



# RESEARCH CURRENTS

Research News from the U.S. Department of Veterans Affairs



Thanks to innovative research at the Baltimore VA, older Veterans are making strides—literally—in their ability to move about, stay balanced, prevent falls, and get up from a fall if they do have one 6

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## Variations in performance on cognitive tests may foretell Alzheimer's


Cognitive tests may be effective in predicting Alzheimer's disease, found a study including William S. Middleton Memorial Veterans Hospital researchers. The researchers looked at biomarker and cognitive test data gathered over six years from 349 patients. They found that performance on cognitive tests lined up with biomarkers from lumbar punctures in predicting the advance of Alzheimer's disease and mild cognitive impairment. Specifically, the participants at risk were those who performed unevenly across tests in different cognitive areas, such as executive functioning, attention, verbal learning, memory, and reading. Such tests may pose an alternative to invasive medical procedures for prediction or early detection of the disease, according to the researchers. (*Journal of Alzheimer's Disease*, 2018)



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**VA**



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## Exploring the risks of sexual assault for deployed versus non-deployed servicewomen

Researchers from the Iowa City VA Health Care System and their colleagues looked at the rates of sexual assault against servicewomen who were deployed, versus those who were not deployed. Of more than 1,000 women surveyed who served during the wars in Iraq and Afghanistan, 16 percent had experienced sexual assault in the military. More servicewomen experienced sexual assault while not deployed. However, after adjusting for time spent in each setting, the researchers found that women were at greater risk of sexual assault during deployment. The results suggest that both locations require unique strategies to reduce sexual assault, say the researchers. (*American Journal of Industrial Medicine*, November 2017)



Photo by Sgt. Richard Blumenstein/USMC

## Program will match cancer patients with clinical trials

Researchers with the VA Boston Healthcare System have created an online system to match cancer patients with clinical trials. The researchers partnered with a team at the University of California, San Francisco, to adapt their CTMatch application to VA patients with non-small cell lung cancer. The system is part of the Precision Oncology Program, a VA program that offers genomic analysis of patients with tumors. The researchers hope that the system will lead to better treatments for patients by matching them with the most relevant clinical trials. (*American Medical Informatics Association Annual Symposium*, Nov. 7, 2017)



Photo: ©iStock/RoBeDeRo

## For back pain, telehealth cognitive behavioral therapy matches in-person treatment

Cognitive behavioral therapy for low back pain delivered by phone had similar results to in-person treatment, in a study by VA San Diego Healthcare System researchers. Patients with chronic low back pain participated in eight weeks of either cognitive behavioral therapy over the phone or in-person supportive care. Both groups showed similar levels of pain improvement. Both also had strong participation. The results show that telehealth approaches to psychotherapy could be useful in treating pain. (*Clinical Journal of Pain*, Sept. 1, 2017)



Photo: ©iStock/fstop123

## Electronic trigger detects mammogram follow-up delays

An electronic trigger was effective at detecting delayed follow-up after an abnormal mammogram result, found Michael E. DeBakey VA Medical Center researchers. The researchers used a computer algorithm to search electronic health records for abnormal mammogram results with no noted follow-up. Looking at more than 2,000 records, the algorithm had 71 percent accuracy for detecting follow-up delays. The results suggest that electronic triggers could help track

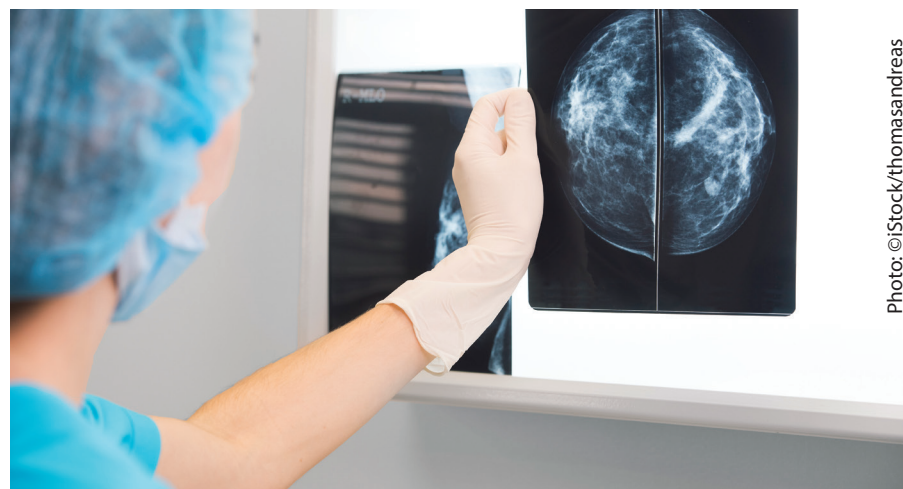


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and reduce missed opportunities to act early for treatment, according to the researchers. The results also show that delayed follow-ups continue to be a problem for some despite federal laws requiring patient notification of mammogram results within 30 days, they say. (*Journal of the American College of Radiology*, Nov. 1, 2017)



## Small, dense cholesterol particles linked to lower death risk

Patients with a pattern of small, dense LDL cholesterol particles had a lower risk of death after a heart attack than those with large, buoyant particles, found a study including a researcher from the Michael E. DeBakey VA Medical Center. Doctors have long known that higher LDL cholesterol levels can put people at risk for cardiovascular problems such as heart attack. In the new study, researchers found a 32 percent lower risk of death after a heart attack for patients with small, dense LDL particles in their blood stream, compared with patients with larger, buoyant particles. Despite the interesting findings, the researchers caution that more research is needed to figure out what causes this association. In the meantime, treatment after heart attack should continue to focus on lowering overall LDL cholesterol levels, they say. (*Journal of Clinical Lipidology*, Oct. 3, 2017)



