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by [Carol Schaeffer](#) | May 11, 2016

Dolores Canales can't seem to find her way around like she used to. She has spent her whole life in Anaheim, California, yet says she gets lost even in her hometown. She feels that her 20 years in prison, and the 18 months she spent in solitary confinement, has resulted in a permanent change to her sense of space and direction.

Research indicates that extended isolation can not only significantly alter the structure of the brain, adding to research that has long indicated the extensive psychological damage caused by solitary confinement. At a panel discussion last month at the University of Pittsburgh School of Law, part of a [two-day conference on solitary confinement](#), neuroscientists testified to the degenerative neurological effects of isolation.

The brain is comprised of 100 billion cells, 500 trillion connections, said Dr. Huda Akil, distinguished professor of neurosciences at the University of Michigan. It is an organ of social function. The brain needs to interact in the world.

Akil is a specialist in the effects of emotions on brain structure, particularly the effects of stress hormones. According to Akil, stress hormones can make dramatic changes to the hippocampus, the concierge of the brain. The hippocampus controls how our senses are translated to the rest of our brain, and is in charge of our relation to outside space.

Stress hormones have been shown to rewrite your DNA program, and rewire the brain, said Akil. These hormonal effects on the hippocampus change space perception and directional positioning. The internal GPS of the brain is disturbed, depth perception is altered and where the body lies in relation to other objects in space is uncalibrated.

For Canales, an activist and leader of California Families Against Solitary Confinement, this rings particularly true. She says her sense of space is permanently altered. You should see my apartment. When I first moved in, I couldn't stand not being able to see the door. To this day, she says, friends tell her that her small apartment is set up like a prison cell.

Canales was confined to her cell twenty-two hours a day. There, I had a window. The guards would take me out to the yard every day. I'd get to go out to the yard with other people, she recalled. Canales knows that she escaped the even harsher conditions suffered by people in supermax prisons such as Pelican Bay, where her son, John Martinez, was confined for more than a decade. But being in solitary confinement still took its toll. I would wake up in the middle of the night, my heart pounding, she described. I'm not just saying that so people think I was suffering. There's a real anxiety.

Other survivors of solitary confinement attest to similar feelings. Robert King, one of the so-called Angola 3, was held in solitary in Louisiana for 29 years, living in a box measuring just 6 by 9 feet for 23 hours a day, until he was released in 2001. He told the BBC in 2014, It is off to the point where I get lost even when I am walking just around the corner from where I live. The disorientation he and Canales both describe is consistent with damage to the hippocampus.

Albert Woodfox, another member of the Angola 3, was held in solitary confinement for 43 years and was released February, 2016. He has a hard time knowing what is a product of solitary confinement and what is a natural part of aging, and his transition has in many ways been too recent to accurately observe.

Yet Woodfox contends that there is a clear shift in readjusting to a world of social interaction, that has deep physical impacts. Physically I've found there is a different rhythm to being free than being in prison, he said in an interview. The way you walk, the way you converse with other people, your awareness of your senses. It's so much more intense than when you're in prison. I had to learn how to pace myself because I was burning way more energy in society than I was in the prison cell.

Akil is quick to note that brain imaging studies of people in prison are lacking. The history of abusive experimentation on prisoners has led to current bans on using them in medical studies. So the data is, in some sense, limited. But she insists, What we do know about the brain suggests that there is a definite change from solitary confinement.

According to Dr. Michael J. Zigmond, University of Pittsburgh professor of neurology, studies of solitary confinement in mice indicated

that overall there was a measurable difference consisting of simpler neurons, fewer connections between those neurons, and fewer synapses in the brain compared to socialized mice.

At the conference, Zigmond described the experiment, which separated some laboratory mice into shoebox housing and others into an enriched environment where they were able to interact with other mice and were given freer range of movement and exercise equipment.

This model of an enriched environment is of course nothing like what would be actually enriching [to an animal], he said. But it is a marked difference in the small, cramped and isolated shoebox containers. The way the housing is set up is very much like many solitary housing arrangements, he said, with stacks of small containers each containing a mouse. They may be able to sense each others presence, but cannot see or interact in any way. Meanwhile, the larger box where the mice are free to interact suggests a model for representing general population in prison settings.

