

A woman in military gear, including a cap, sunglasses, and a tactical vest, is helping a man who is sitting on the ground. The man is also in military gear, including a cap, sunglasses, and a tactical vest. They are in a desert environment with sand dunes in the background. The image is overlaid with a blue tint.

10
YEARS OF TOTAL FORCE FITNESS
10



Uniformed Services University

CHAMP

Consortium for Health and Military Performance

2019 CHAMP ANNUAL REPORT

30 APRIL 2020

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DIRECTOR'S LETTER

1 January 2020

Dear Stakeholders:

Our 2019 Annual Report for the Consortium for Health and Military Performance (CHAMP) just provides a brief summary of what we have accomplished over the year. We remain the Human Performance Optimization (HPO) and Total Force Fitness (TFF) arms of the Uniformed Services University of the Health Sciences (USU) and are sought after by many across the Department of Defense (DoD) and other governmental agencies. We continue to work at the unit level so we hear what is needed. We then take their great ideas, needs, and concerns to the top so we can push the concept of optimizing unit readiness. Our approach of listening and engaging at both community and leadership levels allows us to provide the best and most appropriate resources and guidance, and conduct and translate the most mission-relevant research. We continue to serve as thought leaders, with a drive toward integration and proactive actions. CHAMP is striving to emerge as the premier leader and asset for the entire U.S. national security community in the area of military-unique HPO and TFF and is building many bridges to achieve that goal.

Our strategic objectives flow directly from CHAMP's strategic pillars—Education & Training, Research & Scholarship, and Leadership & Service—which are consistent with those of USU. For education and training, we develop Military Service Member- and provider-inspired evidence-based resources. For research and scholarship, CHAMP conducts investigations to address unanswered questions related

to HPO and TFF and translate relevant, emerging evidence. For leadership and service, we serve as the central hub for clinical issues to expedite return to duty for simple and complex exertion-related events. Each CHAMP effort is tied directly to our strategic plan and objectives: HPO and TFF for mission readiness.

We continue to be aligned with the aims and objectives of DoD where mission readiness and lethality remain the focus, as well as the Military Health System and USU where the Quadruple Aim prevails. We are proactive, engaged, and dedicated to the CHAMP mission and endeavor to promote culturally relevant HPO and TFF activities through building trust and engaging with our customers. The entire CHAMP staff is committed to growing, learning, collaborating, and—above all—promoting teamwork and integration of efforts. I am proud of CHAMP's contributions to mission readiness and expect 2020 to be another productive year.



Patricia A. Deuster

Patricia A. Deuster, PhD, MPH

Director, Consortium for Health and Military Performance



Left to right: Francis Floresca, Travis Lunasco, Gloria Park, Stacey Zeno, Patricia Deuster, Andrea Lindsey, Lauren Messina, Elizabeth Moylan, Preetha Abraham, Francis O'Connor, Carolyn Chou (Not pictured: Sarah de la Motte)

CHAMP LEADERSHIP

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Medical Director

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Chief of Operations

Carolyn Chou, CPA
Chief Financial Officer

Preetha Abraham, DoL
Director of Research and Scholarship

Lauren Messina, PhD, LCMFT
Director of HPO Education and Training

Sarah de la Motte, PhD, MPH, ATC
Director of Fitness and Injury Prevention

Andrea Lindsey, MS
Director of Operation Supplement Safety

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Director of Performance Nutrition

Gloria Park, PhD
Director of Social, Spiritual, and Psychological

Travis Lunasco, PsyD
Director of HPO Strategic Operations

Francis Floresca, MPH
Strategy and Engagement Manager

CHAMP TEAM

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Research Associate

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Staff Scientist

Cindy Astorino
Senior Research Associate

Amelia Barrett
Project Coordinator

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Supplement Education
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Nutrition & Dietary
Supplement Education
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Cynthia Weiner
Research Assistant

Caitlin Wong
Program Manager

Tianzheng Yu
Research Scientist

MISSION & VISION

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The Consortium for Health and Military Performance (CHAMP), located within the Department of Military and Emergency Medicine, is the Total Force Fitness (TFF) arm of the Uniformed Services University of the Health Sciences (USU). Our mission and vision uniquely focus on the promotion of health and wellness within the military community. CHAMP optimizes Warfighter mission and family readiness through leadership, community engagement, education, and translation of human performance research.

In addition to reflecting the values of the University, CHAMP also embodies integrity, service and well-being, excellence and learning, and collaboration, community, and diversity. Through the USU framework, CHAMP emerges as a premier leader in the Department of Defense (DoD) as the translational resource in the complete range of disciplines associated with military-unique Human Performance Optimization (HPO) and TFF for maximizing Warfighter readiness and performance and for optimizing the resilience of the global military family.

***CHAMP optimizes
Warfighter mission
and family readiness
through leadership,
community engage-
ment, education,
and translation of
human performance
research.***



10 YEARS OF TOTAL FORCE FITNESS

The CHAMP 2019 Annual Report features specific activities from each domain and provides the latest snapshot of the Consortium's efforts to support the evolution of TFF in the U.S. national security community within its strategic pillars: Education & Training, Research & Scholarship, and Leadership & Service. Successes in utilizing the TFF framework enable members of the military community to sustain optimal well-being, stay resilient, and perform at their best.

In 2009, the Chairman of the Joint Chiefs of Staff established the TFF framework as a methodology for understanding, evaluating, and maintaining Military Service Members' well-being and sustaining their ability to fulfill mission-essential tasks at peak performance. The TFF framework consists of seven distinct fitness domains—physical, environmental, medical and dental, nutritional, spiritual, psychological, and social—from which CHAMP's domains of focus are derived. Since 2019 marks 10 years of Total Force Fitness, this report looks back at some of our accomplishments and then discusses our future goals.

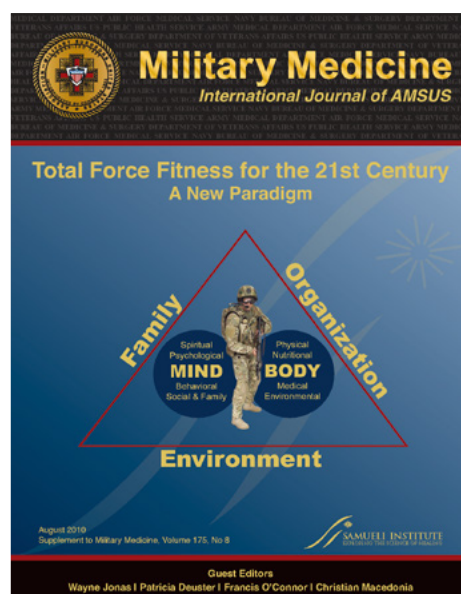
TFF and CHAMP Timeline

2009

The Chairman of the Joint Chiefs of Staff established the TFF framework as a key readiness component for the Armed Forces. In addition, CHAMP launched the Human Performance Resource Center (HPRC) website as a one-stop clearinghouse for evidence-based information and key wellness resources to help Warfighters and their families achieve Total Fitness and human performance optimization.

2010

Military Medicine published a special issue on Total Force Fitness that spelled out the goals and guidelines identified the previous year, creating a paradigm for TFF embraced by HPRC. CHAMP also initiated its Ask the Expert program, which enables Military Service Members to submit questions about specific issues that affect performance and readiness directly to CHAMP's team of subject-matter experts.



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2011

TFF was incorporated into the Chairman of the Joint Chiefs of Staff Total Force Fitness Framework (CJCSI 3405.01), and one of CHAMP's primary missions became providing the best evidence-based, holistic wellness support for Military Service Members and their families, units, and communities.

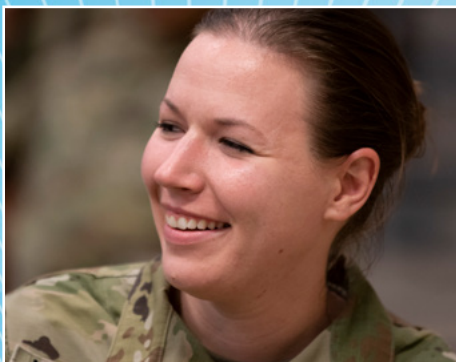
2012

The Military Health System (MHS) Defense Center of Excellence (DCoE) Oversight Committee designated CHAMP as a DCoE, which reinforced our status as an integral part of military medical education and research and a recognized subject-matter expert on HPO, TFF, and other mission-readiness concerns. CHAMP also helped develop the Operation Supplement Safety (OPSS) educational campaign, which provided critical information on the safety of dietary supplements used by Military Service Members for fitness, health, weight loss, and performance. HPRC also began targeting the dangerous dietary supplement ingredient DMAA, which led to the removal of DMAA-containing products from all military installation stores.

2013

The Food & Drug Administration (FDA) banned DMAA, which led to CHAMP's involvement in federal sweeps to actually remove such products from the market. This action helped raise awareness of our dietary supplement program among government agencies. HPRC also revamped its website, and the previous Dietary Supplements domain was renamed OPSS. In addition, the Go for Green® (G4G) DoD-wide nutrition program began as part of HPRC. G4G helps Military Service Members identify foods and drinks that properly "fuel" performance and boost well-being.





2014

The Quadrennial Defense Review (QDR) emphasized commitment to ensuring and sustaining the wellness, endurance, and resilience of U.S. forces and, as a consequence, to sustaining the personnel and knowledge required to provide expert health education, resources, and support to Warfighters.

2015

CHAMP launched OPSS as an independent website to accommodate the volume of material on dietary supplements, which includes useful tools and resources, access to a supplement database, and the ability for Military Service Members to ask CHAMP experts about the safe use of dietary supplements. The Rehab, Refit, Return to Duty (Rx3) program was initiated to help Military Service Members improve their overall physical fitness and prevent common musculoskeletal injuries. CHAMP also helped evaluate existing United States Special Operations Command (USSOCOM) Preservation of the Force and Family (POTFF) programs designed to improve behavioral health. Also this year, CHAMP issued its first formal Strategic Framework policy to guide its research focus, educational activities, organizational operations, and business activities and to ensure its alignment with the overarching strategic framework of USUHS, including a Balanced Scorecard to guide organizational activities and define how performance is monitored and outcomes are improved. CHAMP's 2015 Concept of Operations (CONOPS) renewed the organization's mission, vision, strategic goals, function, structure, organizational structure, and operational processes, and provided relevant performance metrics.

2016

The FY16 Senate Appropriations Committee for Defense Health Program Report endorsed CHAMP as the lead in evaluating the integration of TFF and the Healthy Base Initiative (HBI) program.

2017

CHAMP launched a major update of the Operation Supplement Safety (OPSS) website to better focus on specific topics of concern and interest, as well as to be more usable on mobile devices. Secretary

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of Defense Jim Mattis addressed the importance of human performance optimization and military preparedness: “We must deal with an increasingly complex global security situation... First, restore military readiness as we build a more lethal force.”

2018

CHAMP hosted its first Performance Psychology Summit, bringing together more than 50 psychology-related professionals from the military community to address the growing emphasis on performance optimization. It resulted in the formation of a Performance Psychology Subcommittee Charter under the Psychological Health and Readiness Council. CHAMP also hosted a symposium for medical triage: Marine Corps Marathon and Army Ten Miler Collapsed Athlete Algorithms: Managing Emergencies in Mass Participation Events: Medical Triage and Algorithms.

2019

CHAMP launched an updated HPRC website that coincided with renaming the project “Human Performance Resources by CHAMP.” In addition to a new look, the website was reorganized to make its resources more accessible to users and to improve its performance on mobile devices. OPSS also launched a more user- and mobile-friendly website that includes a Dietary Supplement Risk Assessment (DSRA) tool. This interactive scorecard contains a series of yes-no questions to help consumers identify potentially unsafe dietary supplements. DSRA is used as a teaching tool for healthcare providers, their patients, and all Military Service Members as well.