## New cholesterol drug not cost-effective

Adding a PCSK9 inhibitor to statin therapy for high cholesterol is not cost-effective, found a study including a Michael E. DeBakey VA Medical Center researcher. PCSK9 inhibitors have been available since 2015, but are not widely used because of the cost and the newness of the drug class. Using a statistical model for a theoretical group of patients, based on the existing medical literature, the researchers deter-

mined that adding a PCSK9 inhibitor drug to a statin would typically reduce LDL cholesterol by 59 percent, and adverse cardiovascular events (such as stroke and heart attack) by 15 percent per year. However, the drug is very expensive: \$14,300 per year. This price equates to a cost of almost \$500,000 per quality-adjusted life year, an economic measure of disease burden that takes quality of life into account. The normal cost the market is willing to pay per quality-adjusted life year is \$100,000. The price of PCSK9 would need to be lowered by 62 to 83 percent to become cost-effective, according to the researchers. (*JAMA Cardiology*, Oct. 18, 2017)





Army Veteran Gary Lucas navigates a hurdle exercise with the help of study coordinator Lydia Paden.

## Stepping up their game

**Innovative studies at Baltimore VA aim to build balance, mobility, strength in seniors.**

**I**f you're up in years and don't get around so well anymore, take heart from a group of seniors at the Baltimore VA Medical Center.

These older Veterans are making strides—literally—in their ability to move about, stay balanced, prevent falls—and get up from a fall if they do have one.

They're part of a research program that has been evolving over the past 15 to 20 years. It's based at the Geriatric Research, Education, and Clinical Center at the Baltimore VA Medical Center—one of 20 such centers throughout the VA system. Support comes from VA, the National Institute on Aging, and other sources.

Much of the research takes place at an annex a few blocks from the hospital in downtown Baltimore. Visit here on a weekday morning and you'll find a group of aging Veterans working out on machines and doing a variety of movement drills, under the watchful eye of exercise physiologists.

But it's not your typical neighborhood gym, or even your standard medically supervised exercise program. There's rigorous science driving the action. The researchers want to learn the safest and most effective ways to build, restore, and preserve mobility—and thus independence—for these men and women who wore the uniform, some from as far



back as the Korean or even World War II era.

Talking about his team's newest study, Dr. Les Katzel says: "The age range for the study is 60 to the 90s. There's no upper age limit. We believe everybody should be exercising. And it's never too late to try and prevent falls."

The Veterans targeted in the new study not only have mobility problems, they are also considered obese. They have a body-mass index, or BMI, of 30 or higher. That translates, roughly, into 30 extra pounds or more. The obesity prevalence among VA patients overall tops 40 percent, according to a 2017 study.

To the casual observer, some of the participants in the GRECC study barely look overweight, let alone obese. Katzel asserts that "given the marked secular [general] increase in obesity over the past two decades, we are so used to seeing obese individuals that in some ways it has become the new normal, and appearances are deceiving."

And it's not just the extra pounds. For most of the group, it's also low muscle mass. The combination, which Katzel calls a "double whammy," is known as sarcopenic obesity.

"We have to improve their strength and function, and help them get some of the weight off, while preserving muscle mass," explains Katzel.

### Multiple health challenges

Most of the Vets in the study are coping with other health challenges too: diabetes, high blood pressure, clogged arteries, depression.

"On average the people coming into the program have 10 to 15 active medical problems," notes Katzel. "They are taking 15, as many as 30 medications a day."

Many have begun using assistive devices to get around, such as walkers or canes. Some have been prescribed the devices but resist using them, thus raising their risk of falls.

**"We believe everybody should be exercising. And it's never too late to try and prevent falls."**

The research team is undaunted. Katzel says most past studies on geriatric mobility have excluded this population. His group is seeking them out. Some of the seniors are on the verge of being homebound, and even getting to the annex three times a week for the year-long study is a challenge. Notwithstanding the logistics hurdles, the study aims to enroll up to 120 Veterans in all.

Katzel says the GRECC exercise program, over time, has worked with increasingly more challenging populations of Vets, in terms of their health issues.

"When we first started years ago, with a GRECC clinical demonstration project, we tended to focus on really healthy older adults"—athletes, essentially. (One extreme example: His team has published findings on a runner they followed for several years, and who by age 91 had completed an amazing 627 marathons and 117 ultra-marathons.)

"Then, over the years," continues Katzel, "we focused on certain diseases and their impact on mobility—stroke, peripheral arterial disease, heart failure, Parkinson's, and HIV. In this population [enrolled in the new study], along with the mobility problems and obesity, they have a lot of orthopedic issues."

So how do you go about boosting mobility in such a challenging population?

The researchers use what they call a "multimodal balance intervention," or MMBI. The emphasis is on improving balance and side-to-side movement, and building strength in the legs and core, through a variety of specially designed exercises.

"One thing we've recognized over the years," says Katzel, "is that if you put someone on a treadmill or a bike, that's good, it's certainly better than nothing, but it doesn't really help them in a lot of other areas, like lateral movement. It's also clear that these folks have markedly decreased strength in their legs. They have particular difficulty getting out of a chair, for instance.

Continued on next page



Photo by Mitch Mirkin

Roger Bergeron, who served in the Navy, works his hip abductors as exercise physiologist Katie Dondero adjusts the machine settings.

The multimodal program combines having lateral movement, strength training, balance exercise, and some other things to address these multiple deficits.”

Katzel’s colleague Dr. Odessa Addison, a physical therapist by training, adds, “MMBI tries to get them to move in all planes of movement, to use all their muscles.”

Half the enrollees are also receiving weekly nutrition sessions and individualized diet plans, with the goal of helping them lose 10 percent of their baseline weight. The researchers are comparing this group to



Photo by Mitch Mirkin

One obstacle-course exercise has the Veterans walk over an uneven pile of mats that simulates risks in the home—such as changes in floor textures and heights, or area rugs—that could present fall risks.

the exercise-only group as the study progresses. They will look at outcome measures such as distance walked in six minutes, aerobic endurance, body composition, quality of life, and ability to perform activities of daily living.

