

The Vestibular System

 [healthyhearing.com/report/43720-Balance-vestibular-system](https://www.healthyhearing.com/report/43720-Balance-vestibular-system)

Ear problems involve hearing loss, right? Well, that's what most of us think because we hear with our ears – complex collections of membranes, bones, organs and other paraphernalia required to hear the world around us.

However, the ear is also the location of the vestibular system – the system that enables us to walk upright, catch a baseball on the fly and keep our balance – even in the dark. The vestibular system keeps humans moving in a straight line. But, when problems occur within this important system of balance, we're likely to experience dizzy spells, vertigo, depression, anxiety and other physical and emotional symptoms, none of them any fun.

The vestibular system is critical to “normal” development of the human brain and our ability to get from Point A to Point B without falling down. In fact, this system is so important to human growth and development that it's the first system to develop in a growing fetus. By the sixth month of development in the womb, that baby has a sense of balance.

Here's how The National Institute on Deafness and Other Communication Disorders defines the vestibular system and what it does for us everyday without a thought. “[The vestibular system] is responsible for maintaining balance, posture and the body's orientation in space. This system regulates locomotion [movement], and keeps objects in visual focus as the body moves.” Wow, and the vestibular system does all of that automatically?

Sure does, but there's more. The vestibular system, a series of fluid-filled canals deep within the inner ear and closely related to the hearing system, is also responsible for the control of muscles, joints, sensation within our fingertips, palms and soles of our feet, and, it's even associated with the regulation of heart rate. That's a lot of responsibility for something so tiny and something about which we never even think, until we experience that first dizzy spell or do a header walking across the lawn. What was that all about?

The vestibular system keeps us upright and moving forward. It provides signals to the brain telling us where our body is within space, with a minor adjustment of joints and muscles, we're able to right ourselves and keep from falling down.

That's one reason drivers stopped for suspected DUI are asked to walk a straight line. It's a no-brainer if you haven't had five martinis. But, if you're over the limit, the brain has a tough time exchanging information with the vestibular system and, well, you've seen the

results on all those realty cop shows on TV. The drunk driver falls down. (Usually starts a fight with the police officer at that point, but let's leave that for another article.)

If you experience dizziness, vertigo or lightheadedness, it could be caused by a number of factors from low blood pressure to anemia to problems with the vestibular system.

And if these dizzy spells last, or occur regularly, it's time to call a physician to find out (1) the cause of your dizziness and (2) how to fix it.

The Blues, The Blahs, Full-Blown Depression and The Vestibular System

Yes, there's news on the vestibular front.

The vestibular system is hooked into the central nervous system (CNS) – the collection of nerves, synapses, nerve bundles and brain connections that keep us aware of what's going on around us. The CNS is responsible for the pain we feel when we step on a thumbtack (ouch). It's responsible for the in-take of all the data delivered by the five sensory systems of the human body – sight, hearing, taste, touch and smell.

The skin contains nerves that indicate pressure, heat, cold, pain and other sensory input. The eyes collect visual data that is sent to the brain for processing. The taste buds tell you whether there's too much chili pepper in your taco and the nerves in the nose tell you the brownies are ready to come out of the oven. This is all sensory data collected by the CNS and delivered to the brain for processing. Grade school biology, right?

Well, how about this for news: the CNS is also associated with what we'd call “emotional” disorders – conditions like schizophrenia, attention deficit hyperactivity disorder (ADHD) and even depression, a feeling we all experience from time to time. Sure, there may be a reason for your depression (lots of them for some people) but not many of us associate these emotional conditions to the vestibular system.

Until now.

A biomedical researcher at Monash University in Melbourne, Australia, Brian Lithgow, recognized that there was the potential to diagnose “emotional” conditions and disorders by comparing electro-vestibular activity in different people. FYI, the vestibular system, along with all of the other systems in the body, generates electrical signals for delivery to the brain for processing.

Lithgow, who looks at the human body from a biomedical perspective, recognized that the vestibular system was closely linked to the primitive, less developed sections of the brain where emotions reside. Our rational selves exist in the cognitive parts of the brain. Less developed sections of the brain are responsible for our emotional selves. For example,

when some driver cuts you off on the highway, you don't weigh the good and bad of the action, you just get mad. Those emotions come from the less-highly-developed sections of the brain – the reacting centers rather than the thinking centers.

Same is true of emotions like depression and anxiety. These are often generated in the more primitive regions of the brain. And because the vestibular system also connects up with these primitive brain bits, Lithgow saw the possibility of using vestibular activity to identify depression, anxiety, ADHD and other conditions through the measurement of the activity of the vestibular system.

Potential for Diagnosing Depression

So, maybe you experience depression often. And maybe you can't always identify the reason for these feelings. Life is good, but you're still sad.

Or, life is good but your anxiety levels are off the scale. Well, it may not be in your head. The problem may be in your ear.

Using what he calls a "tilt chair", Lithgow uses a gel coated electrode that's inserted into the vestibular system (it doesn't hurt) where the electrode measures the electrical activity of this critical system. By measuring the activity of the vestibular system, Lithgow believes he can identify distinct electrical patterns that can be used to identify depression, schizophrenia, ADHD and other disorders that have long been associated with the cognitive or more highly-developed centers of the brain.

Lithgow, working in conjunction with psychiatry researchers at Monash's Alfred Psychiatry Research Centre, tested volunteers and discovered distinct patterns of electrical activity that he called "biomarkers" that are distinct for a variety of diseases and conditions associated with the central nervous system.

The research, it is hoped, will lead to a simple, non-invasive means of diagnosing CNS diseases quickly and inexpensively, providing patient care faster before the problem becomes worse.

Instant Diagnosis?

While the team at Monash University has opened the doors on the possibility of a quick diagnosis of what were formally called "mental disorders," the days of an instant diagnosis of potentially dangerous conditions may be a few years off according to Jayashri Kulkarni, a researcher at Monash University in Melbourne.

During a recent radio interview, Kulkarni was asked if this new research was leading to an instant diagnosis of potentially dangerous conditions. “It is an unlikely combination usually, but what we are doing is actually looking to somehow tackle the final frontier in understanding more about the brain in mental illness,” Kulkarni explained.

“We still have a way to go but the potential is there and it is very exciting. It is going to lift us, I think, into an era where mental illness can be better understood and treated,” the researcher continued.

Bottom line? Through the use of this ongoing research in Australia, medical professionals may soon have a tool to diagnose CNS conditions like depression and ADHD sooner through the use of the vestibular system, providing remedies to address these conditions before they worsen.

While the research is still in the beginning stages, the initial results are extremely heartening to the medical community. A simple probe that measures the electrical activity of the vestibular system may soon be available to diagnose CNS disorders faster and, as a result, provide remedies sooner.

Consider this: if you experience chronic depression, if you’re under constant stress or you have a difficult time focusing on any one task for more than a few minutes, it may not be in your head. The problem may be found in the vestibular system deep within the ear. And a simple test in the tilt chair may be all that’s required to diagnose the condition.

Who knew the human vestibular system held these capabilities? Simply fascinating.