CHAMP hosted an ECAST Summit for subject-matter experts to review current policies and develop guidelines for educating Military Service Members about risk factors and prevention of exertion-related events associated with sickle cell trait (see page 27).

HPRC Website

USERS (Q1) 41,733

USERS (Q2) 46,533

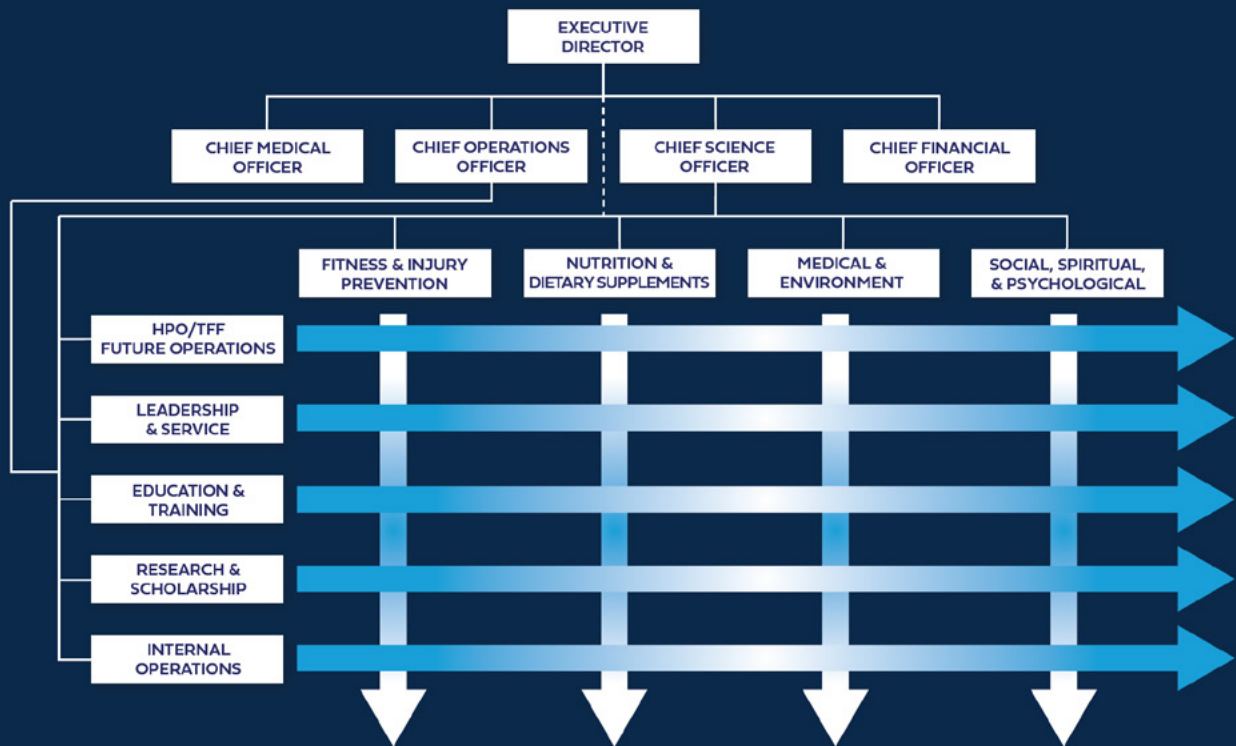
USERS (Q3) 49,805

USERS (Q4) 40,712

WEBSITE & NAME UPDATE
AUGUST 2019



CHAMP Concept of Operations (CONOPS)



We also prepared a new Concept of Operations (CONOPS) document that summarizes CHAMP's functions and new organizational structure to be consistent with and in line with our (and USU's) mission, vision, values, strategic goals, and objectives.

To meet our vision of promoting HPO and TFF within DoD, CHAMP focuses on five external Function Domains: Leadership, Education, Research & Scholarship, Internal Functions, and HPO/TFF Future Operations. Each Function Domain operates in conjunction with the USU academic domains of effort derived from the components of the TFF paradigm: Fitness & Injury Prevention; Nutrition & Dietary Supplements; Medical & Environment; and Social, Spiritual, & Psychological.

Accordingly, this 2019 Annual Report is organized by those components of the TFF paradigm. Each Function and TFF Domain has contributing objectives to achieve the overarching strategy of the organization and sustain the performance readiness of the military community.

2018 Goals Accomplished in 2019



Goal

Engage in teaching opportunities to extend the reach of HPO and TFF.



Accomplishments

CHAMP team members attended professional and military conferences in several locations. In addition, we gave presentations on many performance-optimization topics, including nutrition, dietary supplements, exercise, sleep, and more. For a complete list, see page 42.

Our Physical Fitness & Injury Prevention teaching activities included 13 lectures, 3 briefs, one workshop, one webinar, and one panel discussion. CHAMP's Nutrition & Dietary Supplement activities included 40 presentations, including 3 webinars. Our Medical & Environment activities included 79 clinical consultations. CHAMP's Social, Spiritual & Psychological activities included 13 presentations.



Goal

Be excellent stewards of funding.



Accomplishments

CHAMP always strives to enhance our good stewardship of federal funds by ensuring that we are up to date on all federal guidelines. We continually review and optimize our internal administrative practices so we can use the most cost-effective methods without sacrificing the quality of our work. We regularly monitor our budgets and review all transaction details and financial reports. In addition, over the past year, CHAMP updated policies for travel, telework, office space, etc., and developed standard operating procedures for the administrative team to be more efficient and effective.





Goal

Always act in accordance with CHAMP values.

Accomplishments

We demonstrated the following CHAMP values:

- *Integrity*
- *Service and Well-being*
- *Excellence and Learning*
- *Collaboration, Community, and Diversity*

Goal

Maintain alignment with our strategic objectives.

Accomplishments

CHAMP leadership revised the organization's foundational documents, including its Strategy Map, Strategic Plan, Concept of Operations, and Consortium Charter to ensure alignment with the Consortium's founding purpose, mission, and operational activities.

Goal

Respond as a team to serve our Military Service Members and their families when called upon.

Accomplishments

CHAMP worked on developing a formal HPO education curriculum leading to an undergraduate degree through the USU College of Allied Health Sciences. As part of this effort, we also revised the *Warfighter Nutrition Guide* in preparation for the Warfighter Nutrition Basics course for Army and Air Force Diet Techs (set to launch in 2020).



Goal

Forge new relationships with diverse operational military communities.



Accomplishments

We maintained regional research alliances with the Indo-Pacific Research Alliance for Military Medicine (IPRAMM) and met with a Japanese military delegation for future collaborative efforts. Also, our Injury Prevention Research Lab (IPRL) conducted a final site visit to USCG Training Center (TRACEN) Cape May to observe the newly implemented physical training and injury risk mitigation programs. TRACEN Cape May developed these programs in consultation with CHAMP. In addition, CHAMP summarized work completed and provided recommendations to further advance USCG Recruit Training in our final project report.



Goal

Expand the HPO and TFF concepts to enhance and sustain the health and performance of our Military Service Members.



Accomplishments

CHAMP research activities included studying the effects of dietary supplements on muscle heat tolerance, effects of dietary ingredients on heat stress in mice, biomarkers for heat intolerance in mice, ketone-ester supplementation for protection from TBI in *Mus musculus* and *Rattus norvegicus*, genomics of exertion-related events associated with sickle cell trait (GERESCT), evidence-based efforts to mitigate the incidence of musculoskeletal conditions and their impact on Military Service Member deployability, and Soldiers' physical and nutritional resilience metrics to track Warfighter readiness.

CHAMP's education and training accomplishments included developing a mission/vision and strategic plan for the Education Directorate, producing a podcast on tips for managing PCS, presenting at the XVIII Airborne Corps HPO Symposium, and educating USU/NSAB faculty, staff, and students about strategies to achieve optimal performance at the USU Health and Wellness Fair. In a collaboration with



USCG Station Washington, HPRC also provided semi-customized resources—such as in-person presentations, handouts, and posters—across TFF domains. In addition, CHAMP’s online videos that promote HPO and TFF continue to attract visitors to the HPRC website. Our “What the Warfighter Needs to Know” video about sickle cell trait had 5,900 views, and our video on battlefield acupuncture had 3,600 views.

CHAMP also maintained a strong social-media presence through our Facebook, Twitter, and Instagram accounts. There are nearly 8,700 subscribers to our social media pages, and 7,100 total engagements. We reached over 220,000 users through Facebook, and approximately 10,500 users visited the HPRC and OPSS websites directly from CHAMP’s social media accounts. In addition, roughly 1,200 users subscribe to HPRC’s monthly newsletter, which highlights important HPO knowledge and includes links to website content.



CHAMP 2019 ACCOMPLISHMENTS

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Physical Fitness & Injury Prevention

In the Chairman of the Joint Chiefs of Staff Instruction 3405.01 outlining the Total Force Fitness framework, physical fitness refers to the ability to physically accomplish all aspects of the mission while remaining healthy and uninjured. Physical fitness includes a set of characteristics that people have or can achieve relating to their ability to perform physical activity. Our Military Service Members must demonstrate the ability to physically accomplish all aspects of the mission while remaining healthy and meeting the criteria for deployment, retention, and continued military service. Many components of physical fitness are shared across the Services, but the common thread among them is that Military Service Members and their families benefit from a holistic approach to physical fitness, including injury prevention.

CHAMP's Injury Prevention Research Lab (IPRL) conducts studies such as the Military Entrance

Processing Screen to Assess Risk of Training: Predicting and Preventing Musculoskeletal Injury in Basic Training Recruits (MEP-START); Reducing Injury with Training Enhancement, Targeted Rehabilitation, and Core Conditioning (RITE-TRACC); and Initiation of Marine Psychological Assessment of Female Combat Training (IMPACT).





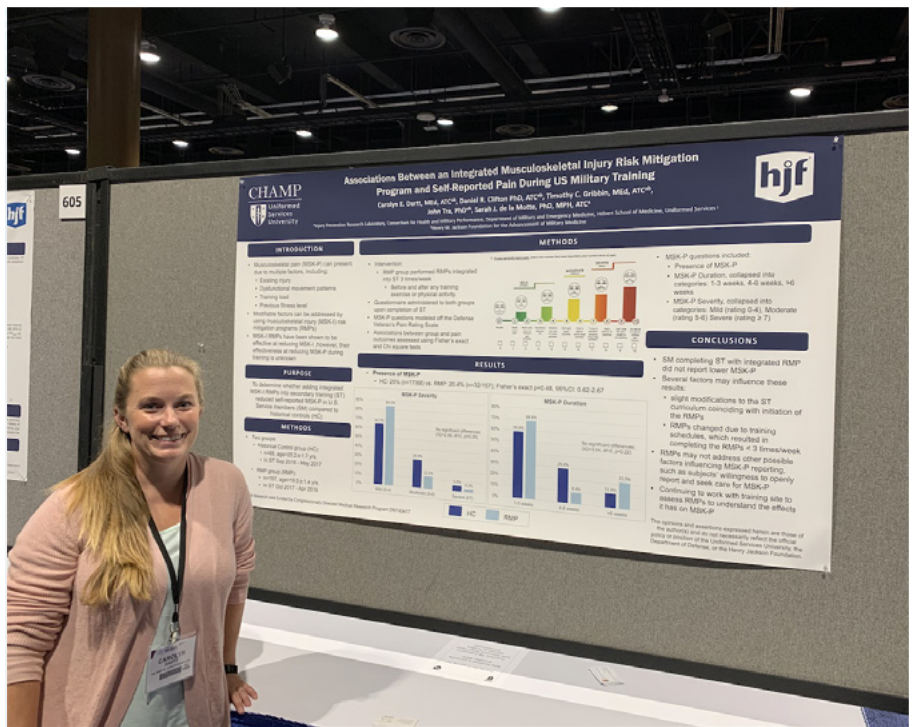
In September, IPRL wrapped up their data collection for the Initiation of Marine Psychological Assessment of Female Combat Training (IMPACT) study and will be analyzing the data in the upcoming months.