### Lively group exercise at the gym

After a medical check-in at each session, the participants get moving.

“Step to the side, bounce and catch! Step to the side, bounce and catch!” That’s the instruction from exercise physiologist Katie Dondero as she demonstrates the motion at one of a handful of stations in the MMBI classroom session. The Vets follow suit, bouncing a blue ball on the floor and catching it, and continuing the drill as they shift left and right.

They move from station to station during the 30-minute session, dance music pumping in the background.

At one corner, they step over a series of yellow mini hurdles.

“This involves step planning,” explains study coordinator and exercise physiologist Lydia Paden. “We want to make sure they pick up their feet and watch out for the obstacles in front of them.”

**Read more at [www.research.va.gov/currents](http://www.research.va.gov/currents) ★**



## MVP data leads to new finding on ‘resistant hypertension’



Dr. Adriana M. Hung meets with patient Rodney Stewart at the Tennessee Valley Healthcare System.

Using data from the Million Veteran Program, VA researchers found that a blood pressure condition called resistant hypertension can increase the risk of cardiovascular problems and kidney failure.

Resistant hypertension is “a condition that increases cardiovascular risk in a tremendous way,” says Dr. Adriana M. Hung, one of the study’s lead investigators. Her group focuses on kidney disease and the impact of high blood pressure and diabetes on kidney function.

The study team included researchers from the Memphis and Nashville VA medical centers. They presented their findings earlier at Kidney Week 2017, a conference hosted by the American Society of Nephrology.

The researchers relied on MVP data. They identified more than 27,000 Veterans with resistant hypertension. Resistant hypertension is high blood pressure that remains above 140 over 90 even when the patient is taking three blood pressure drugs. Patients whose blood pressure has been lowered below this threshold using four or more drugs are also considered to have the condition.

The researchers compared these patients to a group of over 268,000 Veterans with high blood pressure but not resistant hypertension. They found that those with resistant hypertension had a 23 percent higher risk of heart attack than those without. They also had a 31 percent higher risk of stroke. The resistant hyper-

tension group had a whopping 144 percent higher risk for end-stage renal disease, or kidney failure. The condition was not associated with higher risk of death, however.

According to the researchers, better blood pressure control could lower the risk of heart attack and stroke for those with resistant hypertension. More research is needed to explain how this condition is connected to kidney failure, they say.

The team is continuing this research by studying the genetic basis of resistant hypertension. They aim to use MVP data to identify genetic targets that can be treated with medication to better rein in high pressure.

MVP, now with well over 600,000 Veterans enrolled, is one of the world’s largest databases of health and genetic information. ★



Photo courtesy of Christopher Brown

## Down on the farm

The organization **Growing Veterans**, which gets participants involved in agriculture, provides a peaceful and therapeutic experience that can help Veterans reintegrate after deployments.

**T**o Christopher Brown, a PTSD counselor at the Bellingham Vet Center in Washington state, there are two main degrees of suicide ideation—or thoughts of taking one’s own life.

On the subtle end, he says, are “fleeting thoughts where maybe things will be better if I just don’t wake up in the morning.” To a more extreme degree, “There’s a plan in place, a means, and I’m going to [die by suicide] if I don’t go somewhere to keep myself safe,” he says.

Brown speaks from personal experience. He’s a Marine Corps Veteran who has battled PTSD after doing two tours in Iraq and one in Afghanistan. During a 2007 enemy attack on his base in Al Anbar Province in Iraq, he suffered a traumatic brain injury due to a truck explosion and a bullet wound to the leg.

“I have been on that really subtle end where things just felt so low and so hopeless,” he says. “I remember saying to myself that if this is how people feel for an extended period of time, then I kind of understand why they would feel motivated to end their life. Fortunately, I had a really solid support system in place, and I was able to get out of that pretty quickly.



“That experience has helped me be more empathetic and compassionate to the Vets I work with when I’m having those difficult conversations with them,” he adds. “I know where they’re at, and I kind of know what they need to hear to help them see the light at the end of the tunnel.”

In addition to his work at VA, Brown is president and co-founder of an organization that helps Veterans see that light: Growing Veterans. Its goal is to end the isolation that can lead to Veteran homelessness, divorce, depression, or possibly suicide.

### A ‘therapeutic value’ for Veterans

Growing Veterans encourages Vets to work on its farms in Washington state between Puget Sound and the Cascade Mountains. There, they grow food and plants to support local and sustainable agricultural efforts. At the same time, they can congregate, vent among each other about challenges in re-acclimating themselves to society, and build camaraderie and a peer support system. While working in the fields, they could be discussing feelings of loneliness or suicidal thoughts.

The organization also creates opportunities for professional development. Vets considering agriculture as a career are taught valuable farming skills and are connected with resources that allow them to start farming.

The volunteers in Growing Veterans are mostly men who deployed to Iraq and Afghanistan. There are also women, plus Vets from other eras. Non-Veterans can volunteer, too. In 2016, the organization hosted 350 volunteers, grew more than 45,000 pounds of food at three farm sites in Washington (Mount Vernon, Lynden, Auburn), and donated more than 11,000 pounds of food to food banks and families.

In Brown’s view, Growing Veterans has a “therapeutic value” for Veterans who are struggling emotionally. It’s more of a suicide prevention, not a suicide intervention, initiative, he says.

“One of the biggest precursors to suicide is social

isolation, the feeling that there’s no hope and no one out there that can relate to what you’re going through,” Brown says. “By spending time on the farm, we can help prevent that isolation from occurring. Vets are working alongside each other weeding a row in the field and are able to have these difficult conversations without it feeling very difficult. In that regard, it helps prevent suicide.”

