Points of Excellence

The Newsletter of the VISN 17 Center of Excellence for Research on Returning War Veterans

Dr. Steven Nelson, Chief of the Neuroimaging Core, in front of the MRI scanner

The VA VISN 17 Center of Excellence for Research on Returning War Veterans is dedicated to conducting research that serves to improve the quality of life of our nation's Veterans and foster the wellbeing of their families.
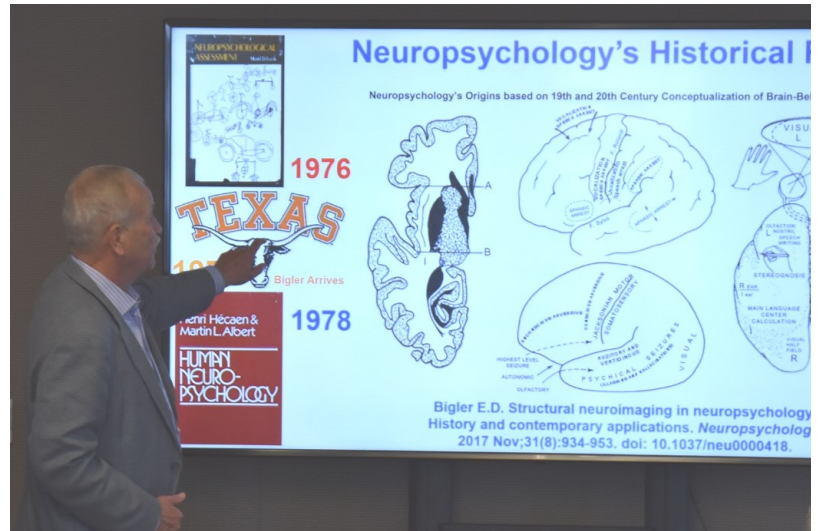
Editor: Richard Seim, PhD

Co-Editor: Laura Zambrano-Vazquez, PhD

Photography: Lisa Shafer, Richard Seim

Content Authors: Christina Hejl, Laura Zambrano-Vazquez

INSIDE THIS ISSUE

CoE Hosts Leading Neuroscience Experts

In September, the Center of Excellence hosted a conference funded by the VA's Office of Research and Development for some of the nation's leading experts on advanced treatments for posttraumatic stress disorder (PTSD) and traumatic brain injury (TBI). The meeting brought together representatives from different scientific disciplines, such as biology and neuroscience, with the goal of innovating biologically-based treatments. Transcranial magnetic stimulation (TMS) and magnetic resonance imaging (MRI) were technologies prominently discussed by the attendees.

Dr. Erin Bigler from Brigham Young University presents his research at the Precision Neuroscience Meeting

TMS uses short pulses of magnetic fields to stimulate nerve cells in a brain area associated with emotional processing. Although TMS has been FDA-approved for treating depression, its impact on PTSD symptoms is an emerging and promising area of research. By uniting TMS, MRI, and basic science researchers, the conference emphasized how these technologies can be integrated to individualize treatment and more precisely target and stimulate the areas of a Veteran's brain that are affected by PTSD and TBI.

Researchers from different fields came together to work on how diverse technologies can be integrated to promote individualized treatment

Over 30 leaders of the field from numerous prestigious universities and VA research centers attended the two-day conference. Dr. Steven Nelson, Core Chief of the Neuroimaging Core, stated that this meeting represents an important milestone in the CoE's continued growth in prominence as a hub of brain-research and could play a key role in revolutionizing how we treat PTSD. "It was an honor for us to welcome some of the best neuroscientists in the country," he said, "We are excited about the connections we were able to build which mark the beginning of research collaborations that will lead to important scientific endeavors." As a result of this conference, several cross-institutional grant efforts, research publications, and white papers are under development. Dr. Nelson concluded, "This meeting was a crucial step in generating individualized brain-based interventions for PTSD and TBI in line with our ultimate goal of providing better care for our Veterans."

Building a Statistical Path Towards Individualized Medicine

Dr. A. Solomon Kurz

As 21st century healthcare moves closer and closer to an individualized medicine approach, the VA is developing ways to better assess and measure outcomes to complement this strategy. Unfortunately, we are often limited by statistical methods that require large sample sizes and ultimately do not allow us to track changes in a specific individual over time. In their recent study published in the *Journal of Contextual Behavioral Science*, Dr. Solomon Kurz, a CoE postdoctoral fellow, and his colleagues describe an innovative method to analyzing longitudinal data at the individual level.