The IPRL team received funding for two more projects over the next three years.

- **LBP Study** – *The overall goal of this project is to identify longitudinal factors that improve the assessment, prediction, prevention, and management of low back pain (LBP) in Military Service Members, among whom LBP is a significant burden. The project will also evaluate the effectiveness of a targeted LBP prevention and wellness program for several at-risk military populations. This project will lead to the development of specific predictive models and risk-mitigation strategies for LBP that can be used prior to, during, and after military training. Prevention and management of low back pain in the military is analogous to that in the civilian sector. Therefore, results from this project will be generalizable to medical communities dealing with LBP and the general public.*
- **RITE-TRACC II** – *This project will epidemiologically assess components of USMC entry-level military training at the Marine Corps Recruit Depot-San Diego (MCRD-SD) and School of Infantry-West that contribute to increased risk for musculoskeletal injury (MSK-I). This project will identify perceived and real barriers to prompt MSK-I self-reporting by MCRD-SD recruits and drill instructors, as well as assess the impact of embedding providers in a sports-medicine model analogous to that of civilian collegiate and professional athletics. Study results will lead to the development of specific Marine Corps predictive models and MSK-I risk-mitigation strategies that can be used prior to and during training. Musculoskeletal injury prevention and return to duty in the military is analogous to MSK-I prevention and return to play in civilian athletic populations. Therefore, results from this project will be generalizable to the civilian sector.*

CHAMP also began evidence-based efforts to mitigate the incidence of musculoskeletal injuries and their impact on Military Service Member deployability as requested by the Office of the Assistant Secretary of Defense, Health Affairs (OASD-HA). Musculoskeletal conditions (MSK) altogether comprise a top reason for medical non-readiness (MNR) to train and deploy in the U.S. military. Variation in MSK-related care, particularly in programs and policies that target MSK and associated MNR, exists across DoD. The Consortium is conducting a three-arm study to understand and characterize the variation in approaches to MSK, including prevention and treatment programs, to help establish best practices and programs across the U.S. military.

Goals accomplished in the musculoskeletal (MSK) project include establishing collaborations with Womack Army Medical Center (WAMC) and the University of Maryland to support analyses of large DoD datasets. At WAMC, we constructed a combined dataset of administrative, medical, and readiness data on active-duty Soldiers. These data have supported the production of numerous products for the Army, including: an assessment of care trajectories involving physical therapy; deliverables describing medical non-readiness and return-to-duty trajectories associated with MSK problems of the spine and lower extremity; an analysis of the factors associated with MNR among new Soldiers; and an analysis of the impact of shoulder surgery on weapons qualification scores and MNR. We conducted administrative processes in cooperation with WAMC staff to receive similar datasets to those on the Army for all other service branches. Readiness data for the Navy and Marines have been received at WAMC, and much more data are pending. Due to the unique programs and needs of Special Operations Forces (SOF), the MSK team conducted a site visit with



In July, CHAMP staff member Carolyn Dartt earned a 3rd place award for her poster presentation on "Associations Between an Integrated Musculoskeletal Injury Risk Mitigation Program and Self-Reported Pain During U.S. Military Training" at this year's Military Health System Research Symposium. This was one of only 11 awards bestowed to the authors of 1,450 posters.

the Marine Special Operations Command (MARSOC) to facilitate study of their MSK-focused programs, which will be compared to those of Army, Air Force, and Navy SOF. The project team has assembled an initial group of these and other MSK-related DoD programs that will be exam-

ined in the growing database at WAMC for their impact on medical readiness. CHAMP Research also engaged in ongoing administrative efforts to establish a server environment at USU, such that work like that at WAMC may eventually be conducted locally.

Nutrition & Dietary Supplements

Nutritional fitness refers to the ability to recognize and select the requisite nutrition to sustain and optimize physical and cognitive performance and health. Members and leaders of the Armed Forces need education and training on how to promote, implement, achieve, and maintain healthy eating behaviors and create environments that make healthy eating easy. The goal of

nutritional fitness is to achieve optimal health and performance, especially if a Military Service Member chooses to complement their nutritional needs with dietary supplements. CHAMP serves as a resource for nutritional fitness and environmental research, best practice and policy recommendations, and education through various initiatives.

CHAMP staff member Melissa Rittenhouse received the Collegiate & Professional Sports Dietitians Associations (CPSDA) Award for her presentation on "Optimization of Omega-3 Index Levels in Athletes and Service Members: Personalized Omega-3 Dosage and Molecular Genetic Approaches." In addition, she received a grant for a one-year research project on applied performance nutrition.



NUTRITION

Go for Green®

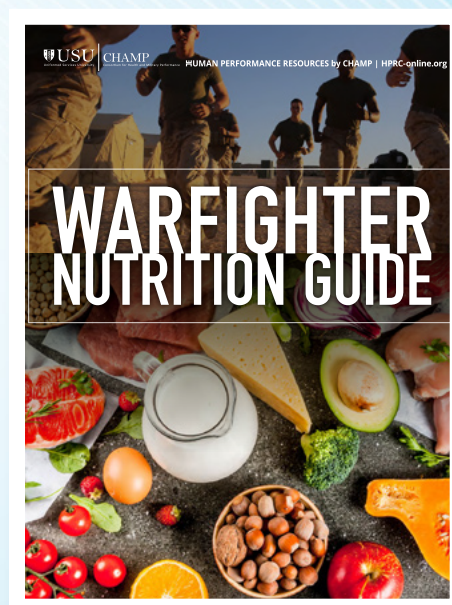
CHAMP serves as the program office for the joint service performance-nutrition initiative that improves the food environment where Military Service Members live and work. Go for Green® (G4G) is a comprehensive program that labels the nutritional quality of foods and drinks with a stoplight system—Green, Yellow, and Red—to help Military Service Members identify the best choices for peak performance, readiness, and health. The G4G team received the COL Rohland A. Isker Award for outstanding contributions made to national preparedness in food, equipment, packaging, food service, or related areas. Other accomplishments include the campus-style dining pilot program for Healthy Army Communities and use of the Military Nutrition Environment Assessment Tool (mNEAT) for evaluating community policies and environmental factors that support healthy eating.

Performance Nutrition Course

CHAMP has been asked to develop a Warfighter Performance Nutrition course for military nutritionists, dietitians, and culinary specialists. Instructors will use the HPRC *Warfighter Nutrition Guide* as the course manual, and the class will be offered through the Uniformed Services University, College of Allied Health Sciences (CAHS) to complement the Nutrition and Diet Therapy program at the Medical Education and Training Campus (METC) next year.

Comprehensive Soldier Fitness: Physical & Nutritional Resilience Metrics

Results from this field study were used to propose simple nutritional metrics to track Warfighter readiness and investigate anthropometric standards among Soldiers. Ongoing analyses focus on comparing the nutritional habits of Soldiers to those of the general population, and analyzing the field study data in tandem to a larger Army data set, in order to make broader inferences.



OPERATION SUPPLEMENT SAFETY

Operation Supplement Safety (OPSS) released an entirely new, reorganized website with 6 main areas of focus that enable users to find information more easily. In addition, the new website was designed to be more mobile-device friendly. It also better features the dietary supplement resources developed by CHAMP, including the OPSS list of DoD-prohibited dietary supplement ingredients, an interactive scorecard, Quick Facts on common supplement ingredients used by Military Service Members, and many articles on dietary supplement research. During 2019, three more items were added to the prohibited list.

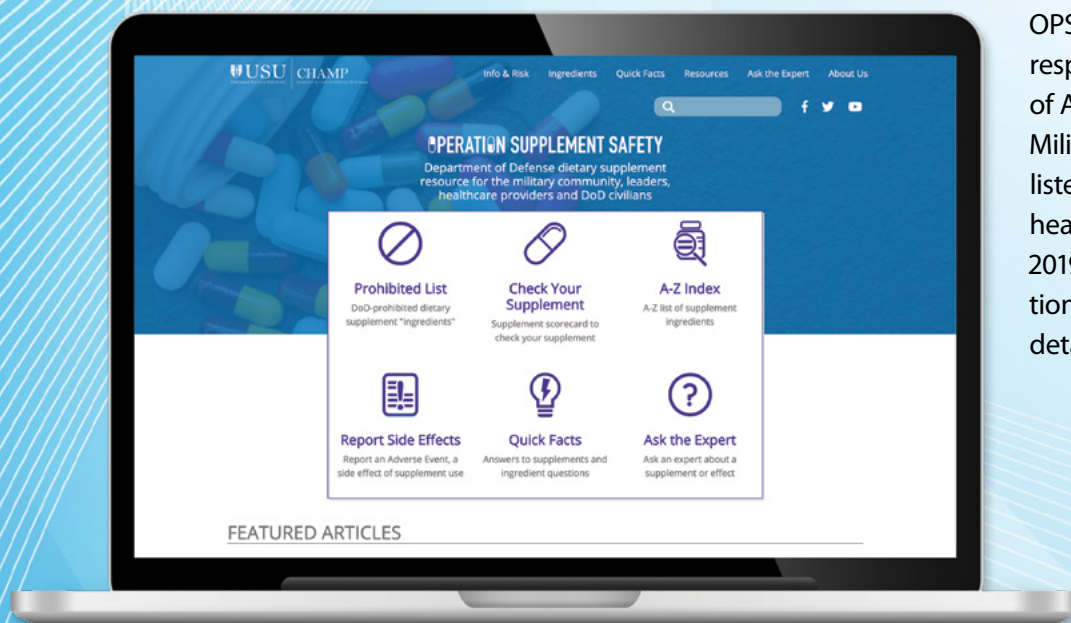
OPSS also increased its outreach efforts in 2019. This included pro-

viding more one-on-one educational activities, including training of healthcare professionals in deployed settings. OPSS also engaged even more with federal and other partners involved with dietary supplement issues affecting the Services, including FDA, DEA, NIH/ODS, and USADA.