Brown knows of three Vets who volunteered for Growing Veterans in a “last-ditch effort to feel something, feel some hope before ending their lives,” he says. “They reported to us that coming out to the farm is what saved them and gave them that hope.”

One of them served in the Army in Afghanistan. He became interested in a specific type of farming, took workshops, and came on as a program coordinator with Growing Veterans. He recently bought a home and has a bright outlook on his future, Brown



Photo by Christopher Brown

A flower arrangement in a military helmet, made to resemble the logo of Growing Veterans.

Continued on next page



In *Growing Veterans*, volunteers can work together or alone, depending, says Christopher Brown, on “what the needs of the farm are that day, as well as what the needs and mood of the volunteer are that day.”

says, noting that “he’s kind of our case model study of what coming out to the farm can potentially do for somebody.”

Growing Veterans is one of many reintegration initiatives that aim to prevent isolation, depression, and suicide among former service members. VA research shows that the suicide risk among Veterans is about 22 percent higher than among other U.S. adults. VA Secretary Dr. David Shulkin has made suicide prevention his top clinical priority.

### Organization leads to improvements in physical, mental health

A VA study published in *Physical Medicine and Rehabilitation* in August 2017 illustrates the potential of Growing Veterans to improve the reintegration process for rural Vets. The researchers found that those who participated in Growing Veterans reported improvements in physical and mental health factors that impact Veteran reintegration.

The Veterans, who harvested food that was sold at a farmer’s market, told of improvements in sleep, nutrition, and exercise, as well as a sense of purpose and mission. They also reported declines in anxiety, pain, depression, and medication and substance abuse.

The study’s lead researcher, Dr. Karen Besterman-Dahan, is a medical anthropologist at the Center of Innovation in Disability and Rehabilitation Research at the James A. Haley Veterans’ Hospital in Tampa, Florida. She says little research has been done on the subject of Veteran reintegration via agricultural work.

She and her team weren’t surprised that Growing Veterans made such a positive impact. But they were amazed at how well-received the program was, she says. They reached their conclusions through surveys, interviews, and site visits.

“It’s great so see the survey results, but it’s even more impressive when you’re sitting and talking with people and when you’re there watching it,” Besterman-Dahan says. “During our site visits, it was quite something to hear accounts from people who said how joining Growing Veterans really was a life-changing event for them. This was validated much later on when we were doing our Farmer Veteran Coalition study. We heard this time and again, how farming saved their life, or how joining these organizations saved their life.”



**Read more at [www.research.va.gov/currents](http://www.research.va.gov/currents) ★**



# VA scientist mentors pair of former Marines in biomedicine, with goal of creating artificial heart

In addition to having the same first name, Nick Mezak and Nick McMenemy both served their country in the Marines. In fact, they spent time together in a Marine expeditionary unit in Japan, Singapore, and the Philippines, and depended on each other “countless times,” as one of them put it.

They have other things in common, too.

For one, both have experience conducting research in the lab of Dr. Ngan Huang, a biomedical engineer at the VA Palo Alto Health Care System in California. The research is centered on cardiovascular tissue engineering, a way of creating artificial pieces of blood vessels and heart tissue using bioengineering principles. The goal is to build a biological heart with human stem cells, a feat the medical community has been striving for to offset the shortage of donated organs and assist those in need of a transplant.

Mezak, 32, has interned in the lab for more than three years. He has pursued research that involves creating three-dimensional scaffolds that organize the structure of engineered tissues.

He uses a technique called electrospinning to make the scaffolds. It creates tiny fibers for use in many biomedical and industrial applications, including tissues for treating cardiovascular disease. His contributions have led him to co-author two studies on cardiovascular-related stem cell research, one published in *Biomaterials Science* in July 2017 and the other in *Cellular and Molecular Bioengineering* in August 2017.

McMenemy, 34, has worked in the lab since June as summer intern under a U.S. Department of Education science and engineering program. He has collaborated with Mezak on the creation of three-dimensional scaffolds.

Both are grateful for the opportunity.

“It has allowed me to work alongside and learn from some of the most gifted and passionate scientists in the country,” Mezak says. “Dr. Huang has struc-



Nick Mezak (left) and Dr. Ngan Huang look on as Nick McMenemy tends to a cell culture inside a biosafety cabinet.

ured her lab so that all members work as a team and stay involved in many different projects. The insight from working in the lab has brought a lot more value and practical understanding of my coursework as a bioengineering student.”

McMenemy finds the experience even more fulfilling because of the chance to develop a treatment that could benefit those who, like himself, once served.

“Nick [Mezak] and I are truly dedicated to helping the doctors in the lab be successful in any way we can, and hopefully we can help save someone’s life someday,” he says. “The fact that we might be able to save a fellow Veteran’s life makes our research all the more important to us.”

## Local college helps Vets transition to professional life

After serving in the Marines, both men began their undergraduate studies at Cañada College, a community college in Redwood City, California. The school has a large Veteran student body and offers much support for returning service members, encouraging them to network and hone their leadership skills in the community. In 2014, Huang gave a presentation about her lab’s research to Veteran students at Cañada, piquing Mezak’s interest in working under her auspices.

**Read more at [www.research.va.gov/currents](http://www.research.va.gov/currents) ★**



Dr. Mascha van't Wout-Frank, a neuroscience researcher at the Providence VA Medical Center in Rhode Island, demonstrates transcranial direct current stimulation with her colleague Dr. Noah Philip.

## Brain stimulation technique shows promise in reducing fear in Veterans with PTSD

VA researchers say a non-invasive technique called transcranial direct current stimulation may help lessen PTSD symptoms. Further testing is planned.

**V**A researchers say a non-invasive electrical brain stimulation technique may improve the ability of a person with PTSD to remember that certain situations are no longer dangerous.

