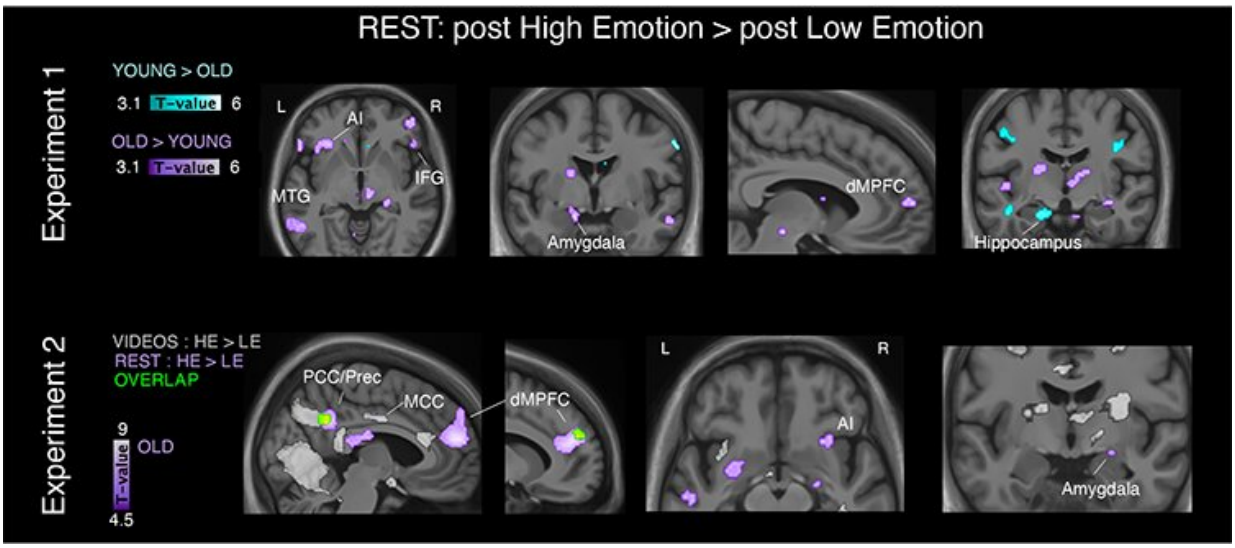
Managing emotions better could prevent pathological aging

January 13 2023



The top image depicts the varying brain activations between 27 older adults and 29 younger adults during rest periods following high emotion (post-HE) and low emotion (post-LE) videos in Experiment 1. The bottom image illustrates the brain regions that respond to rest periods following HE > LE, as well as the overlap of these activations with emotional responses during the HE > LE videos in Experiment 2, with data from 127 older adults. Credit: Baez-Lugo et al., 2023, *Nature Aging*

Negative emotions, anxiety and depression are thought to promote the onset of neurodegenerative diseases and dementia. But what is their impact on the brain and can their deleterious effects be limited?

Neuroscientists at the University of Geneva (UNIGE) observed the activation of the brains of young and older adults when confronted with the psychological suffering of others. The neuronal connections of the older adults show significant emotional inertia: negative emotions modify them excessively and over a long period of time, particularly in the posterior cingulate cortex and the amygdala, two brain regions strongly involved in the management of emotions and autobiographical memory.

These results, published in *Nature Aging*, indicate that a better management of these emotions—through meditation for example—could help limit neurodegeneration.

For the past 20 years, neuroscientists have been looking at how the brain reacts to emotions. "We are beginning to understand what happens at the moment of perception of an emotional stimulus," explains Dr. Olga Klimecki, a researcher at the UNIGE's Swiss Centre for Affective Sciences and at the Deutsches Zentrum für Neurodegenerative Erkrankungen, who is last author of this study carried out as part of a European research project co-directed by the UNIGE.

"However, what happens afterwards remains a mystery. How does the brain switch from one emotion to another? How does it return to its initial state? Does emotional variability change with age? What are the consequences for the brain of mismanagement of emotions?"

Previous studies in psychology have shown that an ability to change emotions quickly is beneficial for mental health. Conversely, people who are unable to regulate their emotions and remain in the same emotional state for a long time are at higher risks of depression.

"Our aim was to determine what cerebral trace remains after the viewing of emotional scenes, in order to evaluate the brain's reaction, and, above

all, its recovery mechanisms. We focused on the older adults, in order to identify possible differences between normal and pathological aging," says Patrik Vuilleumier, professor in the Department of Basic Neurosciences at the Faculty of Medicine and at the Swiss Centre for Affective Sciences at the UNIGE, who co-directed this work.

Not all brains are created equal

The scientists showed volunteers short television clips showing people in a state of emotional suffering—during a natural disaster or distress situation for example—as well as videos with neutral emotional content, in order to observe their brain activity using functional MRI. First, the team compared a group of 27 people over 65 years of age with a group of 29 people aged around 25 years. The same experiment was then repeated with 127 older adults.

"Older people generally show a different pattern of brain activity and connectivity from younger people," says Sebastian Baez Lugo, a researcher in Patrik Vuilleumier's laboratory and the first author of this work.

"This is particularly noticeable in the level of activation of the default mode network, a brain network that is highly activated in resting state. Its activity is frequently disrupted by depression or anxiety, suggesting that it is involved in the regulation of emotions. In the older adults, part of this network, the posterior cingulate cortex, which processes autobiographical memory, shows an increase in its connections with the amygdala, which processes important emotional stimuli. These connections are stronger in subjects with high anxiety scores, with rumination, or with negative thoughts."

Empathy and aging

However, older people tend to regulate their emotions better than younger people, and focus more easily on positive details, even during a negative event. But changes in connectivity between the posterior cingulate cortex and the amygdala could indicate a deviation from the normal aging phenomenon, accentuated in people who show more anxiety, rumination and negative emotions.

The posterior cingulate cortex is one of the regions most affected by dementia, suggesting that the presence of these symptoms could increase the risk of neurodegenerative disease.

"Is it poor emotional regulation and anxiety that increases the risk of dementia or the other way around? We still don't know," says Sebastian Baez Lugo.

"Our hypothesis is that more anxious people would have no or less capacity for emotional distancing. The mechanism of emotional inertia in the context of aging would then be explained by the fact that the brain of these people remains 'frozen' in a negative state by relating the suffering of others to their own emotional memories."

Could meditation be a solution?

Could it be possible to prevent dementia by acting on the mechanism of emotional inertia? The research team is currently conducting an 18-month interventional study to evaluate the effects of foreign language learning on the one hand, and meditation practice on the other.

"In order to further refine our results, we will also compare the effects of two types of meditation: mindfulness, which consists of anchoring oneself in the present in order to concentrate on one's own feelings, and what is known as 'compassionate' meditation, which aims to actively increase positive emotions towards others," the authors add.

This research is part of a large European study, MEDIT-AGING, which aims to evaluate the impact of non-pharmacological interventions for better aging.

More information: Sebastian Baez-Lugo et al, Exposure to negative socio-emotional events induces sustained alteration of resting-state brain networks in older adults, *Nature Aging* (2023). DOI: 10.1038/s43587-022-00341-6

Provided by University of Geneva