To date, research methods have largely focused on identifying patterns that summarize how a group behaves (e.g., the average decrease in symptoms of depression in Veterans after treatment). These methods have been crucial in helping researchers and clinicians describe, explain, predict, and treat problems, largely informing many of our current psychological and medical treatments. Nonetheless, these methods can also lead to distorted conclusions of what is happening at the individual level, thus negatively impacting care. For instance, analyses could suggest that, on average, treatment "x" reduces symptoms of depression, yet fail to recognize that, for a subset of Veterans, it leads to a worsening of symptoms. Providers, then, could wrongly assume treatment "x" works the same for everyone and unknowingly fail to deliver optimal care to some of these Veterans. Therefore, in addition to understanding the average responses, it is also important to have methodological approaches that allow us to understand changes at the individual level. This is consistent with recent efforts to provide Veterans with an individualized medicine approach, which considers each patient's symptoms as unique to them and aims to provide treatments designed to meet their individual needs. Recognizing the importance of both approaches, the field has been calling for a method that can serve as bridge between group and individual statistical analyses by integrating the advantages of both.

Dr. Kurz and colleagues suggest that the *dynamic p-technique* may be the solution for this systemic problem. The dynamic p-technique is a factor analytic statistical approach for multivariate individual-level analysis employing a structural equation modeling framework. This approach can allow researchers to test the influence of multiple variables at the individual level while at the same

Novel statistical approaches can bridge group and individual analyses to advance individualized medicine

time being able to scale back to larger group generalizations. Because, relative to other statistical frameworks, this technique has the unique strength of allowing for analyses across the full spectrum of single-case data, small-n data, and large-scale group data, the dynamic p-technique could be an ideally-suited approach to bridge the advantages of both group and individual level analyses. This work, which has already received national attention, may be an important foundation as the VA helps advance the individualized medicine approach to provide optimal comprehensive healthcare.

Welcome our New Postdoctoral Fellow

Dr. Austen Anderson received his Ph.D. in Counseling Psychology from the University of Miami after completing a predoctoral internship at the Central Texas Veterans Health Care System. During his internship, he completed a research-focused rotation with our Implementation Sciences Core which drove him to pursue a postdoctoral fellowship at the CoE. He is interested in how lifestyle behaviors, friendships, and character strengths impact mental health and well-being, and he is eager to explore how these factors interact in Veterans. "As indicated by the VA's Whole Health initiative," Dr. Anderson says "Veterans' physical and mental health treatment could be strongly supported by a focus on evidence-based approaches for lifestyle behaviors." He further explained that Veterans could benefit from the development and implementation of interventions aimed at building healthy lifestyles, close relationships, and personal strengths. Dr. Anderson is working with Drs. Justin Benzer and Joseph Mignogna on projects investigating the essential components required for effective implementations of treatments in the VA. Through his fellowship, Dr. Anderson will continue to pursue his passion for evidence-based interventions and serving Veterans as he prepares to for a research career in an academic or VA research setting.

Update from our Biomarkers & Genetics Core

The goal of our Biomarkers & Genetics Core is to identify biological markers at the cellular and molecular level that can be used to better diagnose conditions such as PTSD and TBI and explain how they manifest in the brain. Ultimately, through understanding these processes, it is hoped that better biologically-focused treatments could be developed.

Currently, their team is using a technique known as a bead-based multiplex assay, which allows them to simultaneously measure up to 100 different variables in just a small sample of blood. They are also incorporating techniques such as cell culturing and real-time polymerase chain reaction to study cellular and genetic reactions to conditions faced by those in combat situations.

Christina Hejl, a lab technician in the Core, says, "It's very exciting to see all these different test processes and data points come together to create a full picture of what's physically happening and changing in our Veterans' in reaction to PTSD or TBI."

Congratulations to our Graduating Postdoctoral Fellows

Dr. Adam McGuire has obtained a dual appointment as an Investigator in the Behavioral Sciences Core at the CoE and as an Assistant Professor in the Department of Psychology and Counseling at the University of Texas at Tyler. During his fellowship, he conducted the first experimental study to assess moral elevation response in Veterans in a laboratory setting. Moral elevation is novel area of study referring to the uplifting feeling that inspires us to emulate virtuous behavior. The study findings suggested that Veterans endorse a desire to engage with others and become a better person after watching uplifting videos. Dr. McGuire was awarded his first grant to develop of a brief online intervention that will elicit moral elevation and social engagement in Veterans with PTSD and moral injury. "The fellowship," Dr. McGuire says, "afforded me the opportunity to further examine the potential feasibility of using moral elevation as a therapeutic tool in Veterans." He will continue serving Veterans at UT Tyler by leading a specialty track of graduate training in Veterans' mental health.