The findings appeared in a study published in *Brain and Behavior* in May 2017.

The technique—transcranial direct current stimulation (tDCS)—has been tested experimentally to help treat a range of conditions, including depression, schizophrenia, stroke, obsessive-compulsive disorder, and chronic pain. But this is the first study to evaluate whether tDCS may improve the ability of Veterans with PTSD to withstand potentially fearful moments, according to the lead investigator, Dr. Mascha van't Wout-Frank, a neuroscience researcher at the Providence VA Medical Center in Rhode Island.

One of the core problems with PTSD is the inability to escape fearful thoughts, such as a flashback of a buddy being killed in combat. Such thoughts can help fuel PTSD symptoms, which include irritability, anger, nightmares, and insomnia.



“Prior to this study, we completed a similar study in volunteers without posttraumatic stress disorder with promising results,” van’t Wout-Frank says. “However, given that PTSD has been associated with persistent fear, it was crucial to test these ideas in people with PTSD to see whether our ideas had merit and whether tDCS would have similar effects on these people.”

### Fear measured by sweat on hands

The latest study involved 28 Veterans with PTSD. To test their level of fear, the researchers pursued an experiment based on Pavlovian fear conditioning, in which people learn to anticipate unpleasant events when seeing a neutral stimulus. In this case, the neutral stimulus was colored lights, and the unpleasant event was a harmless but highly annoying electric shock to the fingers.

At first, the research team showed the 28 Veterans colored lights in an office room and simultaneously applied an electrical shock to the fingers. Later, the Vets saw the same colored lights on a bookcase but without receiving an electric shock. The latter sequence is known as extinction learning, the process of learning that certain situations or things no longer predict an unpleasant event.

Fourteen of the Veterans received 10 minutes of transcranial direct current stimulation at the same time they experienced extinction learning. The other 14 underwent tDCS immediately after the extinction learning during a period known as extinction consolidation, when information is being processed to go into memory. Twenty-four hours later, all of the Vets were tested on how well they remembered the elimination of the electric shock.

The results showed that the 14 Veterans who received tDCS during extinction consolidation showed slightly less perspiration on their hands than those who experienced the stimulation during extinction

learning. Van’t Wout-Frank explains that skin conductance, which is basically the amount of sweat on the hands, is often used to gauge emotional arousal. In this case, the sweat begins to increase when the Veterans see the light that predicts electrical shock.

“We take this increase as a measure of fear conditioning and thus how well people have learned and remember that seeing the colored lights may result in an electrical shock,” she says.

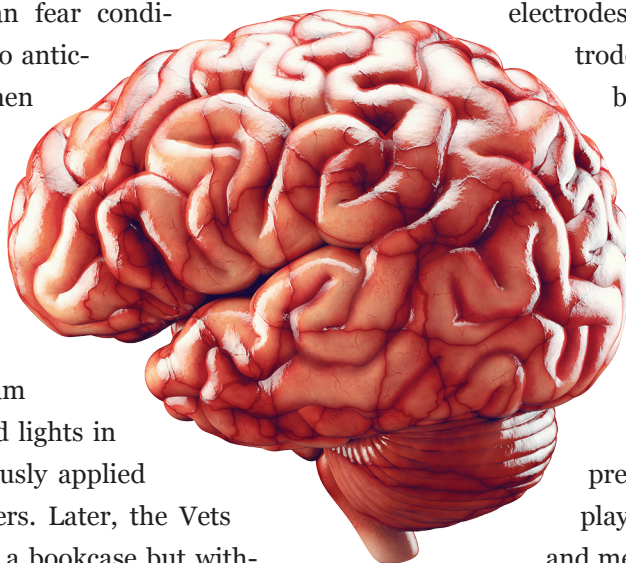
During transcranial direct current stimulation, a low-level electrical current runs through two or more electrodes on the skull. Under the electrode where the current enters the body, neurons become more likely to send signals. Neurons are less likely to generate signals under the electrode where the current exits the body.

The researchers placed the electrode that sends the current into the brain over a region—the ventromedial prefrontal cortex—that is believed to play a key role in extinction learning and memory, as well as PTSD. In doing so, they aimed to make neurons in the ventromedial prefrontal cortex more likely to fire off to see if this could help improve extinction learning or the ability to remember that something no longer predicts an unpleasant event.

“For tDCS to be most effective, it is particularly important to control what the brain is doing during stimulation,” van’t Wout-Frank says. “This is why we applied tDCS when people were doing an experimental task that involved learning or consolidation of learning, which—based on prior research—is associated with neural activity in specific brain regions.”

### ‘Giving the brain a little boost’

Transcranial direct current stimulation is not the only non-invasive electrical brain stimulation technique that has been tested on PTSD patients. Unlike



tDCS, transcranial magnetic stimulation (TMS) has been approved by the U.S. Food and Drug Administration for depression. It has also been explored for conditions including PTSD and traumatic brain injury.

But the two techniques differ, van't Wout-Frank says, in how they alter brain functioning with the goal of changing behavior. TMS makes use of a magnetic field on the skull that causes electrical signals in the brain to be used by neurons to communicate with each other. Essentially, TMS causes neurons to fire, while tDCS can make neurons more likely to fire. The difference is subtle, but one upshot is that tDCS works in collaboration with brain activity that is already going on when people are learning new information that needs to be remembered, she says.

“Think of it as giving the brain a little boost when people learn that the colored lights no longer predict an electric shock and store that learning into memory, so people can better remember that they don’t need to fear the lights any longer,” she says.

Van't Wout-Frank notes that transcranial direct current stimulation can be used with PTSD patients as long as they meet the medical safety criteria. She explains that people with metal in the head, such as shrapnel; electrically implanted devices; or bipolar disorder may not be good candidates for tDCS because it could affect them negatively. She says if a person

meets the safety criteria then tDCS can be combined with existing treatments, such as medication or cognitive behavioral therapy. It is not known if and how certain drugs may influence its effectiveness.

