This is your brain on pot: Neuroscientist studies long-term effects of medical marijuana

By Leah Samuel

BELMONT, Mass. — Staci Gruber vividly remembers her first hit of marijuana, back when she was in college. It made her so paranoid, she locked herself in a bathroom. She couldn’t decide whether to remain in hiding or to run. But she knew she’d never try pot again.

She didn’t lose interest in the drug, however. Today, she runs the 2-year-old Marijuana Investigations for Neuroscientific Discovery, or MIND, project at McLean Hospital in this suburb of Boston. With cognitive testing and neuroimaging, MIND is conducting a longitudinal study of medical marijuana.

“There’s a lot we don’t know about long-term effects, and that’s what I’m here to find out,” Gruber said.

Gruber, 49, has already made her mark on the field.

She ran a small study, published in 2013, that found teenagers and young adults who smoked marijuana were more likely to exhibit impulsive behavior than their peers and were more likely to have certain changes in the brain’s white matter. A follow-up study found that those changes could reorganize brain regions associated with inhibitions. This year, Gruber’s research team also found that chronic recreational users of pot had poorer cognitive and executive functioning, particularly if they began using marijuana as teens.

MIND’s current work involves adults who are legally permitted to use marijuana-based products for medical conditions. The researchers are particularly interested in the non-psychoactive components of the marijuana plant, such as cannabidiol, an ingredient in many preparations of medical marijuana.

“We have this one word, marijuana, which we think means every part of the plant, and it doesn’t. The cannabinoids I study aren’t even the ones that get you high,” Gruber said. “But whether you’re for medical marijuana or against it, what we really need is information.”

Marijuana has been studied before. But previous research has focused on the cognitive effects of smoking pot recreationally. Earlier studies of medical marijuana have looked mostly at efficacy — how well it treats symptoms of conditions like multiple sclerosis, cancer, and HIV/AIDS.

Gruber and her colleagues, by contrast, are trying to determine the long- and short-term impact of medical marijuana on cognition, brain structure and function, quality of life, sleep, and other clinical measures.
“[This] is a primary concern for patients considering cannabinoid treatment, and it may have implications for public policy,” Gruber said.

**Peering into the brain**

The first phase of the MIND study is observational. Before patients begin their treatment, Gruber and her colleagues establish a baseline — using imaging, interviews, and task performance tests — to see what patients’ brains look like before they use medical marijuana.

The patients then record how much marijuana they’re using, and how often. At intervals of three, nine, 12, 18 and 24 months, MIND researchers conduct more tests, brain scans, and interviews to measure the effects of the cannabis on their brain structures, cognition, and daily life.

This is the part of Gruber’s research that will be most valuable, said Madeline Meier, a marijuana researcher at the University of Arizona.

“The most important goal right now is to obtain high-quality data on the potential harms and benefits of cannabis,” Meier said.

There are currently 30 study participants; Gruber plans to enroll up to 200. A separate MIND study will examine military veterans who use cannabinoids.

“People drive two to three hours sometimes to get [here for] the study,” Gruber said. “They’re really committed. They really want to know what effect this will have on them.”

As they wait for long-term results, MIND researchers have made a few interim discoveries. They have found, for example, that marijuana could possibly ease symptoms for people with bipolar disorder and that a medication for strokes and Alzheimer’s disease may reverse the cognitive effects of chronic recreational marijuana use.

Gruber’s earlier findings, raising red flags about the dangers of recreational pot smoking, have caught the eye of some activists, like the Seattle-based drug prevention program SAMA, short for Science and Management of Addictions.

“We brought her out here because she had done this great research on adolescents and THC,” said SAMA president Kim Brackett. “We call her ‘the rock star scientist.’ She has a very nice way of translating scientific information in a way that non-scientists can understand, from grandparents to 8-year-olds.”

**New interest in funding research**

The patients in MIND’s studies bring their own marijuana products, which Gruber’s team analyzes for potency. Studying marijuana can be challenging because the federal Drug Enforcement Administration classifies it as a Schedule 1 drug, a category reserved for substances with a high potential for addiction and no medicinal value. The DEA recently considered changing that classification — but decided not to.

As a result, the federal government is currently the only approved source of cannabis for clinical trials of medicinal marijuana. “But that’s not what people are using,” said Francesca Filbey, who researches marijuana at the University of Texas at Dallas. “The only way science can study what people do is to let them do it.”

Gruber, Filbey, and several other researchers have formed a consortium, dubbed IDEAA, to pool their research data. Their goal is to make their data widely available, and to get more funding for marijuana research.
“We also hope to do some joint projects — pun intended — that can get funding,” Gruber said. “People are warming up to the idea of marijuana as medicine and funding is opening up.”

For now, Gruber’s project is funded with private donations. The first one came in 2014 when MIND launched with a $500,000 gift to McLean Hospital from Gruber’s wife, crime novelist Patricia Cornwell. The two married in 2006, having met when Cornwell visited McLean to research a book.

“She was asking a lot of really good questions,” said Gruber. “Then I found out she wanted to meet and talk more. We went out for dinner and ended up talking about neuroscience until 2 o’clock in the morning.”

Gruber first came to McLean Hospital in the 1990s to work as a lab assistant while completing two undergraduate degrees at schools 10 miles apart. She majored in psychology at Tufts University in suburban Boston. She was also studying vocal performance and jazz at the New England Conservatory of Music.

“I spent most of those years just running,” Gruber said, shaking her head with the memory. “You look back and wonder, ‘How did I ever do that? I could never do that now.’ I guess that’s what’s great about being young.”

While in college, Gruber landed an internship at McLean in a lab studying the effects of marijuana on college students. “From there,” she said, with a wait-for-it grin, “I was hooked.”

She continued working at McLean while earning graduate degrees in psychology and experimental cognitive neuroscience at Tufts and at Harvard, where she is now an associate professor.

‘It takes emotion and soul’

While Gruber has always loved music, she’s only recently fully embraced that side of herself.

“When I was little, I used to sing in the closet because I was terrified that I wasn’t any good,” she said. “But then I had this music teacher who said, ‘Hey you, you should have a solo.’”

At the conservatory, she fell in love with jazz singing, which she said resonated with her much more than classical arias.

“If you’re not feeling what you’re doing, what’s the point?” she said. “And that’s true in science, too. You can scientifically break down all these parts of music, like tone and pitch, but it takes emotion and a soul to make it real. In science, you can have all the findings in the world, but if you can’t communicate them, what good are they?”

Today, Gruber has a home studio and a Youtube channel for her music, which includes covers of popular songs along with her own compositions. And she has recorded two CDs.

But, she insisted, “I’m still the kid in the closet. I mean, I get media calls to talk about medical marijuana and I can do that, but singing? I’m a neuroscientist. Do I really want people hearing me sing a Sara Bareilles cover?

“It’s okay to not be comfortable 100 percent of the time,” Gruber added. “You have to put yourself out there, to sing and be true and be you.”

That is no more than what she asks of study subjects, she explained.

“The whole point of this is getting people to tell the truth, sometimes about illegal activity, so they have to trust you,” she said. “I don’t know that I would be able to do studies like this if I couldn’t connect with people.”