

Daniel Amen, MD: The Impact of Brain Imaging on Psychiatry and Treatment for Improving Brain Health and Function

Interview by Karen Burnett

Daniel G. Amen, MD is regarded as one of the world's foremost experts on applying brain-imaging science to clinical psychiatric practice. He is a board certified child and adult psychiatrist and the medical director of Amen Clinics, Inc. in Newport Beach and San Francisco, California, Bellevue, Washington, and Reston, Virginia.

Dr. Amen is a Distinguished Fellow of the American Psychiatric Association (the highest award given to members) and an Assistant Clinical Professor of Psychiatry and Human Behavior at the University of California, Irvine School of Medicine.

He is the author of 49 professional articles, 5 book chapters, including the co-author of the Comprehensive Textbook of Psychiatry's chapter on Functional Imaging in Clinical Practice, and over 30 books including New York Times bestsellers Change Your Brain, Change Your Life; Magnificent Mind At Any Age; Change Your Brain, Change Your Body; and The Amen Solution. He is also the author of Healing ADD, Making A Good Brain Great, Healing the Hardware of the Soul, and co-author of Unchain Your Brain, Healing Anxiety and Depression and Preventing Alzheimer's. His latest book, Use Your Brain To Change Your Age, was released in February 2012.

Dr. Amen is the producer and host of 6 popular shows about the brain, which have raised more than 35 million dollars for public television.

Alternative Therapies in Health and Medicine (ATHM): Let's begin by talking about how you became interested in psychiatry, the study of the brain, and specifically, using imaging to diagnose and treat brain problems.

Dr Amen: When I went to medical school, I wanted to be a pediatrician. But learned I really didn't like holding children down and having them [become] afraid of me. I'd much rather be on the floor playing with them. And so I found child psychiatry was just perfect.

Four months after I got married, when I was a sophomore in medical school, my wife tried to kill herself, and I [said], "You know, you should go see people at the department of psychiatry." I fell in love with the doctor who helped her and just found that it fit my personality. So, I had a family member who was suffering with a mental illness, and I just loved the stories of people's lives.

Before I went to medical school, I was a soldier in the army. I was an infantry medic and I got retrained as an X-ray technician,

so I had spent years looking at people's body parts. And when I decided to be a psychiatrist, I kept agitating my professors, like, "Why aren't we looking at the brain? I mean, obviously, the brain is the organ of psychiatric problems. Shouldn't we be looking?" And they kept telling me not yet, not ready. When I first started looking in 1988 using a technology, called quantitative EEG [electroencephalography], I was so excited because I could get more information on my patients' brain function. I went to my first lecture on brain SPECT [single-photon emission computed tomography] imaging in 1991 and it changed everything I did. I could become better at diagnosing my patients because I had more information.

The other sort of unique thing that imaging did for me is: I developed brain envy. I scanned myself, and it wasn't that good. I wanted a better brain because I realized that your brain is involved in everything you do—how you think, how you feel, how you act, how you get along with other people—and I wanted my brain to be better. So I studied how to help people have healthier brains, and in the process, I realized that's also where psychiatry should be going.

We should be the champions of brain health rather than just treating brain illness. Some of the best ways to get someone to [overcome] depression are to exercise and take fish oil and correct the negative thoughts that you have, not just throwing medicine in the dark at people's brains.

ATHM: So you have said when your brain works right, you work right, and when your brain has trouble, you have trouble in your life. So what has your research led you to believe about the importance of brain care?

Dr Amen: At the Amen clinics—I have 4 clinics around the country—we have been doing brain imaging virtually every day for the last 21 years. We've built a database of 72 000 scans, and it's very clear to us: When your brain works right, you work right. And when your brain has trouble, you are much more likely to have trouble in your life.

With a healthy brain, people are happier, physically healthier, wealthier, wiser, and they make better decisions so they're more successful. When the brain is not healthy, for whatever reason,



people are sadder, sicker, poorer, less wise, their decisions are not as good, and they're not as successful. But nobody thinks about the brain because you can't see it. You can see the wrinkles in your skin or the fat around your belly or the roots in your hair, and you can do something when you don't like how it looks. But because very few people do brain imaging, people don't get a look at their brain, so they just don't care. And our society acts in ways like we're brain damaged.