Transcranial direct current stimulation is a relatively safe procedure, but it has side effects. The most common ones are an itchy, prickly, or burning feeling under the electrodes during the stimulation period, with a temporary area of red skin afterward. Moderate fatigue, headache, nausea, and insomnia have also been reported but less often. However, tDCS could be harmful if it isn’t done correctly, and the risk for more serious side effects, such as a burn, may increase, van't Wout-Frank cautions.

Technically, anyone can build a tDCS device from materials found in stores, but “putting this on your head without knowing the safety concerns or [electrical] intensities is not recommended,” she says. The tDCS devices that are available online may be better designed for home use, but one should still be cautious when deciding stimulation duration, frequency, and location on the head, she notes.

### ‘Don’t try this at home’

“I would therefore strongly urge everyone not to try this at home without proper guidance from a clinical or research team, even though one could easily find online videos of people doing just that,” van't Wout-Frank says. “With tDCS, it is important to know where you want each electrode to be in order to stimulate the brain in the intended way. Also, how long you will stimulate and with what intensity is important to avoid side effects and obtain the intended effects.”

The researchers on her study call for further testing of tDCS to learn if it can be applied clinically to improve the ability of Veterans with PTSD to shed fear. She hopes to explore whether the technique can be paired with trauma-based exposure therapy, which she calls the “current gold standard for PTSD treatment.”

**Read more at [www.research.va.gov/currents](http://www.research.va.gov/currents) ★**



Photo by Kimberly DiDonato-Ferro

In one phase of the study designed to measure fear conditioning, participants received a mild electric shock on the fingers while viewing a neutral stimulus.



## Program improves cognition, psychiatric symptoms but falls short on employment front

A study shows that a form of cognitive training has the potential to improve thinking ability, psychiatric symptoms, and quality of life in people with severe mental illnesses, such as schizophrenia, bipolar disorder, and major depressive disorder.

However, patients who received the cognitive training fared no better with regard to work outcomes, compared with a group that did not receive it.

The findings appeared in *Schizophrenia Research* in August 2017.

The study focused on Compensatory Cognitive Training (CCT), a program that teaches strategies to improve memory, attention, learning ability, and problem-solving skills. It has been used with Veterans and non-Veterans, mostly to compensate for the cognitive difficulties often observed in people with severe mental illnesses or other brain disorders, such as traumatic brain injury (TBI).

Cognitive impairment is common and persistent in people with severe mental disorders.

Dr. Elizabeth Twamley, of the Center of Excellence for Stress and Mental Health at the VA San Diego Healthcare System, led the research. She says this was the first study to gauge the impact of CCT on people with mood disorders such as depression and bipolar disorder, including with respect to their employment possibilities.

“The good news from our study is that CCT was associated with improvements in cognition, depressive symptoms, and quality of life,” Twamley says. “CCT was not associated with work outcomes, but this may have been due to the fact that the two study groups used different employment specialists. I still believe that high-quality cognitive training interventions that improve cognition should improve long-term employment outcomes, but we will need to demonstrate that empirically in another study.”

### Cognitive program helps patients remember daily tasks

Twamley is also a professor of psychiatry at the University of California, San Diego. Her research focuses on applying neuropsychology to strategies that help people with cognitive impairments.

About 15 years ago, she began developing and testing Compensatory Cognitive Training. The 12-week program is not based on repetition like some other cognitive initiatives. Instead, it teaches people with cognitive deficits how to use strategies to improve thinking and memory. Specialists work with patients as they practice and try to make tasks instinctive in their daily lives, including in the workplace.

Read more at [www.research.va.gov/currents](http://www.research.va.gov/currents) ★



VA employment specialist Laurie Arnold (left) works with Veteran Julian Cook, who suffered a TBI in Iraq.



Photo courtesy of Matthew Smith

Matthew Smith (fourth from right) joins other Veterans and first responders who were recognized at an Oct. 21 college football game at California Memorial Stadium for helping the state combat wildfires. Smith helped transport supplies to field hospitals that were set up in Santa Rosa, and arranged for infectious-disease experts from UC-Berkeley to speak with patients

## Navigating the college experience

**Veterans face challenges in higher education not seen by other students.**

When asked how he's doing, Matthew Smith is quick and to the point.

"I'm living the American dream," he says. "I'm an American, and I go to college."

Smith, a Marine who did two tours in Iraq and fought in the second battle of Fallujah in 2004, is a senior at the University of California, Berkeley. He majors in social welfare and has a grade point average of 3.66. Having battled PTSD, he is aiming for a career focused on counseling Veterans to help them overcome struggles in life.

Smith is one of nearly 3 million post-9-11 service members who have returned home. About a third of them are attending college using U.S. government benefits as part of their transition back to civilian life.

The college experience presents challenges for Veterans unlike those facing traditional students. Researchers have found higher rates of health-risk behaviors, such as substance abuse, and psychological disorders, such as PTSD, among Vets in college, compared with their peers without military experience. Studies have also cited problems for Veterans in adjusting to campus life and interacting with students.

One of the more informative studies appeared in January 2017 in the *American Journal of Orthopsychiatry*. The study not only identifies and elaborates on the potential difficulties that Vets face in higher education, but also makes recommendations for facilitating their successful integration. The research focuses on post-9-11 Vets.



Dr. Brian Borsari, a clinical psychologist at the San Francisco VA Health Care System, was the study's lead researcher. He became inclined to pursue the research when he worked in the PTSD clinic at the Providence VA Medical Center in Rhode Island from 2007 to 2013.