Dr. Carey Pulverman joined an interdisciplinary private practice in Austin where she treats mental health concerns including depression, anxiety, PTSD, chronic illness, insomnia, and sexual dysfunction. Her research focuses on examining the impact of sexual trauma on the mental and sexual health of women Veterans. "My fellowship," says Dr. Pulverman, "provided excellent training in public service psychology and prepared me for my career as a clinical psychologist." She received grant funding during her fellowship to create materials that help women Veterans understand how sexual health can be negatively affected by military sexual trauma and ways in which their VA providers could offer support. Additionally, she published five research papers in top journals such as *Obstetrics & Gynecology*. Dr. Pulverman and colleagues found that among women Veterans there is greater risk for PTSD, sexual pain, and depression following a military sexual assault relative to the risk after a childhood sexual assault. She presented this research at the VA's Health Services Research and Development conference. Through her research and clinical work, she continues to foster healing in women Veterans.

Dr. Yvette Szabo has received an appointment as Investigator in the CoE's Biomarkers & Genetics Core contributing a new outlook for the core with her expertise in clinical psychology and psychoneuroimmunology. As an interdisciplinary investigator, her research examines how biological factors and psychological processes interact to predict mental health outcomes in returning Veterans. "If we can identify the underlying biological mechanisms of trauma-related difficulties," Dr. Szabo explains, "then we can improve our ability to develop novel targeted treatments that promote rehabilitation and improved functioning for Veterans exposed to traumatic stress." During her fellowship, she was selected as a Young Investigator Scholar through the American Psychosomatic Society and published six peer-reviewed papers. To continue her promising line of research, she was awarded grant funding through a VA Career Development Award. Her project focuses on identifying the links between genetics and warzone trauma exposure that may place Veterans at greater risk for cognitive difficulties. Dr. Szabo is on her way to a fruitful VA research career serving our nation's Veterans through her interdisciplinary research.

Novel MRI-based Technique Holds Promise as Diagnostic Tool for TBI

Traumatic brain injuries (TBIs) are considered a "signature injury" of post-9/11 conflicts, with nearly 400,000 U.S. servicemembers affected. Nonetheless, diagnostic measures which are based on self-reports of loss of consciousness cannot reliably predict how an individual who suffers a TBI will be affected in the long-term. With the goal of improving upon existing TBI measures, Neuroimaging Core investigators, Drs. Evan Gordon, Geoffrey May, and Steven Nelson, tested a novel approach using MRI-based measurements to determine if it can more reliably detect TBIs.

TBIs have been linked with a variety of chronic cognitive and behavioral symptoms, including problems with attention, learning, memory, anxiety, mood, and even personality changes. Many of the cognitive dysfunctions observed as sequalae of TBI are believed to be a result of diffuse axonal injury. This refers to damage in parts of the brain cells that enable different brain regions to communicate with each other across the brain, known as axonal projections. The shearing forces induced by head impact or a blast wave result in damage to these axonal projections and their protective layer (i.e., myelin sheath), which leads to impairment in communication and ultimately cognitive dysfunction. Despite the extensive research providing evidence of diffuse axonal injury in individuals with TBI, ultimately our ability to incorporate this information into our diagnostic system will depend on using measurements that can reliably identify this damage regardless of its location in the brain. To date, these measures have heavily relied on a specific technique, known as diffusion imaging, to identify axonal injury. However, this technique fails to capture damage specific to the brain cortex which plays a key role in attention, perception, awareness, thought, memory, language, and consciousness.