I mean, we let children hit soccer balls with their head. How stupid is that? Brain is soft, skull is hard, skull has many sharp, bony ridges. Why would you ever let a developing mind hit a hard ball—soccer balls aren't light; they're not volleyballs—with their head or put their head with their precious brain inside a helmet and start slamming it up against other people? I mean, how does that really make any sense at all if you believe what I say: The brain is the organ of judgment, personality, character, intelligence, every decision you make. Why would you ever put it at risk? But because we don't look at it, no one thinks about it.

ATHM: Your research has discovered evidence that former football players have received trauma from their concussions. Is that right?

Dr Amen: It's very clear. If you play football in the National Football League, you have a very high chance of having a damaged brain.

ATHM: Your research uses SPECT scans, a type of nuclear medicine that analyzes blood flow and activity patterns in the brain. Could you please describe what SPECT imaging has taught you about brain disorders and then how to treat them? And how did SPECT imaging begin? What was the first use for it?

Dr Amen: SPECT is a nuclear medicine study, and nuclear medicine studies use very tiny doses of radioactive isotopes that work like tracking devices in the brain or in other parts of the body. SPECT stands for single photon emission computer tomography. Basically, it takes a radioactive isotope—we use one called technetium. Technetium is 42 on the periodic table of elements and has self-esteem problems. Technetium doesn't like being who it is, so it changes shape. And as it changes from technetium to molybdenum, it produces a little bit of light or photon that we can actually measure with the crystals in the SPECT cameras.

SPECT was actually developed in the '70s and, as it became more sophisticated in the middle '80s, a lot of research was published on brain SPECT. So by the time that I started in 1991, there was already a very substantial body of scientific literature underlying the use for

SPECT in dementia, seizures, strokes, and head trauma.

SPECT basically tells you 3 things: areas of the brain that work well, areas of the brain that are low in activity, and areas of the brain that are high in activity. We always take a really good clinical history, because you can't look at a scan and make a diagnosis by itself. You always have to put it in the context of the clinical situation you're dealing with. But once you have a history—say the [patient is] depressed—how the heck do you know what kind of depression it is?

Depression is a symptom. It's sort of like chest pain. There are all sorts of causes of chest pain and all sorts of causes of depression. So the scans tell me if this is a low-activity depression or a high-activity depression or is it a depression subsequent to some form of toxic exposure, like someone had mold exposure or they have brain infection or is it depression secondary to traumatic brain injury or does their brain work too hard?

So clinical history plus scan equals more targeted treatment. Then, because I have brain envy, we have lifestyle interventions—diet, exercise, simple supplements, cognitive therapy—to really ramp up our effectiveness. We actually have a big 6-month outcome study that we have done [that shows that we] are very effective with complicated patients because the imaging adds important clinical data.

Psychiatrists really are the only medical specialists who never look at the organ they treat. It's sort of crazy when you really think about it, but we make diagnoses today, by and large, exactly like they did in 1840 when Abraham Lincoln was depressed.

President Lincoln had 2 very severe episodes of major depression, including talking about being suicidal. So his doctor talked to him, looked at him and [said], "Oh, you're depressed. Here, take this." That's exactly what happens in 2012. Cardiologists look and gynecologists look and gastroenterologists look and orthopedic doctors look: Why the heck aren't we looking? And the argument against looking is "It's not the standard." It's not what people are taught; we are perpetuating this whole broken field of psychiatry, and no one is actively trying to fix it.

The National Institute of Mental Health Director, Dr Thomas Insel, wrote recently that our effectiveness outcomes have not improved one bit in the last 40 years, and it's a crime that we spend billions of dollars in mental health research and we're no better off than we were when I was a medical student. How crazy is that? And it's because you go to your doctor and say, "I'm anxious," and the doctor gives you a pill as opposed to [this example].

I met a patient recently. He came in because he wasn't sleeping;

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he was having panic attacks. His doctor thought he was anxious, started giving him Xanax and Lexapro—a benzodiazepine and an SSRI, serotonin reuptake inhibitor—and he was getting worse and worse. We scanned him, which showed clear evidence of brain trauma, so I asked, “So when was the last time you had a brain injury?” He said, “What do you mean?” I said, “Well, on the scan, it looks like you had a brain injury.” It [had happened] the month before he started having panic attacks. He was on a mountain bike and got into a bad accident, and even though he was wearing his helmet, he had broken the helmet. That’s a big deal.