"At the Providence VAMC, I was struck by the number of student Veterans with significant PTSD symptoms in my caseload who were trying to enroll and attend school," he says. "I was also alarmed by the number who would drop out or do very poorly. This led me to check with a number of schools in the area to learn more about any coordinated approaches to enhancing the odds that student Veterans could succeed. I discovered tremendous variability in the services that were offered from campus to campus and the near lack of systematic research on the topic."

He adds: "Given my previous research examining brief interventions for alcohol use with college students and my current position as a staff psychologist in VA, this seemed like a good opportunity to review the literature and highlight some pressing issues and needs for the student Veterans who were returning to campus."

### **Non-Veteran students 'lack knowledge of history'**

Borsari and his team reviewed 130 articles with details on Veterans in higher education. About half of the articles were peer-reviewed manuscripts. The other half appeared in government, trade association, and commercial publications.

Among the difficulties Vets could face on campus, according to Borsari and his team, is "intrusive or unpleasant" interactions with their non-Veteran peers, who may ask whether the Veteran killed someone while deployed.

"Veterans often report difficulty connecting socially with traditional students, who are less likely to have firmly established vocational, social, and family roles,"

the researchers write. "Beyond the perception that traditional students are just 'kids,' the military has been a way of life for [Veterans], and the less-structured role as a student may not be as familiar."

Smith, for one, sometimes finds it hard to converse with others on campus and in class. At 33, he's at least a decade older than most of the students at UC-Berkeley and has a view of the United States, the military, and global affairs that is not shared by many of his fellow students. That disconnect frustrates him.

Case in point: After more than 300 people were killed in a recent terrorist attack in the Somali capital, Mogadishu, Smith heard a student say the U.S. is responsible for doing something about the attack. Smith responded that in 1993 the U.S. engaged in a battle in Mogadishu that left 18 Americans dead and became known as "Black Hawk Down." He believes many students who haven't served lack knowledge of history and a sense of when it is right to carry out a military intervention.

"I didn't experience what the American soldiers did in Somalia, but I have been shot at and blown up," he says. "I've seen what it costs to try to go over there and do these interventions. Your average American doesn't know that. They know these interventions happened. But there's no way they could know exactly what it's really like. Unless you really know the cost, you can't understand it in the moment."

Another post-9-11 Veteran, Christopher Brown, concurs with Smith. Brown, a Marine who did tours in Iraq and Afghanistan and like Smith was diagnosed with PTSD, earned degrees from Western Washington University and the University of Washington.

Brown says there's an ideological divide between Veterans and non-Veterans in college that could be dangerous to former service members with mental health conditions.

"The United States—whether we want to believe it or not—we are warriors to a degree, and we're still in

**One survey found that 37 percent of part-time and 16 percent of full-time Veterans dropped out within nine months of enrollment.**

the largest wars to date,” he says. “The problem is that only 1 percent of the population is shouldering those wars.

“In the past, the Native Americans perceived their warriors as highly respected, esteemed members of the community,” he adds. “But it’s not that way today. That speaks to the tension that many Vets experience in college. That’s the underlying cause that leads them to not want to participate in discussions in the classroom. I know a lot of Veterans who have tried to have those discussions and were just overlooked and avoided. That leads to potential isolation, which can exacerbate the condition of a Vet with PTSD.”

### Vets can find logistical challenges ‘overwhelming’ in college

Many Veterans in college confront mental health conditions, such as PTSD, anxiety disorders, and depression, according to Borsari’s study. It notes, however, that findings among college students are mixed as to whether those disorders occur at much higher rates in Veterans than non-Veterans. Suicide attempts and thoughts, substance abuse, and physical disabilities are also concerns among student Vets. Plus, Veteran students may still have active-duty status, leading to redeployments that cause disruptions in education, including a loss of scholarships and course credits.

The researchers also say Veterans may find logistical challenges to be “overwhelming” in the switch from military to college.

“Because a large number of [Veterans] enlist in the military as emerging adults and spend a number of years in the strict and structured environment of the military, they may be less skilled at navigating available services outside the context of the military setting,” Borsari and his team write.

These problems could include not understanding how to use services such as the Veterans Benefits



Photo by Matthew Smith

Matthew Smith in Haditha, Iraq, in 2006.

Administration, which provides financial and other aid to Veterans and their dependents. They may also have trouble managing education-related finances and could be late on tuition payments.

Retention is another problem. A survey cited in the study found that 37 percent of part-time and 16 percent of full-time Veterans dropped out within nine months of enrollment. Generally, retention rates are lower among student Veterans compared with non-Vets, but factors such as the type of school and major can make it a difficult comparison.

There’s also the transition to open campus life after experiencing a more rigid military lifestyle.

“Specifically, the military often uses a standardized, stepwise, and ‘hands on’ approach to teaching a skill, which is different from the more autonomous approach typically used on college campuses,” the researchers write.

**Read more at [www.research.va.gov/currents](http://www.research.va.gov/currents) ★**



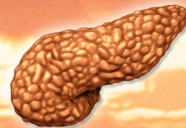
# Service-connected Vets' use of VHA care

VA researchers examined the records of 4,029,672 Veterans who had an active award status for service-connected conditions in October 2016.

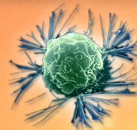
**52%** of those with service-connected conditions used VHA health care.



More than **65%** of those with major depression, PTSD, Agent Orange exposure, or diabetes used VHA care.



**76%** of those with a 100% disability rating used VHA care.



Almost **33%** of users of VHA care were compensated for PTSD.



**Conclusion:** "Veterans with service-connected conditions, particularly those with diabetes or mental illness such as depression or PTSD, depend heavily upon VHA for health care, including mental health services."

