

# Scientists detect inherited traits tied to sleep, wake, and activity cycles

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Credit: Vera Kratochvil/public domain

In the first study of its kind, a team of international scientists led by UT Southwestern Medical Center and UCLA researchers have identified a dozen inherited traits related to sleep, wake, and activity cycles that are associated with severe bipolar disorder.

Researchers also were able to tie the traits to specific chromosomes, providing important clues to the genetic nature of the disorder, as well as potential new avenues for prevention and treatment.

"We were able to identify 13 sleep and activity measures, most of which are inherited, that correlated with whether an individual had [bipolar disorder](#). In addition, we were able to trace some of these traits to a specific chromosome," said Dr. Joseph Takahashi, Chairman of Neuroscience and a Howard Hughes Medical Institute (HHMI) Investigator at UT Southwestern, who holds the Loyd B. Sands Distinguished Chair in Neuroscience.

"This study represents a key step in identifying the genetic roots of this disorder and, in turn, providing targets for new approaches to preventing and treating bipolar disorder," said Dr. Nelson Freimer, who directs the Center for Neurobehavioral Genetics and holds the Maggie Gilbert Chair of Psychiatry at UCLA.

Bipolar disorder, or manic-depressive illness, causes dramatic mood shifts - often called episodes - in which the person is overly excited, extremely sad or depressed, or a mixed state of both, including irritable or explosive behavior, according to the National Institute of Mental Health, part of the National Institutes of Health.

Causes of bipolar disorder (BP) are thought to be both genetic and environmental, and researchers have long suspected that disruption in normal daily circadian rhythms, including sleep and [wake cycles](#), can precede mood shifts.

Researchers here found that those with bipolar disorder awoke later and slept longer, on average were awake fewer minutes overall, and were active for shorter periods than those without the disorder. Researchers also found that those with bipolar disorder displayed lower activity levels while awake and had greater variations in sleep and wake cycles. The findings are reported in the journal *Proceedings of the National Academy of Sciences*.

The study, involving more than 500 members of 26 families from Costa Rica and Colombia, identified because they each include many individuals with severe bipolar disorder, is the first large-scale delineation of sleep and activity traits in BP-affected individuals and their relatives and the first genetic investigation of such a comprehensive set of sleep and circadian measures in any human study.

The 13 endophenotypes (biological or behavioral markers found more commonly in those with a certain disease than without) are: mean of awake

duration, amplitude, Hill acrophase, interdaily stability, interdaily variability, median activity, relative amplitude, mean length of sleep bouts during the sleep period, mean number of sleep bouts during awake period, time of sleep offset, time of sleep onset, mean total minutes scored awake, and WASO (total minutes in awake bouts after [sleep](#) onset).

**More information:** Genetic contributions to circadian activity rhythm and sleep pattern phenotypes in pedigrees segregating for severe bipolar disorder,  
[www.pnas.org/cgi/doi/10.1073/pnas.1513525113](http://www.pnas.org/cgi/doi/10.1073/pnas.1513525113)

Provided by UT Southwestern Medical Center

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