It’s very common in the medical literature: People who have traumatic brain injuries can’t sleep, often have anxiety or panic attacks, can get depressed and even suicidal. I taught him about brain rehabilitation—“Let’s get your brain better and please, let’s get you off this stuff. It’s the wrong stuff for you”—and saved his life. That’s a very common story that I hear, and the mantra that I have in my head with this is: How do you know unless you look? Not looking should be malpractice. But it’s the standard of care in mental health and by not looking, we hurt people—not just a little bit. We hurt them, we misdiagnose them, we label them as personality disorders—of course, you have a personality disorder if your brain is hurt. What’s the organ of personality? It’s your brain.

And because we don’t look, we are not doing a good job of decreasing stigma or increasing compliance. And all of those things are helped when you do psychiatry with imaging.

ATHM: With your background in military and with these increased injuries going on right now in the current wars, do you believe there will be an uptick in brain trauma problems with veterans coming back with injuries and perhaps not getting the treatment they need?

Dr Amen: It is estimated that there are 300,000 soldiers coming back from Iraq and Afghanistan with brain injuries. I have no idea, unless we actively find them and rehabilitate their brains, what the mental health fallout is going to be for these people who gave their lives for us. It is unconscionable to me that the military has not done a better job of looking at and helping to rehabilitate their brains. And I think there’s going to be a very high incidence of depression and dementia, just like we see in the NFL players.

ATHM: A lot of hazards the brain faces seem to be part and parcel of modern life: lack of exercise, lack of sleep, chronic stress, alcohol intake, nicotine, excess caffeine, prescription medications. Do you think we’re moving in the wrong direction in terms of taking care of our brains?

Dr Amen: We are doing such a bad job when you really look at brain health. I think brain health is really 3 things: having brain envy, wanting a better brain; avoiding things that hurt it; and doing things that help it.

If you look at the things we should avoid, drugs and alcohol should sort of be obvious, except many people think of alcohol as a health food. Our brain imaging work says it’s not a health food. People who drink every day have smaller brains, and when

it comes to the brain, size matters. Brain injuries. We cheer at mixed martial arts events, at UFC [Ultimate Fighting Championship] events. We cheer for football players when they get creamed. We allow our children to hit soccer balls with their heads or box [in the ring]. We need to do so much better.

Also in that category of things that you need to avoid if you want a healthy brain is obesity or being overweight. Two-thirds of our country is overweight. One-third is obese. I have something I call affectionately “the dinosaur syndrome.” Eighteen studies now show that as your weight goes up, the actual physical size and function of your brain go down. That should just scare the fat off anyone. When I read that study, I lost almost 30 pounds. I’m like, “I’m not having a smaller brain.” This is information people need to know.

Diabetes damages your brain. The incidence of diabetes is skyrocketing in our country. Hypertension damages your brain [and] low thyroid, low testosterone, low levels of omega-3 fatty acids, and low vitamin D. These all go together. It’s very common for our patients to have low levels of vitamin D or low levels of omega-3 fatty acids in their blood. We just want them to do the right thing. Not sleeping: People who get less than 6 hours of sleep at night have lower overall blood flow to their brain, which means more bad decisions. Being exposed to stress: Chronic exposure to stress hormones kill cells in the memory centers of the brain.

ATHM: You have said that meditation activates the most thoughtful part of the brain and makes one happier and more intelligent. Do you believe that meditation can help heal disorders of the brain?

Dr Amen: You know, when healing disorders of the brain, I like to take a real holistic approach. I went to medical school at Oral Roberts University, where they taught us to take a biopsychosocial spiritual approach to understanding and treating our patients. And so I would never look to one treatment and [say], “Okay, meditation can heal the brain.” But in the context of doing all the right things, meditation is very powerful.

I’ve published 3 studies on a Kundalini yoga form of meditation called Kirtan Kriya, and we saw this 12-minute chanting meditation activate blood flow in the front part of the brain. Well, that’s the most human, thoughtful part of the brain, so wouldn’t that be a cool thing to do?

ATHM: Do spirituality and meditation play a role in your own life and work?

Dr Amen: Huge. People have to know the answer to [this question]: What do their lives mean? Why did they matter? And so when I think of spirituality, I don’t just think of God, although I think of God and believe in God, and I have no [preconceived] idea that I’m here by random chance. It’s harder for me to believe that I’m here by evolution and random chance than I am a special creation.