Source: ["The Burden of Mental Illness Among Veterans: Use of VHA Health Care Services by Those With Service-connected Conditions,"](#) *Medical Care*, November 2017. Infographic by VA Research Communications, November 2017. Photos © iStock





Dr. Joshua Lipschutz in 2005 while serving at Camp Liberty in Baghdad, Iraq, at a forward support hospital under the command of the 3rd Infantry Division.

## VA Researchers Who Served: Dr. Joshua Lipschutz

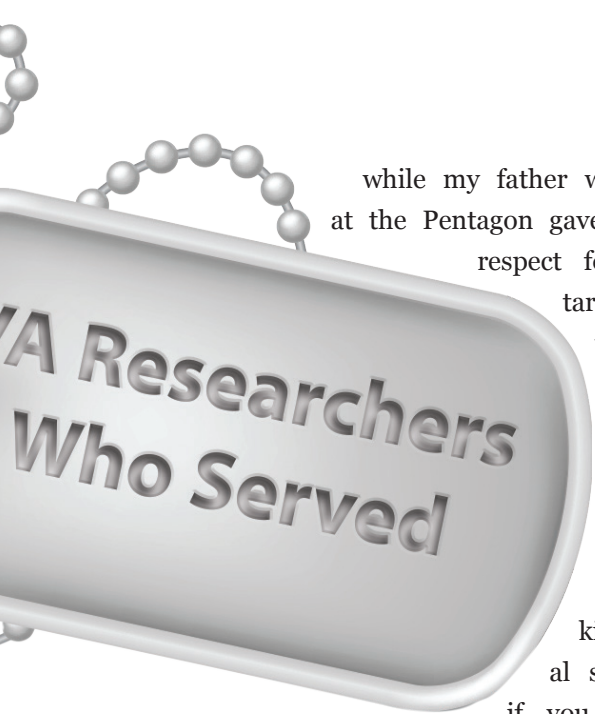
### Ralph H. Johnson VA Medical Center

**D**r. Joshua Lipschutz is a nephrologist at the Ralph H. Johnson VA Medical Center in South Carolina and the renal division director at the Medical University of South Carolina. As a specialist in kidney care, he treats disorders of the kidney, high blood pressure, and mineral balance and dialysis of body wastes in failing kidneys. He also takes care of patients prior to and following kidney transplantation. He's now doing extensive research on autosomal dominant polycystic kidney disease, or ADPKD as it is commonly known. It's a potentially lethal kidney disease that affects many Veterans and for which there are no approved treatments in the United States. Lipschutz is also an Army Veteran and a colonel in the South Carolina Army National Guard. He's excited about the chance to improve the lives of others who have served.

#### What drove you to military service?

I had always wanted to serve, and 9-11 just propelled me to be in the military. It was something I had to do. When 9-11 occurred, I just felt that I had to help out. Two days after the attacks, I submitted my application to the Pennsylvania Army National Guard. I also volunteered to help in the recovery efforts after the attack in New York City, but the victims were either dead or had minimal wounds. At the time, I was working at the University of Pennsylvania and the Philadelphia VA as a physician and scientist. Having been born at Walter Reed National Military Medical Center





while my father was stationed at the Pentagon gave me a deep respect for the military. I believe that everyone should serve their country, and I would strongly support some kind of national service. Even if you don't want

to serve in the military, perhaps you could work at a hospital or help teach in the inner city.

#### **What inspired your research career?**

I was inspired by my father, who was my mentor. He was a very successful chemistry professor at Purdue University in Indiana. My constant enjoyment for "discovering things" also led me to want to be a researcher.

#### **Describe your military service. When and where did you serve? What did you do?**

I was deployed to Iraq in 2005 and served at a troop medical clinic in Baghdad. I was in Afghanistan from 2007 to 2008 and served at a small firebase under the command of the 82nd Airborne Division. I also served at wounded warrior transition units in Huntsville, Alabama, in 2010 and in Salt Lake City in 2014. In addition, I've been part of medical detachment units in the Pennsylvania Army National Guard and the South Carolina Army National Guard.

#### **You've earned a number of medals for your military service, including the Army Commendation Medal (three times) and the Global War on Terrorism Medal. What do these medals mean to you?**

The medals are from all of my deployments. I feel good that I have been able to help our soldiers, some of the finest people I have ever met.

#### **What type of research are you involved in? How does your work contribute to science or health care? How does your work potentially impact Veterans?**

I study autosomal dominant polycystic kidney disease. ADPKD is the most common potentially lethal genetic disease to affect humans. Some 100,000 Veterans, active duty soldiers, and their dependents have ADPKD. The researchers at my lab, which is funded by the National Institutes of Health and a VA merit award, study ciliogenesis. Cilia are thin hair-like organelles that project from the cell surface and are chemo and mechano sensors. Though it has been known for 100 years that renal tubule cells have cilia, up until 15 years ago it was assumed that the cilia were vestigial organelles, kind of the appendix of organelles. We now know that this is not true. My lab has, among other things, identified a highly conserved protein complex called the exocyst that is necessary for ciliogenesis.

**Read more at [www.research.va.gov/currents](http://www.research.va.gov/currents) ★**



Dr. Joshua Lipschutz is a nephrologist at the Ralph H. Johnson VA Medical Center in South Carolina.



# RESEARCH CURRENTS

Research News from the U.S. Department of Veterans Affairs

## Blister packaging improves medication adherence



Psychiatric patients are more likely to take their medications correctly when it is given in blister packaging, found a study by the Rocky Mountain Mental Illness Research, Education and Clinical Center at the Denver VA Medical Center. Blister packaging consists of individual doses of pills in plastic bubbles with a foil backing, similar to how cold medication is often packaged. Study participants who received blister packaging were 59 percent more likely to follow their medication instructions than those who received medication in standard pill bottles. The results suggest that using this kind of packaging could improve treatment outcomes for psychiatric patients, said the researchers. (*Journal of Psychiatric Practice*, September 2017)



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