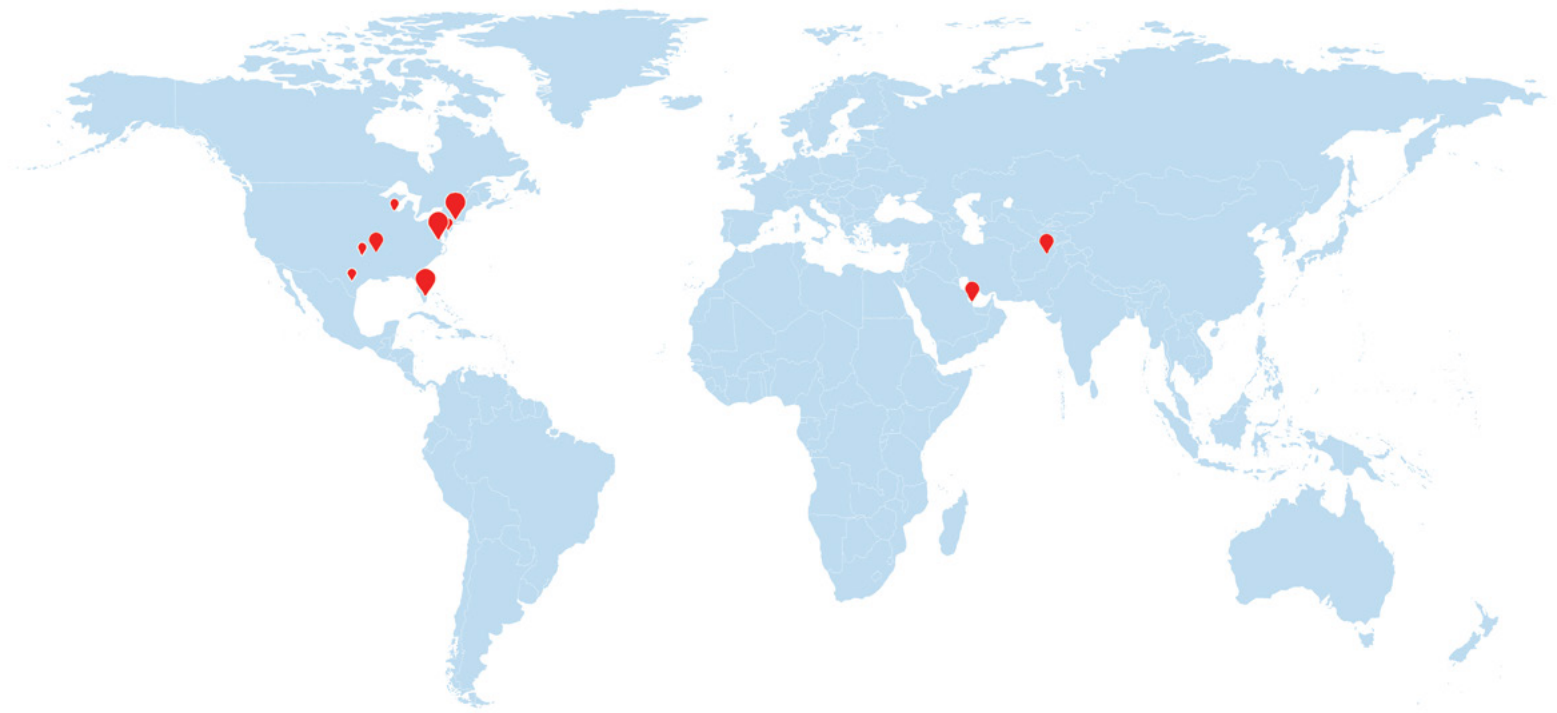
OPSS met with military exchange leaders to address concerns about prohibited and potentially problematic dietary supplement ingredients, such as stimulants, in dietary supplement products sold on military installations.

The U.S. Marine Corps featured OPSS (by invitation) at its Modern Day Marine and HITT 2019 Championship events.

OPSS continued to receive and respond to a substantial number of Ask the Expert questions from Military Service Members (enlisted and leaders) and military healthcare providers throughout 2019. See the Ask the Expert section on page 36 of this report for details.



Selected Dietary Supplement Presentations in 2019



Little Rock AFB, AR
Training Center Cape May, DE
Coast Guard Sector Miami, FL
MHSRS, Orlando, FL
USARIEM, Natick, MA
Joint Base Cape Cod, MA

National Institutes of Health,
Bethesda, MD
Naval Station Great Lakes, MI
Ole Miss, Oxford, MS
Naval Base Millington, TN
Lackland AFB, San Antonio, TX

Marine Corps Base Quantico, VA
USCG Base Portsmouth, VA
The Pentagon, Washington, DC
Camp As Sayliyah, Qatar
Bagram Air Base, Afghanistan

DIETARY SUPPLEMENT CONSULTATIONS AND EDUCATION

The Services frequently ask the CHAMP team to provide input on the occurrence of adverse events and other issues associated with dietary supplements. CHAMP representatives also consulted on and testified in military cases related to positive urine tests associated with dietary supplement use.

CHAMP works closely with DOJ, FDA, DEA, FTC, NIH/ODS, and Natural Medicines, as well as DoD, to provide guidance on policies and programs related to dietary supplement use. In 2019, for example, CHAMP helped the Air Force and Navy/Marine Corps update policy regarding the use of CBD and hemp. We also provided consultations across DoD for dietary supplements, including USMC Office of the General Counsel (OGC), USN OGC, and USAF OGC.

To add to the available evidence on dietary supplements, CHAMP continues to have chemical analyses performed on a variety of dietary supplement products and has reported the results in the published scientific literature (see list of publications at the end of this report).

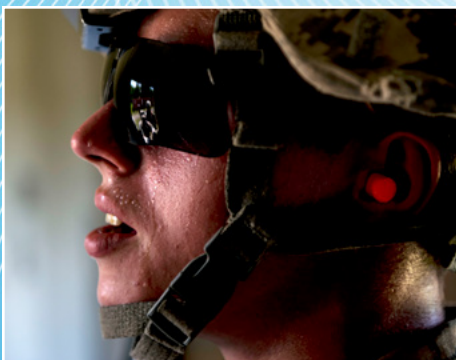
DIETARY SUPPLEMENT RESEARCH

Effects of Dietary Supplements on Muscle Heat Tolerance

This study helped determine the effects of dietary curcumin, quercetin, and astaxanthin on mouse myoblast tolerance to heat. We successfully screened these dietary supplements and published two research articles in the *Journal of Cellular Physiology*. Findings from this study helped us understand how dietary supplements affect energy metabolism and oxidative stress, and provide mechanistic insight to develop strategy to prevent stress-induced injury and improve human performance.

Effects of Dietary Ingredients on Heat Stress in Mice

This study is supported by the NIH Office of Dietary Supplements for validating the in vitro findings and assessing these dietary supplements in a mouse model of heat stress. Preliminary data showed curcumin and astaxanthin, either alone or in combination, prevented heat-induced skeletal muscle injury in vivo. We presented these findings in three local/national meetings and submitted two manuscripts for publication.

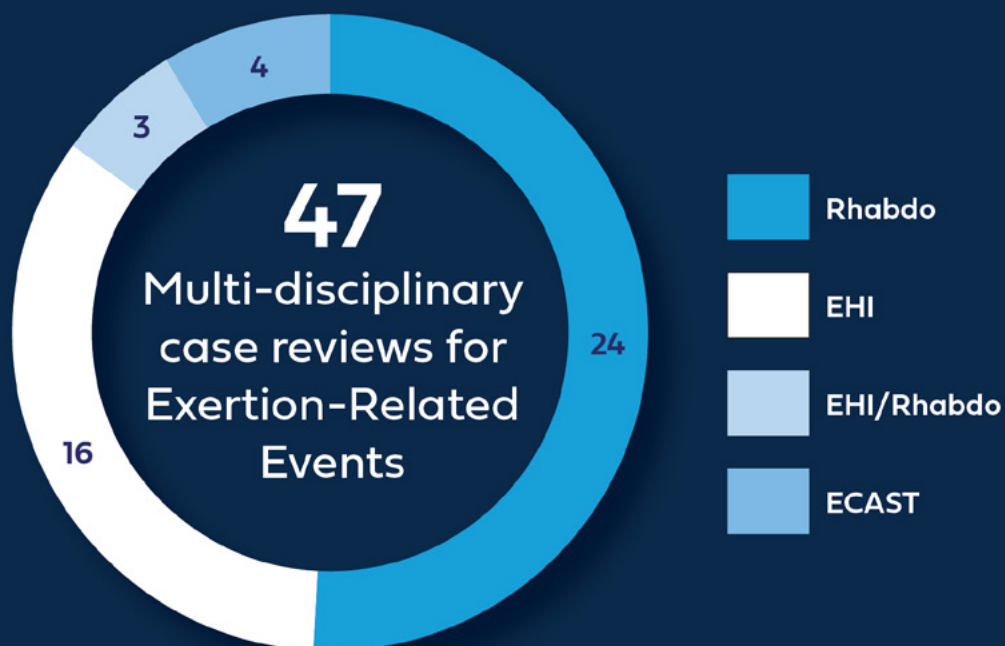


Ketone-ester Supplementation for Protection from TBI in *Mus musculus* and *Rattus norvegicus*

Traumatic brain injury (TBI) is a leading cause of hospitalization and mortality in the U.S., and it often has a negative impact on mental health. CHAMP's Research Directorate is committed to investigating non-pharmacological, food-based interventions that aid recovery and reduce the risk of long-term impairment from a TBI. Ketone bodies are produced in the body during prolonged fasting and minimal carbohydrate consumption. As an alternative, the oral consumption of ketone esters can be used to raise levels of ketone bodies in the blood. This ketone-ester supplementation (KES) can improve recovery after a brain injury and prevent the development of neuropsychiatric disorders. A CHAMP preclinical study revealed that rats receiving a daily dose of ketone esters had smaller brain lesions, reduced brain inflammation, and improved sensorimotor reflexes compared to rats receiving only water after TBI. These preclinical studies have potential application in human studies since the formulation of KES has already been deemed safe and approved for human consumption by FDA. Therefore, these studies on KES have the potential to positively impact Military Service Members' overall physical performance, health, and readiness.

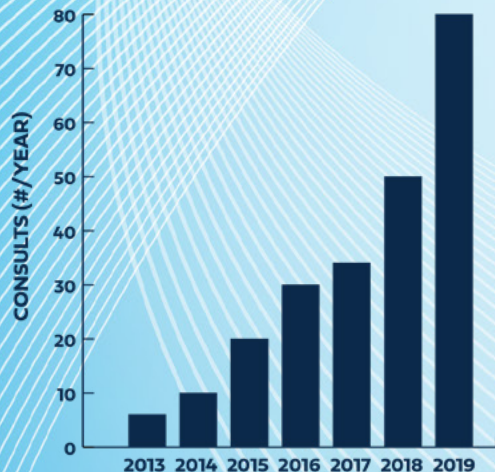


CHAMP Clinical Consultations



32 Service members referred for Heat Tolerance Testing

Medical & Environment



Medical fitness refers to the ability to meet established standards for medical readiness, and environmental fitness refers to the ability to perform mission-specific duties in any environment. The physical environment in which our Armed Forces operates has historically served a key role in the outcomes of military operations. However, many theater-specific environmental stressors can be identified, assessed, and mitigated before deployment. Varied environmental conditions require specific physiological and behavioral adaptations, personal protective equipment, and training to achieve and sustain fitness, as well as prevent injury needing medical intervention. CHAMP continues to be involved in recommending policies, developing clinical practice guidelines, and facilitating clinical consultations for return-to-duty decisions. The number of cases we consult on continue to grow each year.

CHAMP'S EXPERTISE IN SICKLE CELL TRAIT

CHAMP in 2019 provided expertise in sickle cell to support the Navy's Bureau of Medicine and Surgery (BUMED). Francis G. O'Connor, MD, the Medical Director of CHAMP, visited the Great Lakes Naval Recruit Training Center twice in 2019. Dr. O'Connor assisted BUMED in the evaluation

of two recruit deaths, and helped develop new recruit-collapse and return-to-duty algorithms. CHAMP is also engaged in active research in sickle cell trait collapse by exploring the genomics of Warfighters with collapse.

