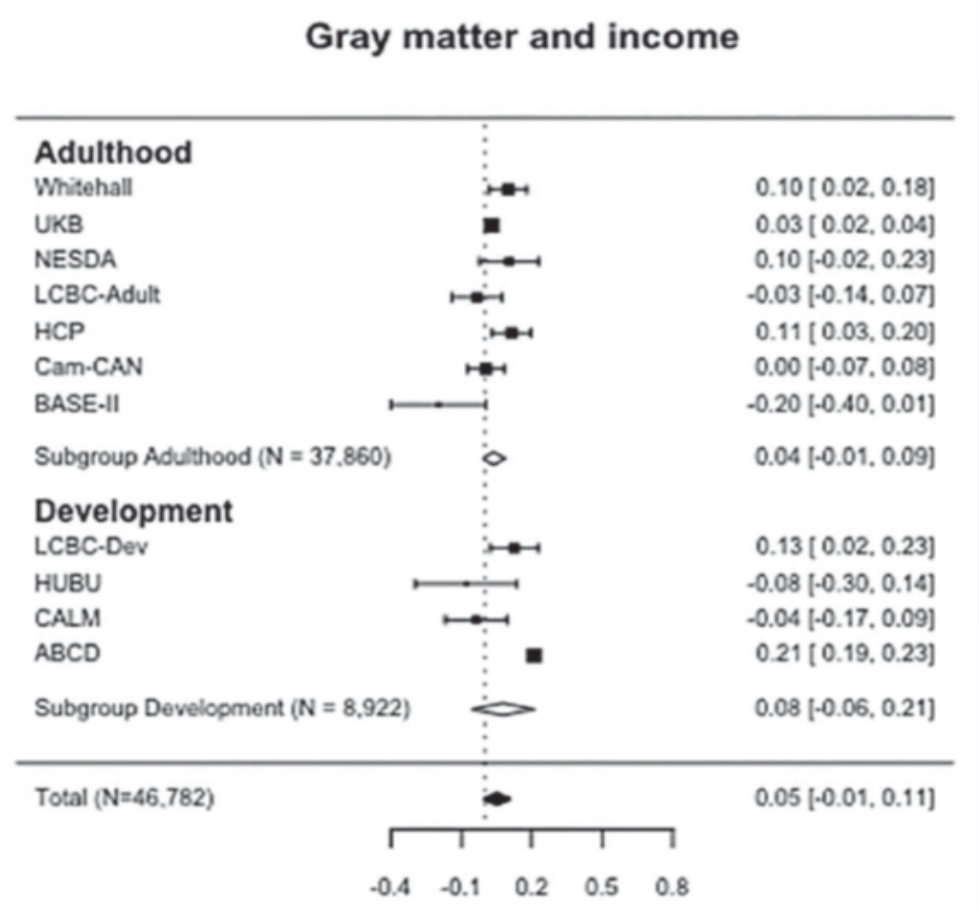
In our recent study, we asked how this rapid switching relates to age and to cognitive functioning. We found that the brains of older adults pay more, and prolonged, visits to brain networks that are involved in "higher" cognitive processes, such as reasoning, memory, and decision-making, but fewer visits to brain networks that are involved in sensory processing. Interestingly, these network dynamics also related to performance on cognitive tasks, particularly in older individuals, where this relationship was stronger. This suggests that the dynamics of our resting state brain networks might play an important role in the ability to maintain cognitive performance into old age.

Reference: Tibon, R., Tsvetanov, K. A., Price, D., Nesbitt, D., Cam, C. A. N., & Henson, R. (2021). Transient neural network dynamics in cognitive ageing. Neurobiology of Aging, 105, 217-228

Effects of Socio-Economic Status on Brain Health Depends on Country

Rik Henson

Higher socio-economic status (SES) has been proposed to have positive effects on brain and cognition. However, the ways in which SES affects brain health are likely to be complex, and may vary depending on whether experienced during childhood (during brain development) and/or later in adulthood. Moreover, the effects of SES may depend on the society that people inhabit (e.g, European vs North American). We combined results from CamCAN with those from other European cohorts, and compared them with cohorts from the USA. Though matching estimates of SES across countries is tricky, we approximated with household income (relative to country norms). We found only a very weak relationship between income and measures of brain health, such as the volume of "gray matter" (see Figure). The size of this effect did not appear to differ between adulthood and childhood (for which income was defined from parents). However, the relationship did seem to be stronger in the USA (the "HCP" and "ABCD" cohorts in the Figure) than in Europe (the remaining cohorts). This may relate to the extent to which society supports individuals with low SES, with greater support attenuating the adverse effects of deprivation.



Reference: Walhovd et al. (in press). Education and Income Show Heterogeneous Relationships to Lifespan Brain and Cognitive Differences Across European and US Cohorts. Cerebral Cortex.

Exciting news!

We are hoping to contact some of you next year to see if you would like to participate in some further testing. This will provide us with an invaluable opportunity to gain more longitudinal data, which will give us further insights and greater understanding of the ageing process. In the meantime, we wish you a wonderful festive period!

Please do keep in touch

If your contact details have changed, or you do not want to participate in further studies, please let us know via:

E-mail: camcan-admin@mrc-cbu.cam.ac.uk

Tel: 01223 769442

Post: Cam-CAN, Medical Research Council Cognition and Brain Sciences Unit, University of Cambridge, 15 Chaucer Road, Cambridge, CB2 7EF

Season's Greetings