Recognizing this existing limitation, Dr. Gordon and colleagues tested whether the T1-w/T2-w ratio, a measure designed to assess potential axonal injury in the cortex, can more reliably detect the presence of lifetime TBIs. The T1-w/T2-w ratio contrasts two separate MRI scans to examine the integrity of cortical myelin, which serves as the protective layer surrounding axons in the cortex. Low T1-w/T2-w ratios suggest that there is lower myelin content and thus greater axonal injury in the cortex, which regular diffusion techniques are unable to measure. Dr. Gordon and colleagues created "myelin maps" of 46 Veterans with a history of TBI. Their results showed that these myelin maps reliably matched known patterns of cortical myelin, and that reductions in the T1-w/T2-w ratio across the cortex were associated with the number of lifetime TBIs. These exciting findings highlight the potential of using intracortical myelin as a biomarker of TBI. When combined with diffusion imaging, this technique could improve MRI-based diagnostic tools for TBI, enabling us to provide better care for our Veterans.
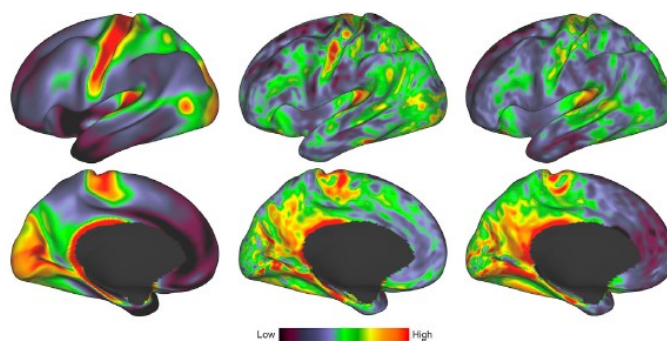
Distribution of the cortical myelin contrast across the brain in individuals with no history of TBI (left), few TBIs (middle) and many TBIs (right).

Webinar on Service Animals vs. Emotional Support Animals

In July, the Center of Excellence Ethics and Diversity Webinar series hosted a presentation on the differences between emotional support animals and service animals, terms that often lead to confusion among the general public and mental health providers alike. Dr. Lauren Barron, a graduate from the Counseling Psychology program at Texas A&M and a former pre-doctoral intern at the Central Texas VA Healthcare System, provided guidance about the nature of the Americans with Disabilities Act (ADA) and VA policies regarding the rights of service dog handlers. Additionally, Dr. Barron explained in depth the terminological, clinical, and legal distinctions between service animals and emotional support animals, particularly pertaining to the training and function of each.

Dr. Barron also discussed at length the ethical concerns for providers regarding the prescription of emotional support animals and service animals. This hour-long webinar was well-received by the over 400 VA and mental health providers across the nation in attendance.

Kudos

- **Dr. Suzannah Creech** was interviewed for an article on the website of NBC's Today Show. Dr. Creech discussed the parenting struggles faced by Veterans with PTSD.

- **LaShanda Montgomery** and **April Salinas** led a coat drive which collected over 60 jackets and sweaters to clothe the homeless in the Waco area.

- **Taylor Phillips** received an honorable mention for Best Student Poster at the San Antonio Combat PTSD Conference for her work with Dr. Bryann DeBeer on improving Safety Planning for Veterans.

- **Dr. Richard Seim** graduated from the Leadership VA (LVA) program. His final project outlined a method for using geospatial technology to aid the VA's suicide prevention efforts.

LaShanda Montgomery and April Salinas receive a commendation for their work to help homeless Veterans stay warm this winter

Recent CoE Publications

Here is a sample of some of the recent articles published by our researchers:

Creech, S. K., Pulverman, C. S., Shin, M. E., Roe, K. T., Wernette, G. T., Orchowski, L. M., Kahler, C. W., Shea, M. T., & Zlotnick, C. (in press). An open trial to test acceptability and feasibility of a computerized intervention for women veterans with sexual trauma histories seeking primary care treatment. *Violence Against Women.*

Frankfurt, S., Coady, A., Grunthal, B., Larew-Ellickson, S., & Litz, B. (in press). Moral injury in service members and veterans. In U. Kumar (Ed.), *Routledge International Handbook of Military Psychology and Mental Health*. Oxford: Taylor & Francis.

McGuire, A. P., Szabo, Y. Z., Murphy, K. M., & Erickson, T. M. (in press). Direct and indirect effects of trait and state gratitude on health-related quality of life in a prospective design. *Psychological Reports.* doi: 10.1177/0033294119868784

Garcia, H. A., **Mignogna, J., DeBeer, B. R.,** Song, J., Haro, E. K., & Finley, E. P. (in press). Provider Factors Predict Use of Evidence-Based Psychotherapies in Veterans Affairs Posttraumatic Stress Disorder Specialty Programs: The Role of Profession, Theoretical Orientation, and Training. *Traumatology.* Advance online publication. doi: 10.1037/trm0000220

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Center of Excellence

for Research on Returning War Veterans

Doris Miller Dept. of Veterans Affairs Medical Center
4800 Memorial Drive (151C)
Waco, TX 76711

Visit us at online at
www.mirecc.va.gov/visn17/