SUMMIT ON EXERCISE COLLAPSE ASSOCIATED WITH SICKLE CELL TRAIT (ECAST)

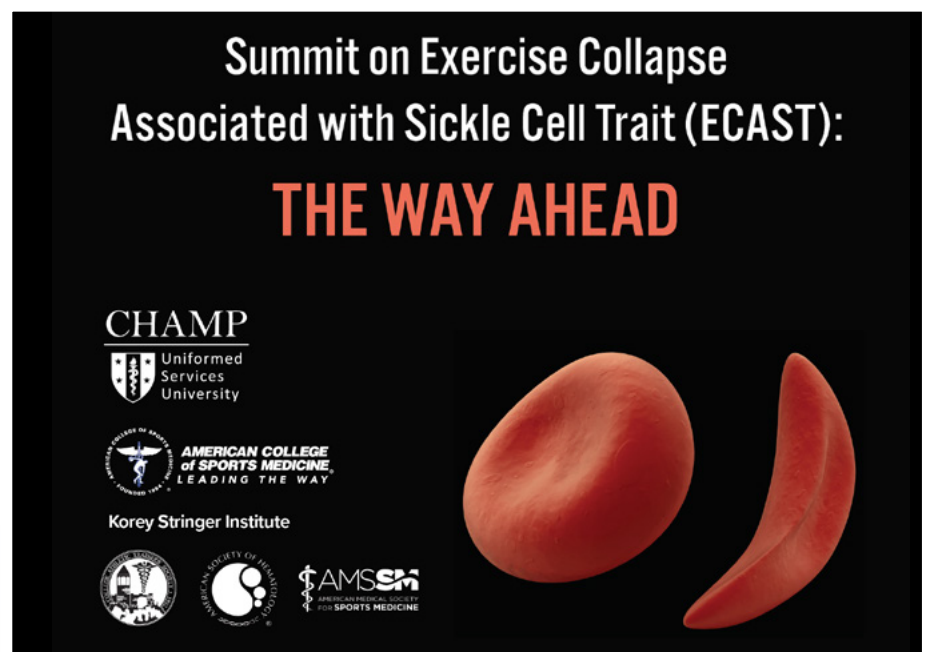
In October, CHAMP held a summit for multiple subject-matter experts to discuss a way ahead for education on and management of medical events related to exercise and sickle cell trait (SCT) or Exercise Collapse Associated with Sickle Cell Trait (ECAST) in the military and civilian communities. The meeting objectives were:

- *Review current branch policies on SCT screening*
- *Develop draft procedural instructions for executing current policy on SCT within DoD*
- *Develop draft clinical practice guidelines for clinical management of ECAST*
- *Establish framework for education on SCT and ECAST*

- *Prepare research agenda to address identified gaps*
- *Develop a plan to work with civilian professional organizations to prepare ancillary documents for clinical management, educational*

resources, and a research agenda that can be utilized by non-military sports medicine and healthcare providers who work with SCT athletes

The summit was successful, and attendees included USU Presi-





dent Richard Thomas, USU-School of Medicine Dean Kellerman, Deputy Surgeon General of the Army, MG Telita Crosland, MC, and Assistant United States Surgeon General, RADM Richard W. Childs, MD. Mr. Clifford Melton, a survivor of an ECAST, delivered a moving testimony of his experience. CHAMP is currently at the forefront of helping to implement new service policy guidance and education for the prevention and management of ECAST.

WARRIOR HEAT- AND EXERTION-RELATED EVENTS COLLABORATIVE

Exertion-related events (ERE) within the military continue despite prevention efforts. Exertional heat illness (EHI), exercise-induced rhabdomyolysis (ER), and exercise collapse associated with sickle cell trait (ECAST) are a direct threat to operational readiness. CHAMP designed the Warrior Heat- and Exertion-Related Events Collaborative (WHEC) to develop a network within the Military Health System to synergistically connect and share best practices across the Services, and systematically and effectively manage and triage Warfighters diagnosed with severe ERE. WHEC assists in providing oversight for the Heat Center of Excellence, which is a forward-field operating agency (FOA) in Fort Benning, GA. The primary focus of the collaborative is to promote best practices across the chain of ERI management and survival and facilitate the safe return to full duty of Military Service Members. Research associated with this collaborative aims to determine the contribution of both intrinsic and extrinsic risk factors associated with ERE and ultimately create a scoring system to evaluate recurrence risk to assess return-to-duty status. In developing such a scoring system, it is anticipated that there will be development of genetic and biologic screening tools for ERE.

GENOMICS OF EXERTION-RELATED EVENTS ASSOCIATED WITH SICKLE CELL TRAIT STUDY

CHAMP's GEREST study enrolled 74 African Americans with SCT from both civilian and military populations: 23 were cases with ERE and 51 controls without ERE. Cases were predominantly younger, physically fit males engaged in more vigorous exercise activity than controls.

Preliminary analyses showed no differences in global whole genome and transcriptome results between cases and controls likely due to the small sample size analyzed to date. Ongoing analyses focused on genes known to be associated with various human-inherited disorders identified that carry rare deleterious variants in genes (ACADVL, AGL, GDAP1, KCNA5, MYPN and SNC9A) associated with metabolic myopathy, heart disease, and pain. Plasma proteomics revealed known ERE markers that might potentially be useful biomarkers for ERE when validated in larger sample sets.

BIOMARKERS FOR HEAT INTOLERANCE IN MICE

We continue our effort to identify biomarkers for heat intolerance, one of CHAMP's long-term goals. We studied the organ-specific, heat-stress response and found that liver is more resistant than skeletal muscle to heat-induced apoptosis in mice. We also investigated the role of tumor protein p53 in heat stress response. Our results show that heat exposure increased protein levels of cytosolic, nuclear, and mitochondrial p53 and caused apoptotic changes. Mechanistic study further revealed that mitochondrial p53 plays a role in heat-induced myocardial injury.

EXERTION-RELATED EVENTS

We used an interdisciplinary approach to determine molecular subtypes of exertion-related illnesses (ERI) and develop a framework to translate our findings into clinical action. To this end, we developed a network within the Military Health System (MHS) to systematically and efficiently manage and triage patients presenting with exertional heat illness and/or exertional rhabdomyolysis (ER). CHAMP also developed and received USU IRB approval for our research protocol that will help us determine the contributions of intrinsic and extrinsic risk factors associated with ERI. In addition, we will create a scoring system to triage Military Service Members to early return to duty or further specialty evaluation for recurrence risk.

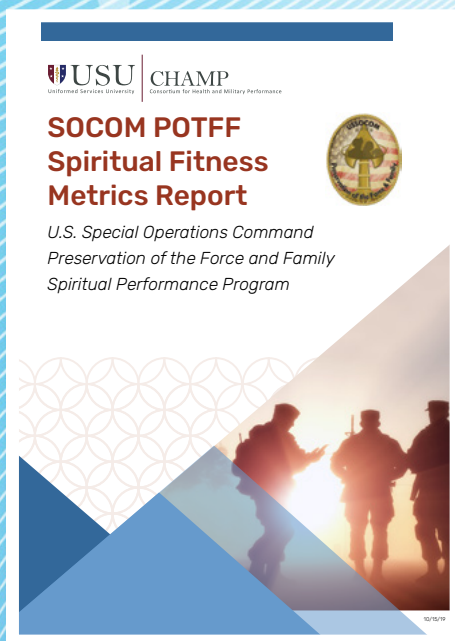


Social, Spiritual & Psychological

Given the demands placed on our Armed Forces, a Military Service Member's resilience is vital to readiness and mission success. Social fitness refers to the ability to engage in healthy social networks that promote overall well-being and optimal performance. Spiritual fitness refers to the ability to adhere to beliefs, principles, or values needed to persevere and prevail in accomplishing missions. A strong spirit promotes resiliency and enhances one's ability to mitigate adverse responses to stress. Psychological fitness refers to the ability to effectively cope with the unique mental stressors and challenges needed to ensure mission readiness. These domains include the integration and optimization of mental, emotional, and behavioral capabilities to optimize performance and strengthen resiliency of Military Service Members.

SPIRITUAL FITNESS METRICS

The CHAMP Spiritual Fitness and Spiritual Care Team produced spiritual fitness metrics for the POTFF Spiritual Performance Program. The 17-item Spiritual Fitness Metrics survey provides three scales for tracking spiritual changes, a counseling tool, and criteria for evaluation of program effectiveness in changing an individual's sense of connectedness and sense of calling. The profile of spiritual fitness is based on the extent to which an individual self-identifies their personal connection to a higher power, their pursuing meaning, purpose, and values, and their service and sacrifice for the greater good. Chaplains can use the resulting spiritual profile to identify which programs work best to improve spiritual performance.



PCS SURVIVAL GUIDE PODCAST

In partnership with the Office of Student Affairs at USU, CHAMP produced a 3-episode podcast on optimizing performance through PCS season. The HPRC team explored all stages of planning for PCS such as setting goals, being flexible, staying present, getting enough sleep, finding consistency, maintaining routines, and leveraging social sup-

port. In support of the TFF framework, our podcast also included tips to maintain healthy eating habits and workout routines during PCS moves.

PARTNERSHIP WITH THE CENTER OF DEPLOYMENT PSYCHOLOGY (CDP)

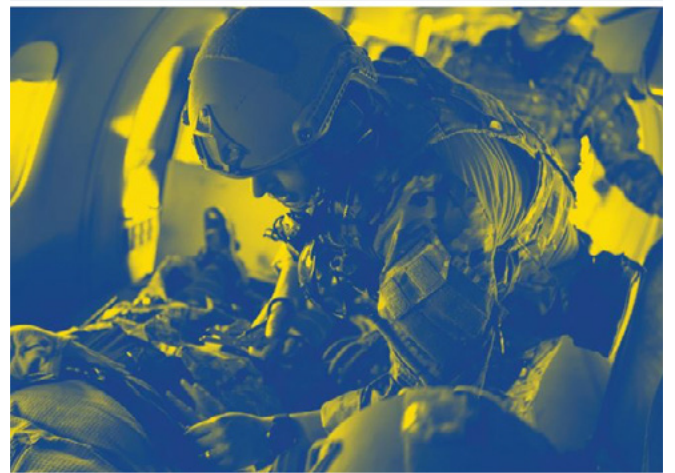
In August, CHAMP collaborated with the Center of Deployment Psychology (CDP) in their Present Series to give a presentation on how mental health professionals can apply HPO in their military communities. Greatly received by attendees, it promoted a lot of discussion on the future of military health service delivery.

USAF SOCOM POTFF

CHAMP researchers designed a mixed-methods study to evaluate POTFF psychological service delivery for Airmen in the 1st Special Operations Wing (1 SOW) stationed at Hurlburt Field, Florida. The study identified the psychological performance and health needs of 1 SOW Airmen, assessed whether identified needs were being addressed by POTFF Psychological Performance services, and evaluated whether resources should be allocated/reallocated in order to address any gaps in POTFF Psychological Performance service delivery. CHAMP made recommendations for enhancing POTFF mental-health service delivery alignment with the psychological demands and needs of 1 SOW Airmen, strengthening overall POTFF mental-health service delivery, and improving access to POTFF services.

Study of United States Air Force
Special Operations Command
Preservation of the Force and Family
Mental Health Program Utilization

FINAL REPORT OCTOBER 2019



Other 2019 Accomplishments

TOTAL FORCE FITNESS

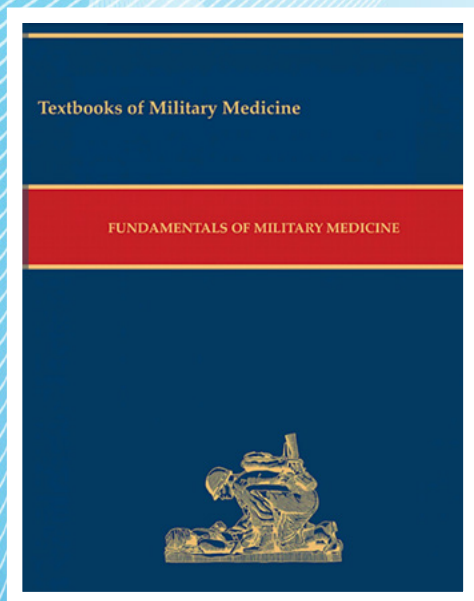
**Total Force Fitness
strategies are
inclusive, innovative,
and preventive.**

As stated in CJCSI 3405.01, effective TFF strategies are inclusive, innovative, and preventive. CHAMP continually strives to integrate all the TFF domains into its HPO products, resources, curricula, and services in alignment with our values of collaboration, community, and diversity. CHAMP partnered with USU's Office of Student Affairs (OSA) and the Student Wellness Advisory to host the USU Health and Wellness Fair. Activities included live cooking demos by the CHAMP nutrition team, healthy sleep strategies, presentations on optimizing performance, and visits with therapy dogs that offer emotional and psychological support to recovering Military Service Members at Walter Reed National Military Medical Center. Nearly 500 people attended the event.

