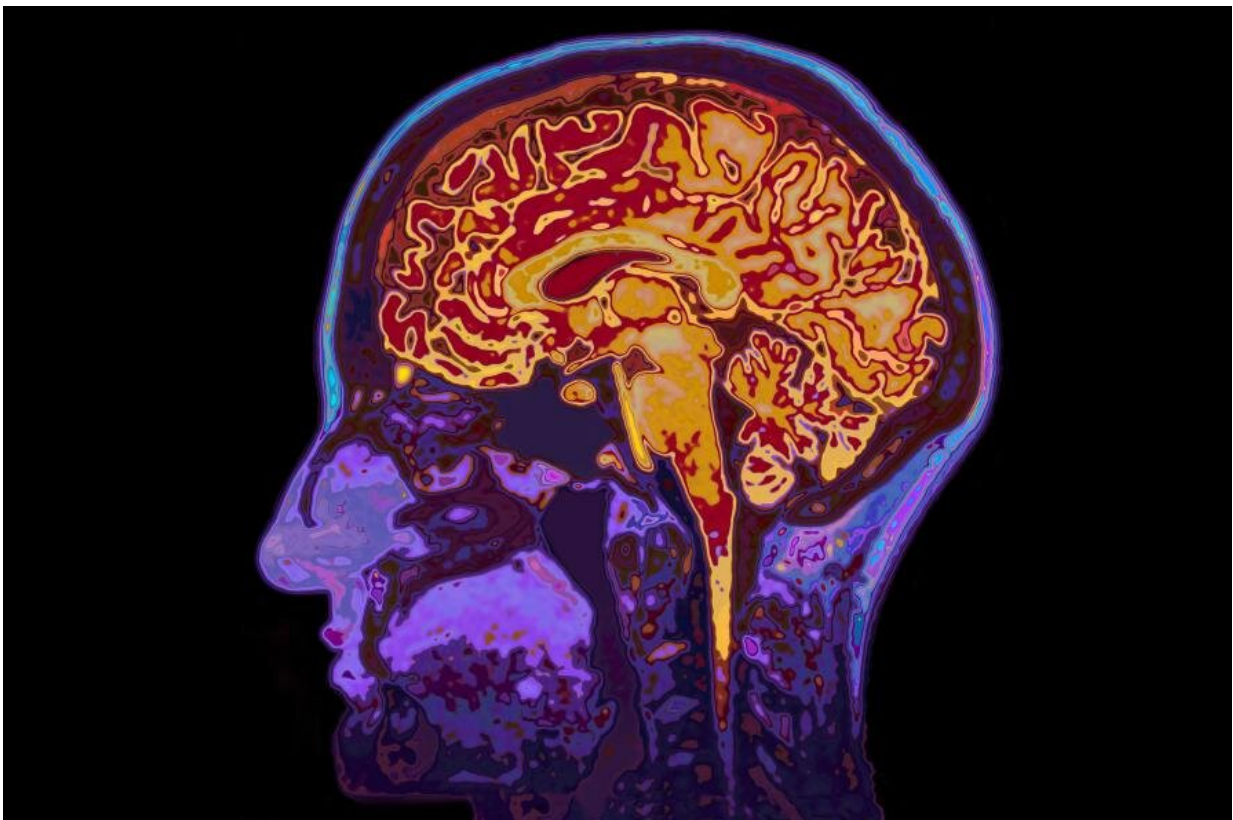


New research finds age of your brain and body can appear many years older (or younger) than your chronological age

April 27 2023, by Ye Ella Tian and Andrew Zalesky



Your brain may appear younger or older than your chronological age. Credit: Shutterstock

While age is commonly understood as the number of years you have

been alive, different organs and tissues may age at different rates. This means your biological age may not necessarily be the same as your chronological age.

Our new research, published in *Nature Medicine*, shows that the [biological age](#) of a person's brain and body can be easily measured.

In fact, the biological age of some organ systems can differ markedly from a person's chronological age and this deviation between chronological and biological age can inform us of the person's risk of [chronic illness](#) and premature mortality.