So deep spiritual beliefs have always been part of my life, and some of my colleagues hate this when I say it, but I feel like I have a mission. And my mission, because of the unique experiences I’ve

had in my life, is to teach people about brain health. It's one of the reasons I try to stay physically and mentally healthy because I have something important to do. And even though I'm 57, it's like, "Well, I want to work for as long as I can because it's important."

ATHM: Do you believe people's spirituality and ability to have a mind-body connection can affect their own mental health, can affect other people?

Dr Amen: Absolutely. If you're spiritually bankrupt, you're more likely to be sick. If the only thing that matters is you and your happiness and you really have no connection to your past and no connection to your future, to future generations, that level of absorption makes people sick. It's being connected to the universe and to God, as you understand God, that makes a life worth living.

ATHM: Do you believe that positive thinking affects the brain, and do you believe negative thinking harms the brain? And are you able to track this with imaging and biofeedback?

Dr Amen: You know, there are people who publish studies on that. We did a study where we had one of our patients focus on what she loved about her life and then we had her focus on what she hated about her life. And it completely disrupted her brain function. Where you bring your attention determines how you feel.

So if I focus right now on all the people who criticize me and have hated me and have been unhappy with me, I'd start to feel crummy as opposed to focusing on all the people who told me my work has changed their life. So I actually have some control over how I feel. In my work I talk about ANTs, automatic negative thoughts, the thoughts that come into your mind automatically and ruin your day. So you have to have a little anteatr patrolling the streets of your brain to keep your mind clean, and it takes a little bit of discipline to not believe every stupid thought you have.

And so I teach my patients, when [they're] feeling sad, mad, nervous, or out of control, to write down what they're thinking and then evaluate it: Is it true? [Then] learn to get rid of the bad thoughts.

ATHM: Is that what you mean when you talk about talking back to negative thoughts?

Dr Amen: Yes.

ATHM: What advantages do you see in using natural supplements for treating brain disorders?

Dr Amen: I'm a fairly classically trained psychiatrist, so I didn't learn one thing about natural supplements in my training program: "You have these symptoms, you have this disorder, take this medicine." When I first started doing imaging, a lot of the medicines I was giving actually made the brain look toxic. It was quite horrifying. So I began to think about what other ways [were available] to optimize brain function.

I think one of the things I'm really good at doing is listening to my patients. So when they would tell me that fish oil took away their pain or they're on a gluten-free, milk-free diet and their anxiety attacks went away or they tried St John's wort and it was helpful, I'd go to the scientific literature and check, "Is there any science behind this?"

For about the last 18 years, I've really thought a lot about using natural supplements to treat psychiatric illnesses. St John's wort, for example, has A-level scientific evidence for mild to moderate depression. That's as good as Prozac or Lexapro, and St John's wort has a lot fewer side effects. So I tend to use supplements before I use medications, but it depends on the clinical situation. For example, if someone is psychotic, I'm probably not just giving [that patient] fish oil. Or if somebody's in a full-blown manic episode, I'm probably not just going to give [that patient] a natural supplement. But for my patients who have mild to moderate depression or anxiety attacks, I'm starting with supplements first, and if they don't work, then we'll consider what medication [can do].

I also do bio-psychosocial-spiritual interventions for people, and supplements are a great biological intervention. But just because it's natural doesn't mean it's innocuous. One of the hallmarks of my work—as I've described 6 different types of attention deficit disorder (ADD), 7 different types of anxiety and depression, 6 different types of addicts, and 5 different types of overeaters—is you need to [consider], "Okay, this person has ADD. What type?" Because that will [impact] what medicine or what supplement you give for each type.

The same thing is true for depression. Someone might have a worried depression—overfocused; can't let go of negative thoughts; when things don't go their way, they get upset. That person is going to respond very nicely to the St John's wort. But if someone has a low-energy depression—low blood flow to their brain and not really worried, just sad—St John's wort can actually make them worse. So whether it's medicine or supplements, I target them to the brain type I'm dealing with and I never think of one treatment fitting everybody.

ATHM: Can you describe an example of what you would see in a



SPECT scan that would tell you that you are looking at a certain type of ADD that would need a certain type of supplement?

