

Study reveals how menopause affects brain and cognition

Researchers Barbara Jacquelyn Sahakian and Christelle Langley outline the results of a menopause study based on a large database of subjects.

Waikato Times · 12 Feb 2026 · Barbara Jacquelyn Sahakian is Professor of Clinical Neuropsychology at University of Cambridge; Christelle Langley is a Postdoctoral Research Associate, Cognitive Neuroscience, at University of Cambridge.

Menopause is a key period in a woman's life. This transition is often accompanied by wide-ranging physical and psychological symptoms – some of which can be debilitating and affect daily life. Menopause has also been linked to cognitive problems – such as memory, attention and language deficits.



To mitigate the effects of menopause – including hot flashes, depressive symptoms and sleep problems – many women turn to hormone replacement therapy (HRT). In England, an estimated 15% of women are prescribed HRT for menopause symptoms. In Europe, this number is even higher – varying between 18% in Spain to 55% in France.

But there's limited understanding of the effects of menopause and subsequent HRT use on the brain, cognition and mental health. To address this, we analysed data from nearly 125,000 women from the UK Biobank (a large database containing genetic and health data from about 500,000 people).

We placed participants into three groups: pre-menopausal, post-menopausal and post-menopausal with HRT. The average age of menopause was around 49 years old. Women who used HRT typically began treatment around the same age.

In short, we found that menopause was associated with poorer sleep, increased mental health problems and even changes within the brain itself.

Post-menopausal women were more likely than pre-menopausal women to report symptoms of anxiety and depression. They were also more likely to seek help from a GP or psychiatrist and to be prescribed antidepressants.

Sleep disturbances were more common after menopause, as well. Postmenopausal women reported higher rates of insomnia, shorter sleep duration and increased fatigue.

Brain imaging analyses also revealed significant reductions in grey matter volume following menopause. Grey matter is an important component of the central nervous system which is composed mainly of brain cells. These reductions were most pronounced in regions critical for learning and memory (namely the hippocampus and entorhinal cortex) and areas key in emotional regulation and attention (termed the anterior cingulate cortex).

Notably, the hippocampus and entorhinal cortex are among the earliest affected in Alzheimer's disease, the most common form of dementia.

The changes we observed in our study could suggest that menopause-related brain changes may contribute to increased vulnerability to Alzheimer's disease later in life. This could help explain why there's a higher prevalence of dementia observed in women.

We also investigated whether taking HRT post-menopause had any effect on health outcomes. Notably, HRT did not improve the reduction in brain grey matter.

In addition, we found that women using HRT showed higher levels of anxiety and depression compared to post-menopausal women who had never used HRT. However, further analyses indicated that these differences were already present. This suggested that pre-existing mental health problems may have influenced the decision to begin using HRT, rather than these symptoms being caused by the medication itself.

Post-menopausal women who had never used HRT showed slower reaction times compared with both premenopausal women and post-menopausal women who had used HRT. This indicates that HRT helps to slow the menopause-related declines in psychomotor speed. HRT and menopause

There's still much we don't know about HRT – and more evidence on its benefits and risks is still needed.

Some studies report that those taking HRT have an increased dementia risk, while others suggest a decreased risk of dementia.

More research is also needed to understand the effects of HRT and how the different routes and dosages affect menopause symptoms. But according to one UK Biobank study of 538 women, the effects don't appear to differ – regardless of factors such as the formulation, route of administration and duration of use.

Importantly, however, it's difficult to establish whether women are actually receiving an effective dose. One in four women using the highest licensed dose of HRT still had low levels of estradiol (oestrogen) – around 200 picomoles per litre. Older women and HRT patch users were more likely to have lower levels.

Optimal plasma levels to relieve menopause symptoms are between 220550 picomoles per litre. This means that for 25% of the women in the study, HRT would not have had optimal benefit for menopause symptoms.

Considering that most women go through the menopause, it's important to resolve the question of whether HRT is beneficial – including preventing brain grey matter volume reductions and reducing the risk of dementia. It will also be important to know what the best dose and route of administration are.

There is evidence to suggest healthy lifestyle habits may mitigate these menopause-related changes in brain health.

Our work and that of other research groups shows that a number of lifestyle habits can improve brain health, cognition and wellbeing, thereby reducing the risk of cognitive decline associated with ageing and dementia. This includes regular exercise, engaging in cognitively challenging activities (such as learning a new language or playing chess), having a nutritious and balanced diet, getting the right amount of good-quality sleep and having strong social connections.

Research also shows regular physical activity can increase the size of the hippocampus, which may help mitigate some of the menopause-related reductions observed in this region.

Sleep is also critically important as it supports the consolidation of memories and helps clear toxic waste byproducts from the brain – processes that are essential for memory, brain health and immune function.

Having a healthy lifestyle may offer an accessible and effective strategy to promote brain health, cognitive reserve and resilience to stress during and after the menopause transition.