CHAMP also collaborated with USCG Station Washington to deliver HPO and TFF resources affecting performance. We met with unit leadership and other Military Service Members to discuss gaps and needs in health and wellness. We also gave presentations on communication skills, clean eating, safe use of dietary supplements, coping strategies for stress, and preventing musculoskeletal injuries.

FUNDAMENTALS OF MILITARY MEDICINE

A textbook was prepared for military medical educational use to foster discussion that may form the basis of doctrine and policy within the military. An entire section within the textbook is dedicated to human performance optimization through a Total Force Fitness lens. CHAMP staff contributed to chapters of the book, including physical fitness, performance nutrition, musculoskeletal injury prevention, and environmental extremes. This textbook will have significant impact on how future military health providers approach health and readiness.



BUILDING HEALTHY MILITARY COMMUNITIES (BHMC)

Along with its partners, the CHAMP evaluation team conducted Rapid Needs Assessment (RNA) site visits to 7 pilot states. The team presented the results at the Military Health System Research Symposium in August 2019. The CHAMP team also helped train state coordinators from the pilot states on strategic planning, documentation of changes to those plans, and identification of process and outcome measures.

We worked with Ignite Technologies to initiate an effort to expand the audience that receives BHMC messaging and improve the return on investment of state coordinators' digital communications activity. A paid Facebook campaign was launched in the summer of 2019, and ads were targeted to military-affiliated individuals both in and beyond the pilot states. The ads encouraged people to "like" or follow BHMC on Facebook. Across the 5 BHMC Facebook pages included in the ad campaign, the ads reached more than 343,000 people and received 23,000 new page likes.

IDENTIFICATION OF LEADING INDICATORS OF READINESS AMONG SOLDIERS

This protocol was established in 2018 in order to better understand large-scale trends in health behaviors, leading indicators of readiness, and their longitudinal associations with common Army career trajectories. Per IRB approval, CHAMP received access to the data necessary for this project and began to execute analyses. Work that is in-progress depicted large-scale annual trends in health behaviors and interrelationships between dietary supplement usage and high-intensity interval training. We found regular decreases in dietary supplement usage, excessive alcohol use, and smoking; other health behaviors (diet, activity, and sleep) remained relatively constant. Ongoing work is examining whether self-report behavioral metrics can predict various indicators of readiness with a focus on specific occupational specialties and communities.



HUMAN-DOG INTERACTIONS— NEUROENDOCRINE AND PHYSIOLOGICAL ALTERATIONS IN MILITARY SERVICE MEMBERS WITH PTSD WHO TRAIN SERVICE DOGS

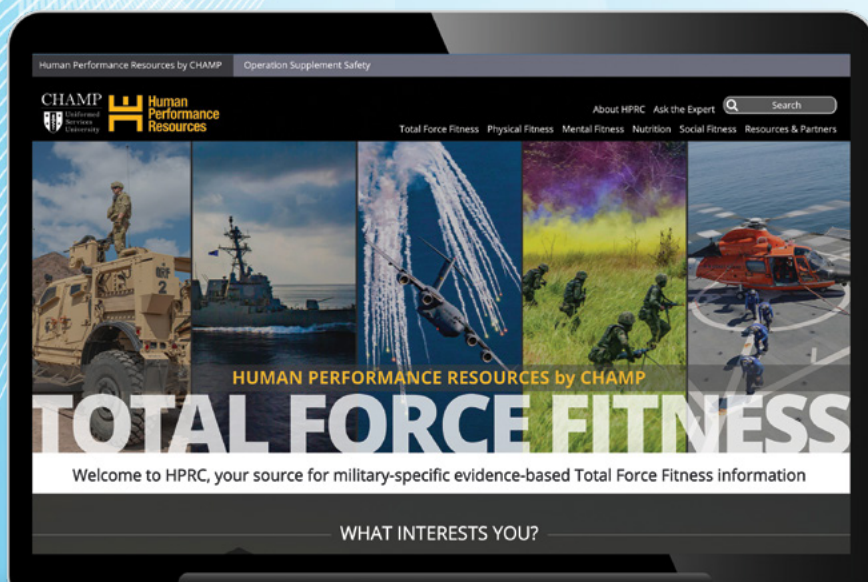
CHAMP completed analyses from this mixed-methods pilot randomized control trial, which included diverse sources of data: thematic interviews, survey responses, heart-rate variability, and neuroendocrine markers. Results indicated that the treatment modality under study—a service dog training intervention—was feasible and well-accepted. We found broad and enthusiastic qualitative responses to the treatment, but these findings were not mirrored in quantitative analyses, although these were under-powered since it was a pilot study.

In 2019, HPRC produced 84 articles, 51 graphics, 27 blog items, 8 videos, and one 3-part podcast. HPRC also maintained a strong presence in social media, logging over 500 Twitter and Facebook posts and nearly 30 Instagram posts.

HUMAN PERFORMANCE RESOURCES BY CHAMP

The Consortium's main website, previously the Human Performance Resource Center, was renamed Human Performance Resources by CHAMP (HPRC) as part of a rebranding initiative to bolster CHAMP's programs, products, and services. The initiative also included updating the HPRC website, which highlights performance optimization

categories, trending topics, service-specific programs and policies, and enhanced capabilities for viewing on mobile devices. The HPRC team also successfully executed its ongoing #GotMySix social-media campaign, which asks Military Service Members and their families to share how social support from friends and loved ones help them maintain Total Fitness. In addition, HPRC published the *Total Force Fitness for Endurance Events* guide.



HPO/TFF CAPABILITY-BASED BLUEPRINT AND TARGETING SYSTEM

CHAMP's mobile training team: HPO/TFF Future Operations had tremendous success with their Capability-Based Blueprinting (CBB) workshops and consultations with various military communities. Most notably was our work with the U.S. Air Force 1U Censor Operator Career Field. These workshops operationalize DoD JROCM 073-18 (11 July 18) "in collaboration with SMEs, to conduct an analysis of their METL and identify key areas of strengths and weaknesses... identify opportunities to develop COAs for optimizing HPO and minimizing identified risks... and incorporate elements of the TFF framework." The CHAMP

team evaluated and mapped performance enhancement and health sustainment needs and gaps to support their unit's mission-essential tasks and provided a report of their findings and recommendations in alignment with HPO and TFF.

TOOLBOX FOR READINESS MEASURES AND METRICS REPORT

CHAMP, in collaboration with the Thought Leadership & Innovation Foundation (TLIF), developed a report for POTFF at Special Operations Command (SOCOM) on a "Toolbox for Readiness Measures and Metrics." In workshops coordinated with the Army, Navy, Marine Corps, and Air Force Special



Operations involving personnel and their spouses, factors of performance were identified and analyzed in depth to determine relevancy and effectiveness as a measure of readiness. SOCOM is planning and testing a concept known as SABRES (Special Operations Assessment, Baselineing and Readiness Evaluation System) in which those in the Special Operations Force will take their initial assessments while they are in training to establish a readiness baseline and then they will be assessed on a recurring basis to see if their readiness in a certain domain has changed. If changes occur but not for better, interventions could be implemented to bring the Operator back to a previous, higher level. The report serves as a launching point for the development of a comprehensive readiness system for all of the Special Operations Forces and the military community in the future.

ASK THE EXPERT

**A unique service
CHAMP provides the
military community
is our “Ask the
Expert” (ATE)
feature on both the
HPRC and OPSS
websites.**

A unique service CHAMP provides the military community is our “Ask the Expert” (ATE) feature on both the HPRC and OPSS websites. A Military Service Member or military healthcare provider has the ability to ask CHAMP experts an HPO- or TFF-related question and receive a customized response. Our team draws on the experience of professionals in the TFF domains to collect, filter, translate, and provide the best and most recent evidence-based information on human performance optimization. This year alone, CHAMP received and responded to almost 800 questions, including 680 for OPSS, 59 for G4G, and 50 for HPRC. The following lists provide unedited examples of some of the questions fielded, as well as some feedback we received for ATEs across the various TFF domains.

HPRC

- *What is the best way to introduce mindfulness to our national guard soldiers. We plan on an hour long presentation and want to make the most out of our limited time. We have completed the red cross mind and body training so will include some breathing techniques. we want to make sure that we reinforce that mindfulness can be helpful in everyday life as well as military obligation.*

- *I am having relationship issues with my partner of 4 years. The issues stems from a lack of communication (she shuts down when she is angry and will ignore me for days; but to be fair, I do the same thing) and also my partner has an attachment to her parents that I feel is stronger than ours. What is your advice and/or recommendation for overcoming or fixing this? Or should I just walk away?*
- *Whats an accepted practice for accommodating people who are at risk for heat stress (those on BP meds). The only thing I can come up with is avoid placing employee in moderate to heavy heat stress environments. Any other approach is appreciated. Thanks.*
- *I work 3- 12 hour night shifts a week. Timed nutrition is every 2.5-3 hours. I sleep on average 5 hours. When I am off the day after working, I still have to sleep. I workout approximately 4-5 times a week, haven't lost a pound in 4 months. I am 51, post-menopausal, fattest ever at 180. Is there a way to schedule a proper timed nutrition with my hours? HELP.*

OPSS

- *There is a new dietary supplement I want to try. Would like to make sure ingredients are legal especially 7-Keto-DHEA*
- *SARMs: If the subject of the substance is marked up as 'Currently unapproved new drugs', does that make it prohibited? Because I've came across other substances that specifically say "prohibited for military personnel" and I'm trying to differentiate between the two.*
- *Should kids under 14 have energy drinks?*
- *I received a question at a unit brief recently about whether third party certification verified*





that the amount of each ingredient was accurately depicted on a supplement or if it is just that the correct ingredients (regardless of quantity) are accurate?

- *I have a patient that started using [name omitted] for cell regeneration. I am always skeptical of supplements. This one has NSF/BSCG certifications. I recommend she supplement with healthy diet and whole-foods. But do those certifications indicate that there is at least not harm associated with using? Thanks!*
- *Is there a new order out prohibiting the use of hemp seed in food products? I thought that the Marine Corps rescinded the ban a few years ago, unless the products were manufactured outside of the US. I had a Marine call and tell me that the ban is back in effect. I have not been able to locate any new information. Thanks for any help you can give me.*

Feedback

- *"Thank you so much!!! This response was great!!! I sincerely appreciate this!"*
- *"Greatly appreciated and forwarded this to our medical provider who inquired about a pilot wanting to use this."*
- *"Thank you guys very much for all of the help, it's greatly appreciated! You guys are awesome for breaking down each ingredient that was listed as well, that was extremely useful!"*
- *"Excellent. Thanks for help me stay out of troubles guys. The best."*
- *"Thank you for such a detailed and rapid answer!"*
- *"Great resource for supplement information."*
- *"Very well worth my time! I hope you all are well funded because you deserve it!"*
- *"The detailed report of my supplement question was very reassuring and helpful!"*
- *"This was a thorough answer and greatly appreciated!"*

SELECTED 2019 PUBLICATIONS & POSTERS

Peer-Reviewed Publications

Avula B, Chittiboyina AG, Bae JY, Haider S, Wang YH, Wang M, Zhao J, **Deuster PA**, & Khan IA. (2019). The power of hyphenated chromatography-Time of flight mass spectrometry for unequivocal identification of spirostanes in bodybuilding dietary supplements. *J Pharm Biomed Anal*, 167, 74-82. doi:10.1016/j.jpba.2018.12.045

Berry KG, Sakallaris B, & **Deuster PA**. (2019). Measuring Special Operations Forces Readiness. *J Spec Oper Med*, 19(4), 100-104.