Dr Amen: A very common type of ADD is what I call over-focused ADD. They have all the ADD symptoms: short attention span; distractibility; restlessness; hyperactivity; impulse control; poor handwriting; trouble going to bed at night; trouble getting up in the morning; and they're worried, rigid, inflexible, and if things don't go their way, they get upset. They tend to get argumentative and oppositional. What we've discovered is that they probably have low serotonin and low dopamine at the same time.

From a medicine standpoint we'd use something like Prozac and Ritalin; an unbelievably great combination for that group. From a supplement standpoint, we would use 5-Hydroxytryptophan (5-HTP), and L-tyrosine: L-tyrosine to boost dopamine, 5-HTP to boost serotonin.

ATHM: You stated that the best brain diet includes lean protein; low-glycemic, complex carbohydrates; and good fats.

Dr Amen: Your brain uses 20% to 30% of the calories you consume. So the brain is the most energy-hungry organ in the body. You literally are what you eat. If you want to be on a brain-healthy diet, it includes healthy fats. Why? Sixty percent of the solid weight of your brain is fat. So if someone calls you a fathead, say "Thank you."

Low-fat diets are bad for the brain. We know high cholesterol will kill you, but most people don't know that low cholesterol is associated with both homicide and suicide. Healthy fats are found in avocados, walnuts, green leafy vegetables, salmon, tuna and fleshy fish, and also lamb. But you need carbohydrates as well. Carb-ohydrates are not the enemy. It's bad carbohydrates that are the enemy. Think of avoiding the 4 white powders: white rice, white flour, white salt, and white sugar. All of those things are addictive and not helpful for you. Think of smart carbohydrates, low glycemic—which means they don't raise your blood sugar—and high-end fiber.

Fiber keeps things going and helps your digestive tract work well. Your digestive tract actually produces many neurotransmitters, so your gut is really important to brain health. In addition, you need lean protein because protein helps balance your blood sugar. It provides the building blocks for many of the neurotransmitters that help your brain function properly.

You also want to think about drinking a lot of water because your brain is 80% water, and anything that dehydrates you makes it harder to think. So think of caffeine and alcohol as two specific examples of that. A brain-healthy diet is eating from the rainbow,

putting foods in your diet of many different natural colors. This does not mean Skittles. But if you have natural blue things and red things and orange things and green things, yellow things, [your diet becomes] filled with phytonutrients and antioxidants to really give you a healthy mix of the nutrients that you need.

ATHM: Do you believe that it's possible to prevent Alzheimer's disease, and could you please tell us about the Alzheimer's smell test?

Dr Amen: Yes, I do believe it's possible in many, many people to prevent Alzheimer's disease, and the way you do that is to prevent all the illnesses that are associated with it. For example, obesity doubles your risk of Alzheimer's disease, sleep apnea doubles your risk, hypertension, heart disease, heart arrhythmias, cancer treatment.

All increase your risk for Alzheimer's disease, depression—and almost all of these illnesses are treatable and preventable. So I think the best way to prevent Alzheimer's is to prevent the illnesses that are associated with it. Now, will that mean that no one will ever get Alzheimer's disease? Of course not but fully about 50% of it, according to one study from the Veterans Affairs Hospital in San Francisco. It said if we can decrease these risk factors, we'll decrease the incidence by 50%. I just want to do everything I can to prevent that devastating illness.

The smell test [maintains] that when you lose [the ability to sense] certain smells, like lemon or leather or strawberry, you're at a much higher risk for Alzheimer's disease because it means the neurons in your olfactory centers are dying. Gasoline is actually another one, and I'm like, "Oh, great. You can't smell the gasoline, and now you're likely to die from an explosion." So having your smell checked periodically is a good idea.

ATHM: And doctors can administer this test?

Dr Amen: If they know about the research and they're actually practicing it in their offices.

ATHM: Why is exercise so important for the brain?

Dr Amen: You know, exercise is one of the fountains of youth, in that as exercise boosts blood flow to the brain, it increases chemicals, like BDNF or brain-derived neurotrophic factor, and it increases hormones, like testosterone, that help our brains work better. People think, "Oh, I'm older. I have low testosterone. It's normal." It may be normal, but it's not good for you. When testosterone levels get low, people have lower libido, but in addition, they have low memories and they're more likely to

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be depressed. So if you have no interest in sex, it may mean more trouble than you want.