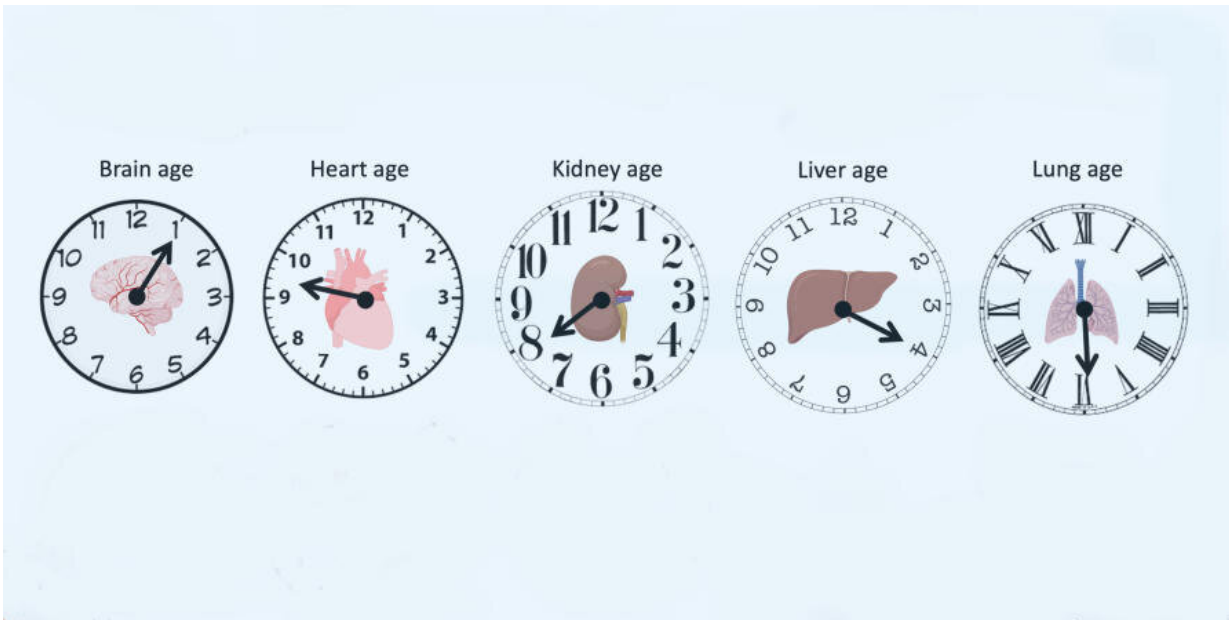
We call this our organ age clock.

What is an organ age clock?

This clock tells us whether the health and function of a person's brain, heart, lungs and other organ systems appear older or younger than their chronological age.

For example, a 40-year-old may have a brain that appears more like that of a 50-year-old. In this case, we say that the person's brain appears 10 years older than their chronological age.

In our study, we establish organ age clocks for the brain and seven body systems, including cardiovascular, lungs, musculoskeletal, immune, kidneys, liver and metabolic systems, in more than 100,000 adults who took part in the UK (United Kingdom) Biobank.



Age is understood to be the number of years that you've been alive, but organs and tissues may age at different rates. Credit: University of Melbourne

The Biobank is a large-scale biomedical database and research resource, containing in-depth genetic and health information from half a million UK participants.

We then used [magnetic resonance](#) imaging (MRI) brain scans and measures from a wide range of physical, physiological, blood and urine tests, which are already available in most clinical settings.

Do different organ systems age at their own pace?

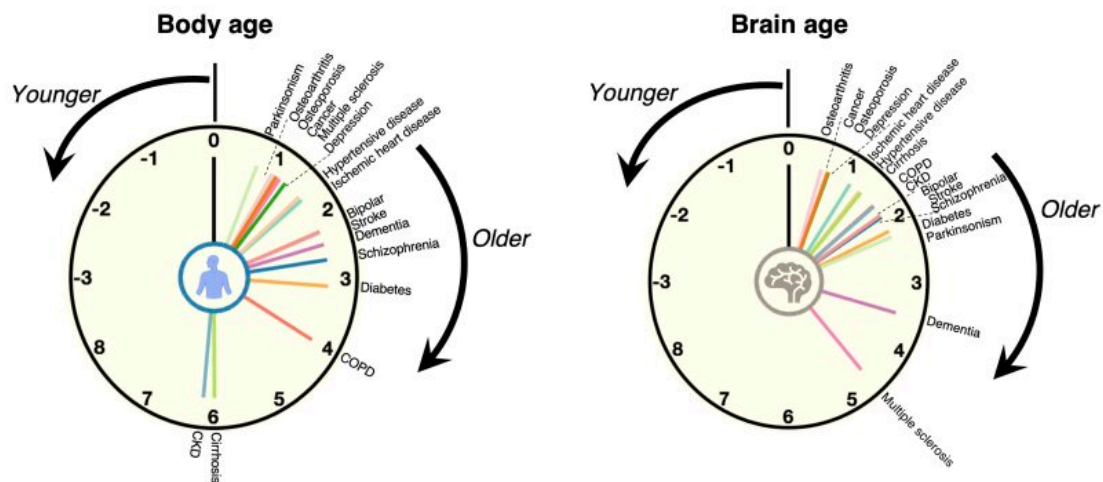
Our study reveals diverse organ aging patterns; however, the aging of different organ systems is closely linked.

Intriguingly, we found a multi-organ aging network, where the age of

one organ system selectively and characteristically influences the aging of other organ systems.

So, if a person's lungs appear older than their chronological age, it's more likely that their heart, kidneys, bones and muscles, as well as their brain, will also appear older.

We also show that brain age is most influenced by the age of the lungs and heart, whereas the musculoskeletal system is a network hub—influenced by the extent of aging of most other organ systems.



Body and brain age in 16 common chronic illnesses. Credit: University of Melbourne

Our organ age informs our risk of chronic illness

Where chronological age is a common risk factor for chronic illness, people at the same [chronological age](#) may present with varied risks of these chronic health conditions.

