

Why some people get depressed and some don't—clues from the "winter blues"

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Credit: Larisa Koshkina/public domain

Depression is notoriously hard to study, but what if you could switch depression on and off and look at the biological differences between when people are depressed and when they are not? Now a study of seasonal depression, SAD (Seasonal Affective Disorder), suggests that some people, and especially women, can avoid depression by maintaining or even increasing levels of the neurotransmitter serotonin

throughout the year, even though they carry a gene which would normally cause winter blues. This work is published in the October issue of the peer-reviewed journal *European Neuropsychopharmacology*.

SAD is a condition caused by lack of daylight, leading to an increase in clinical [depression](#) in the [winter](#), especially in areas further from the equator. Studies have shown that around 90 percent of people living in Copenhagen are affected in some way, such as sleeping or eating disturbance, with around 5 percent showing [clinical depression](#) in the winter. Copenhagen is at roughly the same latitude as major population centres such as Glasgow and Edinburgh, Moscow, Novosibirsk, and Sitka, Alaska. With the coming of spring, these clinical symptoms generally disappear.

As lead researcher, Dr. Brenda McMahon (Rigshospitalet, Copenhagen) said "Daylight is effectively a natural antidepressant. Like many drugs currently used against depression, more daylight prevents [serotonin](#) being removed from the [brain](#)."

Scientists had previously found that SAD is more common in women, and in people carrying the 5-HTTLPR gene. This genetic variation determines the efficacy of the serotonin transporter which regulates how the [neurotransmitter serotonin](#) is removed from the brain: most anti-depressive medicines (such as Prozac) work by slowing the clearance of serotonin between the brain cells.

The team of scientists from Copenhagen studied 23 young volunteers who had the HTTLPR genetic predisposition to depression, but who were amongst the 10 percent of Danes who are unaffected by the change of season. The volunteers were given two brain scans (PET scans, Positron Emission Tomography) in summer, with two follow-up scan in winter, with the aim of measuring both the serotonin transporter and [serotonin levels](#) in the brain.

According to Brenda McMahon

"Daylight deprivation is a potent trigger of depressive symptoms. This is the first time anyone has used PET scans to look at resistance to winter depression. We found that the level of serotonin transporter protein dropped by an average of around 10 percent from summer to winter, with the drop being noticeably greater in women.

We found that some people who you would expect to have SAD because of their genetic disposition were nevertheless able to control how much serotonin transporter was produced, which means that they were able to regulate how much serotonin was removed from their brain: in this way they become more resilient to depression. SAD resilient women down-regulate their brain [serotonin transporter](#) more in the winter than men do, meaning that the levels of serotonin did not remain unaltered between seasons. In general SAD resilient people maintained the same level of serotonin across seasons.

Senior author, Professor Gitte Knudsen (Rigshospitalet, Copenhagen) said: "We need to note that this is a small study, and we measured serotonin levels indirectly. Nevertheless, our findings offer good grounds for treatment of SAD with SSRIs."

Commenting, Professor Eduard Vieta (Institute of Neuroscience, University of Barcelona) said:

"Psychiatry has traditionally focused on risk factors and illness outcomes. This is one of those rare studies that focuses on protective factors, something called "positive psychiatry." By selecting and studying people who did not develop [seasonal depression](#), the authors provide further knowledge on the neurobiology of resilience, which may translate, in the future, on better ways to prevent depression."

Professor Vieta was not involved in this work, this is an independent comment.

European Neuropsychopharmacology editor, Professor Andreas Meyer-Lindenberg (Mannheim), added: "This study illustrates the power of combining neuroimaging with genetic analysis to understand what brain processes increase resilience against mental disorders."

More information: Brenda Mc Mahon et al. Seasonality-resilient individuals downregulate their cerebral 5-HT transporter binding in winter – A longitudinal combined 11C-DASB and 11C-SB207145 PET study, *European Neuropsychopharmacology* (2018). [DOI: 10.1016/j.euroneuro.2018.06.004](https://doi.org/10.1016/j.euroneuro.2018.06.004)

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