One of the best ways to boost your testosterone level is to stop eating sugar. Sugar drops your testosterone level. So if you share a cheesecake with your wife at the restaurant, probably no one is getting dessert when you get home. Another is exercise. The amount of lean muscle mass on your body is associated with longevity. The stronger you are as you age, the less likely you are to get Alzheimer's disease.

What I do personally is walk like I'm late for 45 minutes 4 times a week and I lift weights for about half an hour twice a week. And then I play a coordination game. I like to play table tennis because that works out the coordination centers of your brain, which just happen to be really important to things like judgment and impulse control.

I had a new public television special out called Use Your Brain to Change Your Age. I'm very excited about it because about 2 years ago, I couldn't do more than 2 pull-ups. And in the show—I have read the research, and the stronger you are as you age, the less likely you are to get Alzheimer's disease—I put 22 lbs of weight around my waist and on the show I do eight pull-ups. It's really fun for me to do because I can show, "Hey, an old guy like me can do this, too." The funny reason I put it in the television show is because when I figured out that I could do this, I gave my phone to my trainer and I said, "Here, take a movie of this." I brought it home to my wife, and she said, "That's female porn." And I went, well, I just have to put this on my show then because more women tend to watch public television than men.

You know, what's interesting is I've discovered that one of the reasons women live longer is because they actually care more about their health and they're more concerned than the "don't worry, be happy" people, who die the earliest in life from accidents and preventable illnesses. I want people to be concerned about their health, so they'll do something about it.

ATHM: What kind of feedback have you received from your patients after they've gone through some treatments?

Dr Amen: We study our outcomes, and our patients, by and large, are very happy to have more information, a more holistic approach. Our 72 000-scan database is built in large part from referrals from our own patients. So they're our biggest referral source, which always makes me very happy.

ATHM: And how has the medical community responded to your work with the study of the brain?

Dr Amen: You know, it's been very interesting how my colleagues have responded to me. Some people think I should win the Nobel Prize for what I do, and other people think I should be arrested. It all keeps me balanced. I never can get too full of myself because there is always someone out to smack me. And you know, I think the reason I've irritated some of my colleagues so much is that I'm really crying that the "emperor has no clothes," that we're broken as a medical specialty. I mean, like, really broken. To say, "Your outcomes have not improved in 40

years," is a scandal. 60 Minutes recently did a story on psychiatric meds, and they basically came out and said that our antidepressants are really no better than placebo for most people. Now, I don't actually believe that's true. It's because they don't type depressed people; they give everybody the same SSRI, and that really is no better than placebo. But if you give Prozac to the right person, you literally can save their life. The problem is that if they give it to the wrong people, they may take their own lives or the lives of others. So we have to be more thoughtful and more careful.

ATHM: Is it true that a placebo, if it is in the form of positive thinking, might be very powerful also?

Dr Amen: Placebos can be very powerful, and I think the scans actually increase the placebo effect because people can see their brains. They're more compliant with the treatment because they get brain envy.

The New York Times did a story on me a couple of years ago, and one of my colleagues said I was a snake-oil salesman. And it's too bad that at the time when they asked me that question—you know, "Your colleague said you're a snake oil salesman. What do you say about that?"—I wish I would have known then that snake oil was 23% omega-3 fatty acid. Maybe there's something to this.

ATHM: That would be a good comeback. Do you believe it's helpful to use these preventive treatment methods for the brain if you have no behavioral or mental health issues, just to keep your brain healthy?

Dr Amen: Of course. As we age, the brain gets less and less active. Sort of like your skin falls off your face with age, the same process is happening in your brain, and you either accelerate the aging process with your behavior or you decelerate it. When I was practicing my new public television show, a 60-year old woman who was a friend of my mom's was there, and she said, "Now that I'm 60 years old, I just don't want to think about what I eat anymore. I don't want to think about exercising anymore." And I looked at her and said, "As long as you're okay with the consequences of an aging brain—brain fog, depression, memory problems—don't worry about it." But the truth is, as we age, we have less room for error, not more room for error.

ATHM: Where is your research leading you right now?

Dr Amen: We got a really great grant from a family in Hong Kong that has sent us 30 patients, and we are taking our 72 000 [SPECT] scans and putting them into a searchable database so that we can publish research on thousands of patients at once. We are very excited about changing the way psychiatry is practiced and demonstrating that if you add imaging, it improves your outcomes.

ATHM: Do you still find the brain exciting?

Dr Amen: Every day.