We studied 16 common chronic illness conditions including Parkinsonism, multiple sclerosis, stroke, dementia, depression, [bipolar disorder](#), schizophrenia, [coronary artery disease](#), hypertensive diseases, [chronic obstructive pulmonary disease](#) (COPD), chronic kidney disease (CKD), diabetes, cirrhosis, osteoarthritis, osteoporosis and cancer.

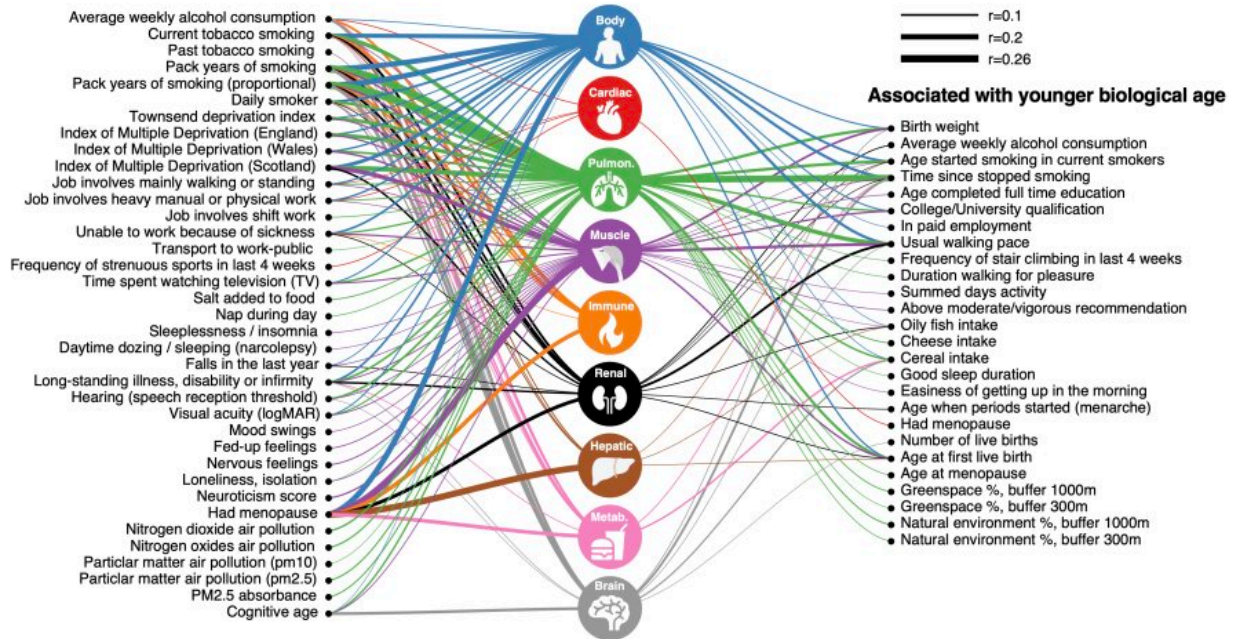
Our research found that advanced organ age significantly increases the risk of chronic illnesses and that chronic illnesses are characterized by unique organ aging profiles.

More interestingly, across the 16 common chronic brain and body disorders, we show that advanced biological aging extends from the organ of primary disease pathology to multiple [organ systems](#).

For example, where advanced brain age (that is, an older-looking brain) is evident for most major brain disorders, like multiple sclerosis, dementia and Parkinsonism, people with non-brain disorders, like diabetes, CKD and COPD, also show significantly advanced brain age.

In fact, advanced organ age—particularly of the lungs, kidneys, liver and immune system—significantly raises a person's mortality risk.

Associated with older biological age



Environmental and lifestyle factors associated with organ age. Credit: University of Melbourne

How to keep our brain and body young

Our study shows that smoking, alcohol intake, sedentary behavior, poor sleep, air pollution and socioeconomic inequality are linked with an older-appearing brain and body.

Fortunately, several of these factors are modifiable, potentially enabling you to reduce your brain and body age.

In contrast, people who have a larger birth weight, tertiary education, regular exercise and live in areas of greater greenspace and natural environment coverage tend to have a younger appearing brain and body.

The next step for our research is investigating whether modifying these factors can slow the rate of organ aging and reduce the risk of chronic illness and premature mortality.

Measuring organ age

We hope that in the future, the biological age of a person's [brain](#) and body will be routinely measured in the doctor's clinic to identify people at risk of chronic disease, as well as inform medical professionals to commence early treatments and interventions.

Notably, most of the biomarkers and measures used to estimate biological organ age are already widely used in clinical settings which means our organ age clocks could move quickly and easily into clinical practice.

For now, if you're worried about the health of your organs, head for a check-up with your GP and try to take good care of your body by practicing good lifestyles—for the sake of your organs.

More information: Ye Ella Tian et al, Heterogeneous aging across multiple organ systems and prediction of chronic disease and mortality, *Nature Medicine* (2023). [DOI: 10.1038/s41591-023-02296-6](https://doi.org/10.1038/s41591-023-02296-6)

Provided by University of Melbourne

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