Boyd C, Crawford C, Berry K, & **Deuster P**. (2019). Conditional Recommendations for Specific Dietary Ingredients as an Approach to Chronic Musculoskeletal Pain: Evidence-Based Decision Aid for Health Care Providers, Participants, and Policy Makers. *Pain Med*. doi:10.1093/pm/pnz051

Clifton DR, Tra J, & de la Motte SJ. (2019). Letter to the Editor: Measuring true accuracy of self-reported injuries. *Musculoskelet Sci Pract*, 42, e1. doi:10.1016/j.msksp.2019.02.006

Cota S, Williams N, Neff R, & **Deuster P**. (2019). How Evidence-Based Recommendations May Direct Policy Decisions Regarding Appropriate Selection and Use of Dietary Ingredients for Improving Pain. *Pain Med*. doi:10.1093/pm/pnz039

Crawford C, Boyd C, Berry K, & **Deuster P**. (2019). Dietary Ingredients Requiring Further Research Before Evidence-Based Recommendations Can Be Made for Their Use as an Approach to Mitigating Pain. *Pain Med*. doi:10.1093/pm/pnz050

Crawford C, Boyd C, Paat CF, Meissner K, Lentino C, Teo L, Berry K, & Deuster P. (2019). Dietary Ingredients as an Alternative Approach for Mitigating Chronic Musculoskeletal Pain: Evidence-Based Recommendations for Practice and Research in the Military. *Pain Med.* doi:10.1093/pm/pnz040

de la Motte SJ, Clifton DR, Gribbin TC, Beutler AI, & Deuster PA. (2019). Functional Movement Assessments Are Not Associated with Risk of Injury During Military Basic Training. *Mil Med.* doi:10.1093/milmed/usz118

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Deuster PA, Lunasco T, & Messina LA. (2019). Optimizing Warfighter Lethality Through Human Performance Education. *J Spec Oper Med*, 19(2), 100-104.

Eichner AK, Coyles J, Fedoruk M, Maxey TD, Lenaghan RA, Novitzky J, **Lindsey AT, & Deuster PA.** (2019). Essential Features of Third-Party Certification Programs for Dietary Supplements: A Consensus Statement. *Curr Sports Med Rep*, 18(5), 178-182. doi:10.1249/jsr.0000000000000595

Gaffney-Stomberg E, Nakayama AT, Guerriere KI, Lutz LJ, Walker LA, Staab JS, **Scott JM, Gasier HG,**

& McClung JP. (2019). Calcium and vitamin D supplementation and bone health in Marine recruits: Effect of season. *Bone*, 123, 224-233. doi:10.1016/j.bone.2019.03.021

Hosokawa Y, Casa DJ, Trtanj JM, Belval LN, **Deuster PA, Giltz SM, Grundstein AJ, Hawkins MD, Huggins RA, Jacklitsch B, Jardine JF, Jones H, Kazman JB, Reynolds ME, Stearns RL, Vanos JK, Williams AL, & Williams WJ.** (2019). Activity modification in heat: critical assessment of guidelines across athletic, occupational, and military settings in the USA. *Int J Biometeorol*, 63(3), 405-427. doi:10.1007/s00484-019-01673-6

Hu J, **Nelson DA, Deuster PA, Marks ES, O'Connor FG, & Kurina LM.** (2019). Sick cell trait and renal disease among African American U.S. Army soldiers. *Br J Haematol*, 185(3), 532-540. doi:10.1111/bjh.15820

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Mungunsukh O, **Deuster P, Muldoon S, O'Connor F, & Sambughin N.** (2019). Estimating prevalence of malignant hyperthermia susceptibility through population genomics data. *Br J Anaesth*, 123(3), e461-e463. doi:10.1016/j.bja.2019.06.010

Nelson DA, Marks ES, Deuster PA, O'Connor FG, & Kurina LM. (2019). Association of Nonsteroidal Anti-inflammatory Drug Prescriptions With Kidney Disease Among Active Young and Middle-aged Adults. *JAMA Netw Open*, 2(2), e187896. doi:10.1001/jamanetworkopen.2018.7896

O'Connor FG. (2019). Sports Medicine: Exertional Heat Illness. *FP Essent*, 482, 15-19.

Ren MQ, Kazman JB, Abraham PA, Atias-Varon D, Heled Y, & Deuster PA. (2019). Gene expression profiling of humans under exertional heat stress: Comparisons between persons with and without exertional heat stroke. *J Therm Biol*, 85, 102423. doi:10.1016/j.jtherbio.2019.102423

Russell DW, Kazman J, & Russell CA. (2019). Body Composition and Physical Fitness Tests Among US Army Soldiers: A Comparison of the Active and Reserve Components. *Public Health Rep*, 134(5), 502-513. doi:10.1177/0033354919867069

Scott JM, Deuster PA, & McClung JP. (2019). Letter to the Editor. *Mil Med*. doi:10.1093/milmed/usz183

Scott JM, Kazman JB, Palmer J, McClung JP, Gaffney-Stomberg E, & Gasier HG. (2019). Effects of vitamin D supplementation on salivary immune responses during Marine Corps basic training. *Scand J Med Sci Sports*, 29(9), 1322-1330. doi:10.1111/sms.13467

Shams-White M, Chui K, **Deuster P**, McKeown N, & Must A. (2019). A Comparison of Anthropometric Measures with Bioelectrical Impedance Analysis in the Classification of Overweight and Obesity in U.S. Military Personnel (P21-050-19). *Curr Dev Nutr*, 3(Suppl 1). doi:10.1093/cdn/nzz041.P21-050-19

Shams-White MM, Chui K, **Deuster PA**, McKeown NM, & Must A. (2019). Investigating Items to Improve the Validity of the Five-Item Healthy Eating Score Compared with the 2015 Healthy Eating Index in a Military Population. *Nutrients*, 11(2). doi:10.3390/nu11020251

Stoddard JM, Taylor CR, & **O'Connor FG.** (2019). Ulnar Nerve Entrapment at the Cubital Tunnel Successfully Treated with Ultrasound-Guided Peripheral Nerve Hydrodissection: A Case Report and Further Evidence for

a Developing Treatment Option. *Curr Sports Med Rep*, 18(11), 382-386. doi:10.1249/jsr.0000000000000649

Yu T, Dohl J, Chen Y, Gasier HG, & Deuster PA. (2019). Astaxanthin but not quercetin preserves mitochondrial integrity and function, ameliorates oxidative stress, and reduces heat-induced skeletal muscle injury. *J Cell Physiol*, 234(8), 13292-13302. doi:10.1002/jcp.28006

Yu T, Dohl J, Elenberg F, Chen Y, & Deuster P. (2019). Curcumin induces concentration-dependent alterations in mitochondrial function through ROS in C2C12 mouse myoblasts. *J Cell Physiol*, 234(5), 6371-6381. doi:10.1002/jcp.27370

Research Poster Presentations (from among more than 20)

- *Alders, Libby. "Validity of the Spiritual Trauma Assessment Tool." USU Research Day.*
- *Steward, Sarah. "Validity of the Spiritual Trauma Assessment Tool (STAT)." USU Research Day.*
- *Simon, Ashleigh. "Team Fitness Tracker: Exploring Whether Soldiers' Use of a Fitness Tracker and Dashboard Helps Promote Physical Fitness." USU Research Day.*
- *Dartt CE, Clifton DR, Gribbin TC, Tra J & de la Motte SJ. "Associations Between an Integrated Musculoskeletal Injury Risk Mitigation Program and Self-Reported Pain During US Military Training." Military Health System Research Symposium (MHSRS).*
- *Southmayd, Emily, Barrett, Amelia, Goforth, Carl & de la Motte, Sarah. "Female Military Officers Report A Desire For Menstrual Suppression*

During A 6-month Military Training Course." MHSRS.

- Abulhawa, Zainah. **"Why Have a Total Force Fitness Spiritual Fitness Metric? Pros and Cons."** MHSRS.

Research Abstract Presentations (from among more than 25)

- Alders, Libby. **"Why Have a Total Force Fitness Spiritual Fitness Metric? Pro and Cons."** MHSRS.
- Abulhawa, Zainah. **"The Role of Psychosocial Factors in Minimizing Spiritual Distress among Military Service Members."** The Society for Personality and Social Psychology Annual Convention (SPSP).
- Abulhawa, Zainah. **"Relationships Among Stress, Sleep and Spiritual Fitness: A Secondary Analysis of Data on Military Service Members."** SPSP Annual Convention.
- Park, Gloria. **"Redefining Readiness: Bridging Human Performance and Psychological Health Approaches for Warfighters."** American Psychological Association Annual Conference.

Presentations at Scientific Conferences

- Scott, Jonathan. **"Dietary Supplements."** USSO-COM Moral Injury Symposium.
- Lunasco, Travis & Chamberlin, Rachel. **"HPO and TFF: ISR Operator Capability-Based Blueprinting."** ISR Annual Summit.
- Lunasco, Travis & Chamberlin, Rachel. **"Blueprints as Boundary Objects: A New Methodology for the Alignment of Service Providers and the U.S. Military Communities They Serve."** Society for Ap-

plied Anthropology Annual Conference.

- Alders, Libby. **"Creating the Spiritually Ready Warfighter: A Roadmap for Defining, Measuring, and Implementing Spiritual Fitness in the Military."** APA Division 36.
- Lindsey, Andrea. **"Dietary Supplements and Operation Supplement Safety."** 2019 Navy and Marine Corps Public Health Conference.
- Scott, Jonathan. **"Performance Nutrition: Emerging Topics for the Warfighter."** XVIII Airborne Corps (ABC) Human Performance Optimization (HPO) Symposium.
- Lunasco, Travis & Myatt, Craig. **"Integration of HPO: Deriving Metrics Based on Unit Mission Essential Task List."** XVIII ABC HPO Symposium.
- Crawford, Cindy, Boyd, Courtney, Lindsey, Andrea & Deuster, Patricia. **"Dietary Ingredients Promoted for Brain Health: An Analysis of Identified Products and Systematic Review of Ingredients in Products."** MHSRS.
- Barrett, Amelia Southmayd, Emily, Goforth, Carl & de la Motte, Sarah. **"Self-Reported Musculoskeletal Injuries and Pain during U.S. Military Secondary Training and Medical Seeking Behaviors."** AMED Campaign Research to Practice Seminar.
- Goforth, Carl, Barrett, Amelia, Southmayd, Emily, Deuster, Patricia & de la Motte, Sarah. **"Relationship between Reported Pain, Sleep Quality, and Fatigue in Female Officers Following a 6-Month Training Course."** MHSRS.
- de la Motte SJ, Clifton DR & Goforth CW. **"Commissioning Route Significantly Influences Presence of Ankle Dorsiflexion Asymmetry in Newly Com-**

missioned Military Officers.” Oral Presentation given by Amelia Barrett. MHSRS.

- Clifton, Daniel, Dartt CE & de la Motte SJ. **“Self-Reported General Health and Fitness Among U.S. Service Members Entering Secondary Training.”** National Athletic Trainers’ Association Clinical Symposia & AT Expo.
- Cone BL, Tra J, Dartt CE, Clifton DR & de la Motte SJ. **“The Impact of Limited Flexibility and Previous Musculoskeletal Injury on Likelihood of Injury in U.S. Service Members during Secondary Training.”** National Athletic Trainers’ Association Clinical Symposia & AT Expo.

