# Biomedical Correlates of Ageing

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There is not a single one of us who does not experience memory lapses. However, the frequency tends to increase as we age. As the percentage of the ageing population increases across the globe - and in all probability would keep on increasing - it is very important for all of us to acquaint ourselves with the scientifically established principles that can provide us an insight into the ageing process and how the biomedical correlates of ageing can explain memory lapses.

Comparison of current memory of a young 18 year old with an elderly person of 70 years age requires a cross sectional design. A longitudinal design is needed when we need to follow a single individual over a long period (Figure 1 ).

A longitudinal design enables us to study the changes within the same individual to see the changes that appear with ageing. Methodologically however, we may have to contend with a problem that high functioning people are more likely to remain in the longitudinal studies. This can convey a false impression of artificially positive impressions of ageing. There are of course logistical problems of following the same individual over decades.

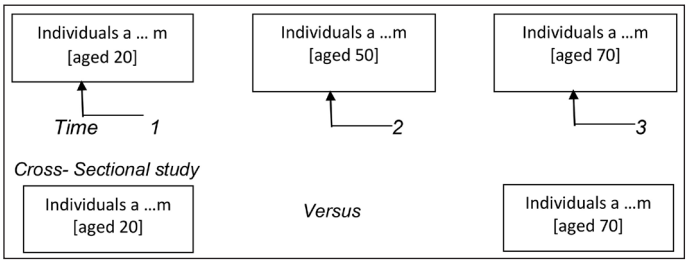


**Figure 1 : In a longitudinal study, we would follow the same people across their lifespan from the age of 20 to 70; whereas comparing the memory of current 20-year-olds with the memory of current 70-year-olds represents an example of a cross-sectional experimental design. There are pros and cons with each approach.**

**Dr. Ashoka Jahnavi Prasad** is identified as the most educationally qualified person in the world by The Polymath. He has a dynamic resume with a PhD in history of medicine from Cambridge, LLM from Harvard among other notable qualifications. Dr. Prasad has also worked as a consultant to the World Health Organization (WHO) and helped prepare two of their reports.

When we peruse both the cross-sectional as well as the longitudinal studies, we are presented with very consistent findings. We find that there are strong parallels in the memory profiles of children and older adults.[1] Short term memory seems to be quite well preserved in older individuals although they experience difficulty in tasks that require more of a working memory element.[2] For instance, age related difficulties are very apparent when individuals are asked to repeat numericals in a reverse order than when asked to repeat in the normal order.[3]

Tasks where long term memory recall is required tend to decline very significantly specially when free recall is tested, although recognition may hold up with age.[4] When recognition requires contextual recollection, deficits are much more pronounced with age. This would automatically imply that older people are more susceptible to suggestion and bias in their memory. In practical terms, this would definitely have serious consequences in situations such as when the elderly are expected to make decisions on their financial management. [4]

Memory without awareness, which is generally tested by observation of a person's overall behaviour rather than any recall, is generally referred to as Implicit Memory and this seems to decline little with age.[5]

There is also very little effect of ageing on Semantic Memory. Rather, this seems to improve throughout life. We have all observed that a person's vocabulary and general knowledge seem to increase as they grow older. In fact it has been suggested that accumulation of information through semantic memory is the reason why older individuals are over-represented in certain professions e.g. senior attorney-at laws.[6]

There is a lot of evidence to suggest that age-related memory loss is a consequence of relative degeneration in the frontal lobes of the brain which mediates

the organizational and strategic aspects of memory. It is noteworthy that this part of brain appears to have developed more in human beings when compared to the genetically related species. In children, the emergence of what is known as meta-memories (awareness of one's memory abilities) also seems to be linked to frontal lobe maturation. There is also evidence that age-related deterioration in meta-memory is related to frontal lobe dysfunction.[7] Post mortem brain cross sections have shown marked differences between the brains of patients with Alzheimer's when compared to the normal subjects.[7]

Remembering to do something in the future is generally known as Prospective Memory. This is definitely linked to the frontal lobe and there is evidence that ageing has an adverse effect on prospective memory.[8]

There has been recent evidence to suggest that age related memory loss could be linked to reduction in speed of cognitive processing as we grow older. There have also been suggestions that age-related memory changes can be caused by reduced attention span and reduced environmental support.[8]

As with the frontal lobe hypothesis, each of these accounts has limitations - but they have all provided interesting research avenues.

An area of considerable interest is whether memory changes in normal ageing can be construed as evidence of decline in brain capacity. The colloquial term 'mild cognitive impairment' is generally considered an intermediate state between dementia and normal ageing. Mild cognitive impairment could be memory-specific or may spread across several cognitive domains. Not all those exhibiting mild cognitive impairment proceed to the stage of dementia and the major biomedical research focus is to identify the factors that would make a person more prone to develop symptoms of frank dementia. Recent evidence would suggest that factors such as exercise and a healthy diet (especially diets low in saturated fats and high in antioxidants) are not only healthy for the body, but they may well also help the brain to function well into old age.

Mental activity such as regularly reading newspapers may well be useful in maintaining neurological and psychological capacity. The hippocampal region has been known to exhibit neural growth following adequate nutrition and regular psychological activity.[9]

When it comes to age-related disorders, memory dysfunction is an early prodrome of dementia. Deficits in episodic memory and hippocampal functioning characterize Alzheimer's, the most common form of dementia. Episodic memory impairment can occur on its own in the early stages of Alzheimer's. But later on language, perception and ability to look after oneself are affected.[9]

Another form of neurodegenerative illnesses is known as Semantic Dementia. In this condition, there is a major breakdown of semantic memory such that people with this illness lose the ability to recognize familiar objects such as cups and tables.[10]

As of now, the available treatments for dementia are of symptomatic nature dealing with the effects of the disease and not the fundamental cause. Moreover they are unable to prevent the progression of the disease. Many biomedical researchers are placing their hopes on stem cell treatment in the future. At present however, there is no viable alternative to cognitive rehabilitation techniques.

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