Depression's Evolutionary Roots

Two scientists suggest that depression is not a malfunction, but a mental adaptation that brings certain cognitive advantages


Depression seems to pose an evolutionary paradox. Research in the US and other countries estimates that between 30 to 50 percent of people have met current psychiatric diagnostic criteria for major depressive disorder sometime in their lives. But the brain plays crucial roles in promoting survival and reproduction, so the pressures of evolution should have left our brains resistant to such high rates of malfunction. Mental disorders should generally be rare — why isn’t depression?

This paradox could be resolved if depression were a problem of growing old. The functioning of all body systems and organs, including the brain, tends to deteriorate with age. This is not a satisfactory explanation for depression, however, as people are most likely to experience their first bout in adolescence and young adulthood.

Or, perhaps, depression might be like obesity — a problem that arises because modern conditions are so different from those in which we evolved. *Homo sapiens* did not evolve with cookies and soda at the fingertips. Yet this is not a satisfactory explanation either. The symptoms of depression have been found in every culture which has been carefully examined, including small-scale societies, such as the Ache of Paraguay and the !Kung of southern Africa — societies where people are thought to live in environments similar to those that prevailed in our evolutionary past.

There is another possibility: that, in most instances, depression should not be thought of as a disorder at all. In an article recently published in Psychological Review, we argue that depression is in fact an adaptation, a state of mind which brings real costs, but also brings real benefits.

One reason to suspect that depression is an adaptation, not a malfunction, comes from research into a molecule in the brain known as the 5HT1A receptor. The 5HT1A receptor binds to serotonin, another brain molecule that is highly implicated in depression and is the target of most current antidepressant medications. Rodents lacking this receptor show fewer depressive symptoms in response to stress, which suggests that it is somehow involved in promoting depression. (Pharmaceutical companies, in fact, are designing the next generation of antidepressant medications to target this receptor.) When scientists have compared the composition of the functional part rat 5HT1A receptor to that of humans, it is 99 percent similar, which suggests that it is so important that natural selection has preserved it. The ability to “turn on” depression would seem to be important, then, not an accident.

This is not to say that depression is not a problem. Depressed people often have trouble performing everyday activities, they can’t concentrate on their work, they tend to socially isolate themselves, they are lethargic, and they often lose the ability to take pleasure from such activities such as eating and sex. Some can plunge into severe, lengthy, and even life-threatening bouts of depression.

So what could be so useful about depression? Depressed people often think intensely about their
problems. These thoughts are called ruminations; they are persistent and depressed people have difficulty thinking about anything else. Numerous studies have also shown that this thinking style is often highly analytical. They dwell on a complex problem, breaking it down into smaller components, which are considered one at a time.

This analytical style of thought, of course, can be very productive. Each component is not as difficult, so the problem becomes more tractable. Indeed, when you are faced with a difficult problem, such as a math problem, feeling depressed is often a useful response that may help you analyze and solve it. For instance, in some of our research, we have found evidence that people who get more depressed while they are working on complex problems in an intelligence test tend to score higher on the test.

Analysis requires a lot of uninterrupted thought, and depression coordinates many changes in the body to help people analyze their problems without getting distracted. In a region of the brain known as the ventrolateral prefrontal cortex (VLPFC), neurons must fire continuously for people to avoid being distracted. But this is very energetically demanding for VLPFC neurons, just as a car's engine eats up fuel when going up a mountain road. Moreover, continuous firing can cause neurons to break down, just as the car's engine is more likely to break down when stressed. Studies of depression in rats show that the 5HT1A receptor is involved in supplying neurons with the fuel they need to fire, as well as preventing them from breaking down. These important processes allow depressive rumination to continue uninterrupted with minimal neuronal damage, which may explain why the 5HT1A receptor is so evolutionarily important.

Many other symptoms of depression make sense in light of the idea that analysis must be uninterrupted. The desire for social isolation, for instance, helps the depressed person avoid situations that would require thinking about other things. Similarly, the inability to derive pleasure from sex or other activities prevents the depressed person from engaging in activities that could distract him or her from the problem. Even the loss of appetite often seen in depression could be viewed as promoting analysis because chewing and other oral activity interferes with the brain's ability to process information.

But is there any evidence that depression is useful in analyzing complex problems? For one thing, if depressive rumination were harmful, as most clinicians and researchers assume, then bouts of depression should be slower to resolve when people are given interventions that encourage rumination, such as having them write about their strongest thoughts and feelings. However, the opposite appears to be true. Several studies have found that expressive writing promotes quicker resolution of depression, and they suggest that this is because depressed people gain insight into their problems.

There is another suggestive line of evidence. Various studies have found that people in depressed mood states are better at solving social dilemmas. Yet these would seem to have been precisely the kind of problems difficult enough to require analysis and important enough to drive the evolution of such a costly emotion. Consider a woman with young children who discovers her husband is having an affair. Is the wife's best strategy to ignore it, or force him to choose between her and the other woman, and risk abandonment? Laboratory experiments indicate that depressed people are better at solving social dilemmas by better analysis of the costs and benefits of the different options that they might take.

Sometimes people are reluctant to disclose the reason for their depression because it is embarrassing or sensitive, they find it painful, they believe they must soldier on and ignore them, or they have difficulty putting their complex internal struggles into words.

But depression is nature's way of telling you that you've got complex social problems that the mind is intent on solving. Therapies should try to encourage depressive rumination rather than try to stop it, and they should focus on trying to help people solve the problems that trigger their bouts of depression. (There are several effective therapies that focus on just this.) It is also essential, in instances where there is resistance to discussing ruminations, that the therapist try to identify and dismantle those barriers.
When one considers all the evidence, depression seems less like a disorder where the brain is operating in a haphazard way, or malfunctioning. Instead, depression seems more like the vertebrate eye—an intricate, highly organized piece of machinery that performs a specific function.

*Are you a scientist? Have you recently read a peer-reviewed paper that you want to write about? Then contact Mind Matters co-editor Gareth Cook, a Pulitzer prize-winning journalist at the Boston Globe, where he edits the Sunday Ideas section.*

### Further Reading

- Head Lines: Practice Removes Prejudice—And More
- A Wiring Diagram in the Brain for Depression
- Providing Psychotherapy for the Poor
- Happy Fish Go Hungry?
- A Brighter Tune
- A Magnetic Boost
- Postpartum Depression Epidemic Affects More than Just Mom
- News Bytes of the Week—Genetics of Childhood Trauma