But in order to conduct these experiments, Zigmond has to get special permission from animal care boards, as extended isolation is carefully regulated in animal experiments as cruel conditions. It is clear to animal care boards that solitary housing is unacceptable under express circumstances.

Studies on humans and primates are rare, largely because they are considered inhumane by most major research groups and universities. There are examples of research from the middle of the 20th century, which prompted many reforms in experimentation ethics.

As an example, in 1951 researchers at McGill University paid a group of male graduate students to stay in small chambers equipped with only a bed for an experiment on sensory deprivation. Students were to be observed for six weeks, but not one lasted more than seven days. Students dropped out of the experiment after being unable to think clearly about anything for any length of time, while others reported hallucinations.

In another notorious experiment from the 1950s, University of Wisconsin psychologist Harry Harlow placed rhesus monkeys inside a solitary chamber. Harlow found that monkeys kept in isolation wound up profoundly disturbed, given to staring blankly and rocking in place for long periods, circling their cages repetitively, and mutilating themselves. Most readjusted eventually, but not those that had been caged the longest. Twelve months of isolation almost obliterated the animals socially, he wrote.

Akil notes that the power of social contact helps remodel the brain and relieves stress. But the stress hormones never really go away, never leveling out entirely. The longer [people] are kept isolated, the worse it gets, she says.

Isolation devastates the brain. There is no question about that, said Zigmund. Without air, we will live minutes. Without water, we will live days. Without nutrition, we live weeks. Without physical activity, our lives are decreased by years. Social interaction is part of these basic elements of life.

Canales and other advocates at the conference expressed hope that the growing body of the evidence on the neurological damage caused by isolation will provide new ammunition in the battle to end solitary confinement. She has no doubt as to the lasting effects of solitary, based on her sons experiences and her own. There is an intensity that I can still describe to this day. I get overwhelmed if it rains. Everything is intensified, she says. I could be walking and think about what its like to be in that space where you cant even see color. I get overwhelmed thinking about all the people that cant feel the rain, or the sun. That are stuck in there.

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I know the people that are using this voice to skull on me .its been 7yrs they have gotten away with this on other people,one women she was very beutiful now she has gone off the deep end .they tell what to do drugs and now she a prostiute just because of them,.they work at reverbnation have a good cover for the b.s. They do .my name is Michael bomberry they have made me commit suicide 3times got me stabbed 6 times ,in my dreams use vertigo on me and call it black magic ,use translator to scare the hell out of Mexicans here in PHOENIX AZ!.theystock you you with satillight,they can give tumors my step daughter has two from them ,gives me electro shocks very day in my genitals burns my face ,eyes the very sensitive parts of my body ,names Kevin Carle and shacoy Carle,they used Thompson ,Garcia,Gomez,Moore. (Shacoy Moore)law laws I would be surprised if used my last name bomberry ,they have stolen my ID

my bank accounts every thing I have and trying to take my life slowly ,if you know anybody with the same problem I have this killer here in phx

Non-consensual human experimentation still exists in fact, thousands of us allege we are being used as human guinea pigs. There are loopholes any director of a fed agency can waive consent forms, researchers can conduct remote experimentation, nonlethal weapons research can be conducted, etc. I was interested in this article because we are isolated from family and friends. Some call this no touch torture or prison without walls. Its often combined with COINTELPRO tactics. Obama has a BRAIN initiative underway, said to rival the human genome project. Non-consensual human experimentation is persistent and as horrific as ever.

This is an important issue that deserves much wider public exposure, particularly in the U.S. where so many people are imprisoned.

The authors mention and characterization of animal use was however, misleading. While isolation experiments using monkeys are not common, they do continue. Moreover, it is part of standard laboratory practice in the U.S. for many monkeys to be caged alone. Currently, it is estimated that approximately 14,000 monkeys are individually caged. (Bennett BT. Association of Primate Veterinarians 2014 NHP housing survey. ACLAM Forum 2014.) Arguably, such isolation has an even more profound impact on monkeys than it does on humans as the incidence of chronic self-injury and stereotypies readily demonstrates.

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