

## COOL FACTS FRIDAY #20

Dave Asprey:

Welcome to this month's edition of cool facts. A listener suggested this first fact.

### Cool Fact #1

Neuroscientists in Munich found that breathing coordinates neuronal activity throughout your brain when you're sleeping and when you're resting. Until now, we always thought it was a sense of smell thing, that it was the receptors inside your nose and that was what was entraining your brain regions. And we were totally wrong. So if someone tells you the science is settled, well, apparently you can smell that it's not settled, or at least your brain knows because these scientists did large scale electrophysiological recordings in mice, from thousands of neurons across the limbic system. I don't actually know how you do that to a mouse and I'm impressed that they did, but they looked at the hippocampus, the medial prefrontal and visual cortex, the thalamus, amygdala and nucleus accumbens.

What they found is that breathing is linked directly to your limbic circuits. This is your fight or flight response, and that means that your behavioral and emotional responses are tied directly to your brain. So, no, it's not about air flowing over your nasal passages. It's not about what you smelled. It's about the breathing rhythm itself, because that's controlling your behavior and your emotion. Now, neuroscientists in Munich have figured this out, or you could have just asked your yoga teacher in the first place.

Source: [https://www.lmu.de/en/newsroom/news-overview/news/breathing-the-master-clock-of-the-sleeping-brain.html?utm\\_source=join1440&utm\\_medium=email](https://www.lmu.de/en/newsroom/news-overview/news/breathing-the-master-clock-of-the-sleeping-brain.html?utm_source=join1440&utm_medium=email)

### Cool Fact #2

Here's another cool fact for you. Now that you know that breathing already helps your brain. Another cool fact says it helps your pain. Researchers from, this time, the University of Michigan, they created a virtual reality mindful breathing tool. They wanted to see if extra guidance could reduce pain like traditional mindfulness without virtual reality.

So in their normal traditional group, the participants just focused on their breath and the scientists did find that the connection with the brain's frontal regions increased when people were focusing on their internal sensory details. That process is called interoception and it competes with external pain signals. In other words, close your eyes and feel about how your body feels and that'll compete with pain.

But in the virtual reality group, the participants wore those glasses and they watched a video of lungs while they were breathing mindfully and their pain decreased when the auditory and visual sensory brain regions engaged with the VR sound and image was happening. That's called exteroception.

It turns out that people do learn and respond differently to different stimuli. Different meditative breathing methods can decrease pain sensitivity. If you have a hard time getting into the focused attention of traditional mindfulness where you have to learn how your body feels inside, you might be able to just use for virtual reality and use that in order to use exteroception to reduce pain and get more control. Then maybe over time, you can learn the process of interoception, which I highly recommend. You want to be able to use your onboard sensors, but there's nothing wrong with using off board imagery in order to get the results you want now. That's biohacking.

Source: <https://www.sciencedaily.com/releases/2021/10/211012154810.htm>

### Cool Fact #3

Our next cool fact is bouncing us from brain to pain and back to brain again. New research just published in PLOS Genetics says that your brain's ability to clear a protein, that's tied to Alzheimer's disease is tied to your circadian cycle. What does that mean? It means if you go to sleep well and you don't eat it the wrong time, you do the other things that entrain you for your circadian cycle. You're probably not going to get Alzheimer's disease unless you have some weird genetics.

So here's what we already know. Your circadian system is made up of a core set of clock proteins that anticipate your day and night cycle. Your levels of enzymes in that system and your hormones swing back and forth on a regular daily basis. It's tied to your body temperature, your immune response, and your alertness. When you disrupt your circadian system, it does cause diseases like diabetes, cancer, and Alzheimer's. All of those are quite definitively raised if you're say a night shift worker.

A telltale sign of Alzheimer's is plaques. These little clumps of protein called amyloid beta 42 in your brain. That's not to say that the plaques cause Alzheimer's. They're a sign of it. In this new research, scientists in New York found that the ability of your immune system to destroy Alzheimer's related protein oscillates with your daily circadian rhythm. What happens during that daily circadian rhythm, the unsung heroes of your brain? The neurons are the rock stars. The glial cells are the roadies. They do the work and these macrophages, which sure part of your microglia, there are immune cells that seek and destroy unwanted material in your brain. They eat AB42 in your brain, which is likely to help you with Alzheimer's. But when your circadian rhythm is out of a whack, these things called proteoglycans form on the surface of cells and the macrophages don't eat as much AB42.

So the more and better you sleep, the fewer proteoglycans form. And that means you're unlikely to get Alzheimer's. You want to learn how to sleep better, go to [sleepwithdave.com](http://sleepwithdave.com). It is a gift for you. I'll teach you how to sleep.

Source: <https://www.sciencedaily.com/releases/2022/02/220210154215.htm>

### Cool Fact #4

Our next cool fact of the day is about how you sense reality. Your brain refresh cycle is way longer than you think. Your brain is constantly uploading visual stimuli from around you, but you're getting little chunks of it at all times and you stitch it together in your unconscious processing until you look around and you see everything, but you're not actually seeing everything at once. Scientists have now figured out for the first time that your brain's refresh time is 15 seconds. This is new findings from UC Berkeley. And we call this your continuity field. And this function of your body's perception is how your brain merges what you see to give you that sense of visual stability instead of a bunch of little flashes for what you saw in this microsecond.

If your brain always updated, what's happening in real time, all you would see is little bits of shadow and light and movement all around you and it would be disorienting and you'd probably actually throw up from motion sickness. It would not work well. So instead it gets stitched together into this beautiful fake version of reality, based on what you saw in the last 15 seconds. So you don't feel like you're hallucinating all the time. It's like you have an app that's consolidating your visual input every 15 seconds into one impression, which lets you handle to everyday life without just freaking out. These researchers figured it out because they were looking at a mechanism behind something called change

blindness. You don't actually notice subtle changes that occur over time. For instance, the change between an actor and a stunt double or a blooper in a movie or a very, very slow change in the environment, it's just invisible. How does it happen? Well, knowing your brain has a slight lag when you process visual stimuli is really important.

So if you're wondering why you've ever say walked into your kitchen and looked around and not seen the thing that was right on the counter in front of you, it's because of the way your brain is stitching together all the little pictures of reality. It just didn't show that one to you. No, you're not crazy. It's just how you do it. There's another different timing system that wasn't covered in this research, which is how quickly can you notice something happening in your environment. This is called evoked potential. This new research is entirely different from that. Evoked potential is how quickly will your brain respond with an electrical pulse when something happens. And this new thing around changed blindness is saying how do you paint a coherent picture of reality, given that all you can see is a tiny bit of it at one time. It's kind of spooky because when you know this, what AI algorithms are doing to you with visual perception, what are magicians doing, what are marketers doing? All kinds of crazy stuff. That is really interesting.

Source: <https://www.sciencedaily.com/releases/2022/01/220113194121.htm>

#### **Cool Fact #5**

And our final cool fact of the day has to do with medical repression. It turns out it goes all the way back to Ivan the Terrible who is known for publicly executing people in Moscow for using folk recipes around breath holding. It turns out that breathing is just now finally having its Renaissance when we're realizing how important breathing is for human awareness, for human activity, for health, for setting how your brain works. Why has there been a war on breathing for longer than there's been a war on nutrients? I didn't really know, but Ivan the Terrible did.