

Education, dementia and the brain: compensation not neuroprotection



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Key finding.

In a large European population-based cohort, education (in early life) did not protect individuals from developing pathologies in the brain but it did attenuate the detrimental cognitive effects of these neuropathologies.

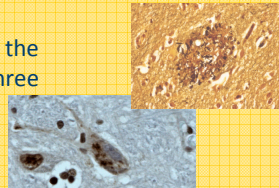
Background.

Those who have experienced more education in early life are at a lower risk of dementia. This could be because

- those with higher education develop less pathologies in the brain (neuroprotection), perhaps due to a healthier life style. Or,
- those with higher education compensate for the burden of pathology before expressing clinical dementia (brain reserve hypothesis).

Methods.

The Epidemiological Clinicopathological Studies in Europe (Eclipse) is the harmonisation of neuropathological and clinical data from the only three longitudinal population-based European studies of ageing and dementia with a brain donation program.



MRC Cognitive Function and Ageing Study (England and Wales), n=414

Cambridge City over 75s Cohort (England), n=213

Vantaa 85+ study (Finland), n=245

Eclipse sample

n=872

68-107 years, 56% demented, 68% female

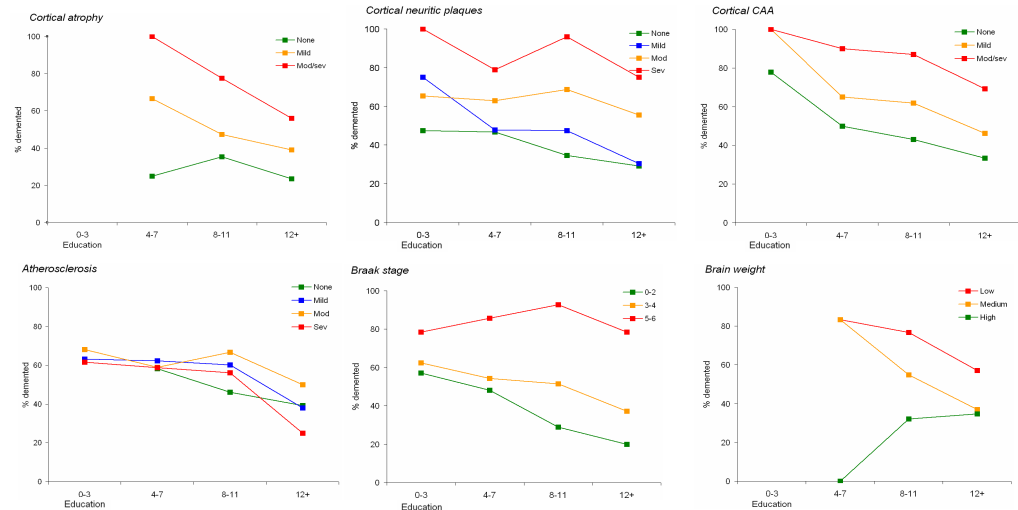
Formal years of education recorded at baseline and clinical dementia status at death determined for each individual.

17 neurodegenerative and vascular pathologies assessed: neocortical and hippocampal neuritic plaques, diffuse plaques, tangles, cerebral amyloid angiopathy (CAA) and atrophy, together with atherosclerosis, lacunes, infarcts, white matter pallor, brain weight and Braak stage.

Results.

Higher education (in years) was associated with

- lower risk of clinical dementia at death: OR=0.9 (95%CI 0.8-0.9).
- greater brain weight (classified in sex-specific tertiles): OR=1.1 (95%CI 1.1-1.2).
- decreased risk of dementia expressed during life given pathological burden (examples shown in figure). For brain weight and Braak stage this was only for certain pathological severities, i.e., there was an interaction between severity of pathology and education.



Percentage of demented individuals (y-axis) relative to years of education (x-axis) and pathological severity for 6 of the 17 pathological markers investigated. Each graph illustrates how education attenuates the association between pathology and dementia. For Braak stage and brain weight, this protective education effect varied with pathological severity.

Conclusion.

It appears that the lower risk of dementia for those with high education is due to cognitive compensation rather than neuroprotection. This finding may help explain why individuals differ in their ability to withstand a burden of neurodegenerative or vascular brain disease before expressing the dementia syndrome.