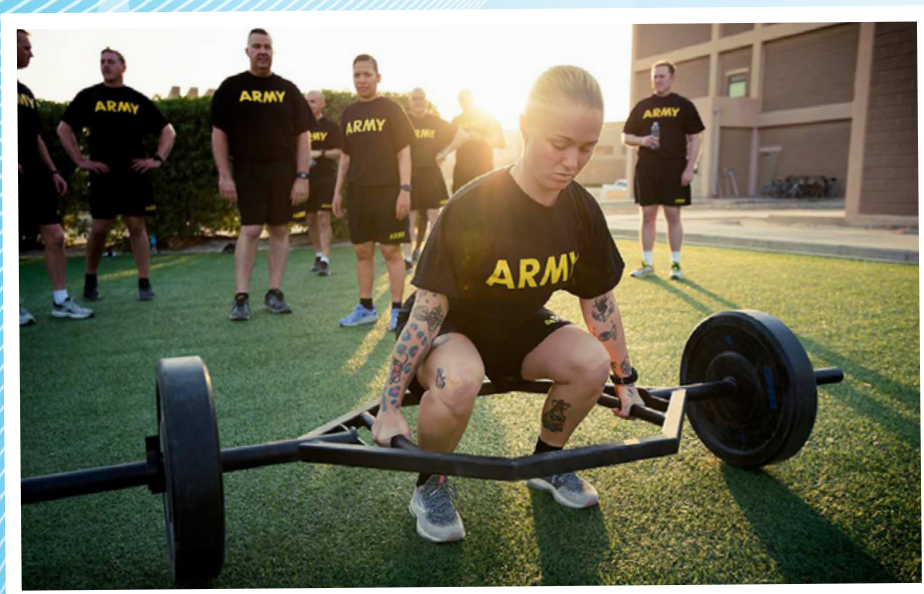
Other Presentations

- Deuster, Patricia. **“Optimizing Performance in the Military: Lessons Learned from the Consortium for Health and Military Performance.”** Extremity War Injuries XIV: Emerging Combat and Readiness Research.
- Deuster, Patricia. **“Human Performance Optimization (HPO) and Total Force Fitness (TFF) Hub and Spoke Delivery System.”** Close Combat Lethality Task Force HPO.
- Deuster, Patricia. **“Sports Nutrition and Dietary Supplements.”** International Conference on the Science of Botanicals, Oxford, MI
- Deuster, Patricia. **“Operation Supplement Safety and Train the Trainer.”** USAF Nutritional Medicine Course, San Antonio, TX
- Deuster, Patricia. **“Dietary Supplements & Operation Supplement Safety.”** Joint Service Drug Testing Program Managers’ Meeting, Naval Station Great Lakes, IL
- Deuster, Patricia. **“Dietary Supplements & Operation Supplement Safety.”** Navy Alcohol and Drug Control Officers Summit, Millington, TN
- Moylan, Beth & Southmayd, Emily. **“Exercise and Nutrition as Medicine.”** Science, Service, Mentoring & Medicine Program (S2M2) at USU.
- Van Arsdale, Stephanie & Kirkpatrick, Katie. **“Exercise and Nutrition as Medicine.”** S2M2 at USU.
- Paoletti, Gabe. **“Stress Optimization.”** National Defense University.
- Deuster, Patricia. **“Dietary Supplements.”** National Defense University.
- Gribbin, Tim. **“Limited Equipment Exercise 101.”** National Defense University.
- Moylan, Beth. **“Mindful Eating: Practical Tips for Building Mindfulness into Your Eating.”** National Defense University.
- Wong, Caitlin. **“How do you evaluate supplements?”** Office of Dietary Supplements Dietary Supplement Label Database meeting.
- Messina, Lauren. **“Human performance optimization interventions in mental healthcare.”** Women’s Mental Health Sub-Community Board Meeting.
- Wong, Caitlin & Lindsey, Andrea. **“How do you evaluate dietary supplements?”** Dietary Supplement Label Database Meeting.
- Rittenhouse, Melissa. **“Optimal Fueling.”** Warrior Transition Brigade (WTB).
- Rittenhouse, Melissa. **“Carbohydrates.”** WTB Wellness Program.

- Rittenhouse, Melissa. **"Food and Mood."** WTB.
- Wong, Caitlin & Lindsey, Andrea. **"Dietary Supplements & Operation Supplement Safety."** WTB Soldiers – USO.
- Rittenhouse, Melissa. **"Fad Diets."** WTB.
- Wong, Caitlin & Lindsey, Andrea. **"Dietary Supplements & Operation Supplement Safety."** Mission Nutrition/Navy Fitness.
- Lindsey, Andrea. **"Dietary Supplements and Operation Supplement Safety."** NMCPHC Webinar for Health Promotion Educators.
- Deuster, Patricia & Lindsey, Andrea. **"Dietary Supplement Safety."** USMC Force Fitness Instruction (FFI) Quantico.
- Scott, Jonathan & Wong, Caitlin. **"OPSS: Supplement Label Reading."** USU Wellness Fair.
- Paoletti, Gabriel. **"Positive Psychology and Goal Setting."** Fit to Win at the Pentagon.
- Wong, Caitlin & Kirkpatrick, Katie. **"Performance Nutrition: Why what you eat matters (part 1) and Evaluating Dietary supplements (part 2)."** 1st Battalion, 3rd Infantry Regiment.
- Paoletti, Gabriel. **"Positive Psychology and Goal Setting."** Fit to Win at the Pentagon.
- Messina, Lauren. **"Communication Skills to Optimize Work Performance."** USCG Station Washington.
- Lindsey, Andrea. **"Dietary Supplements and Operation Supplement Safety."** AF Health Promotion Workshop.
- Chamberlin, Rachel. **"An Introduction to CHAMP, TFF and HPO."** Canadian Forces Morale and Wellness Service Directorate for Fitness Team.
- Scott, Jonathan. **"Human Performance Optimization and Precision Performance: The Role of Nutrition."** NATO Human Factors and Medicine on Personalized Medicine in Mental and Performance.
- Kirkpatrick, Katie. **"Clean Eating for Performance Optimization."** USCG Station Washington.
- Deuster, Patricia & Lindsey, Andrea. **"Dietary Supplements and Operation Supplement Safety."** FFI.
- Lindsey, Andrea. **"Dietary supplements and Operation Supplement Safety."** Pentagon healthcare providers (doctors and nurses) and patients.
- Scott, Jonathan & Wong, Caitlin. **"Evaluating Dietary Supplements."** USCG Station Washington.
- Scott, Jonathan & Lindsey, Andrea. **"Dietary Supplements and the Department of Defense."** Mary Frances Picciano Dietary Supplement Research Practicum.
- Patton, Maya & Weiner, Cynthia. **"Take a Mindful Walk through the Green Road."** LRC Wellness Events at USU.
- Steward, Sarah & Shivers, Ayanna. **"Communication Skills to Optimize Work Performance."** EMDEC.
- Gribbin, Tim. **"Injury Prevention: And things you can do if you do get injured."** USCG Station Washington.
- Paoletti, Gabe. **"Stress Optimization."** USCG Station Washington.

- Lindsey, Andrea. **"Dietary Supplements and Operation Supplement Safety."** Massachusetts Army National Guard.
- Messina, Lauren. **"Reclaiming the Homefront: Mental health professionals, military culture, and overcoming stigma."** ANG Directors of Psychological Health Training.
- Steward, Sarah. **"Human Performance Optimization and Military Families."** Tri-Service Nursing Research Program – Research Interest Group.
- Rittenhouse, Melissa. **"Practical Nutrition and Exercise Tips for WORK."** HJF Wellness series.
- Lunasco, Travis. **"Human Performance Optimization (HPO): A Paradigm Shift to Improve Mental Health Care to Service Members."** Center for Deployment Psychology (CDP) Webinar.
- Lindsey, Andrea. **"Dietary Supplements and Operation Supplement Safety."** Warrior Fit – Massachusetts Army National Guard.
- Southmayd, Emily. **"Female Military Officers' Desire for Menstrual Suppression During Training: Characteristics and Bone Health Implications."** Army Medicine Campaign Research to Practice Education Seminar.
- Barrett, Amelia. **"Self-Reported Musculoskeletal Injuries during U.S. Military Officer Secondary Training and Medical Seeking Behaviors."** Army Medicine Campaign Research to Practice Education Seminar.
- Scott, Jonathan. **"College of Allied Health Sciences."** DoD Food and Nutrition and Dietary Supplements and other Self-care Products meeting.
- Lindsey, Andrea. **"Dietary Supplements & DoD's Operation Supplement Safety."** MNT Dietitians, USAF.
- Paoletti, Gabe. **"Total Force Fitness/Human Performance Optimization Basics."** National Defense University.
- Southmayd, Emily. **"Female Military Officers' Desire for Menstrual Suppression During Training: Characteristics and Bone Health Implications."** Tri-Service Nursing Research Program (TSNRP) Women's Health Research Interest Group (WHRIG) Quarterly Call.
- Gribbin, Tim. **"CHAMP Heat Tolerance Testing."** KSI HEATT Summit.
- Steward, Sarah. **"Communication Skills to Optimize Work Performance."** National Defense University.
- Vander Molen, Lindsay and Rittenhouse, Melissa. **"Dietary Supplements & Operation Supplement Safety."** USCG Training Center (TRACEN) Cape May.
- Lindsey, Andrea. **"Dietary Supplements & Operation Supplement Safety."** Coast Guard Sector Miami.
- Lindsey, Andrea. **"Dietary Supplements & Operation Supplement Safety."** Tactical Law Enforcement Team South (TACLET South).
- Scott, Jonathan. **"Dietary Supplement Safety."** USCG Personnel Readiness Expo.
- Scott, Jonathan. **"Dietary Supplements & Operation Supplement Safety."** USU Graduate School of Nursing.

- Gribbin, Tim and Scott, Jonathan. **"Dietary Supplement Safety and Injury Prevention 101."** USCG Base Portsmouth Personnel Readiness Expo.
- Lindsey, Andrea. **"Dietary Supplements & Operation Supplement Safety."** Safety & Occupational Health Office, Massachusetts National Guard.
- Lindsey, Andrea. **"Dietary Supplements & Operation Supplement Safety."** USARIEM Soldiers, providers, and civilian staff members.
- Paoletti, Gabe. **"Stress Optimization and Work/Life Balance."** Office of Naval Intelligence.
- Lunasco, Travis. **"Human Performance Optimization (HPO)/Total Force Fitness (TFF) Capability-Based Blueprint (CBB) and Targeting System: A Commander's Tool to Realign Service Delivery."** NASEM Combat Trauma Care Workshop.
- Lunasco, Travis. **"Human Performance Optimization/Total Force Fitness Capability-Based Blueprint and Targeting System: A Commander's Tool to Optimize Warfighter Talents and Mission Readiness."** 692 ISRG.
- Scott, Jonathan. **"Keto and Endurance Performance: What does the research say."** Fit To Win DiLorenzo TRICARE Health Clinic.
- Barrett, Amelia, Southmayd, Emily, and Scott, Jonathan. **"Physiology of Training and Over-training."** Force Fitness Instruction.



PARTNERS & COLLABORATORS

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YEARS OF TOTAL FORCE FITNESS

This year, CHAMP has received numerous letters of support from DoD communities prioritizing HPO and TFF, to include the Close Combat Lethality Task Force and the Human Systems Directorate within the Office of the Under Secretary of Defense for Research and Engineering.

Internal DoD USU Stakeholders

- *School of Medicine*
- *Graduate School of Nursing*
- *College of Allied Health Sciences*
- *Defense & Veterans Brain Injury Center*
- *Defense and Veterans Center for Integrative Pain Management*
- *Center for Deployment Psychology*
- *Center for Rehabilitation Sciences Research*
- *Henry M. Jackson Foundation*
- *Center for Neuroscience and Regenerative Medicine*

External DoD Stakeholders

- *Defense Health Agency*
- *Office of Naval Intelligence*
- *Services: Army, Navy, Marine Corps, Air Force, Coast Guard*
- *Army Public Health Center*
- *Marine Corps Public Health Center*
- *National Guard Bureau*
- *U.S. Special Operations Command*
- *Armed Forces Health Surveillance Center*
- *Walter Reed National Military Medical Center*
- *Marine Corps Forces, Pacific (G-10)*
- *Defense Advanced Research Projects*
- *Defense Commissary Agency Headquarters*

- *Defense Suicide Prevention Office*
- *Medical Education and Training Campus*
- *Morale, Welfare and Recreation*
- *Walter Reed Army Institute of Research*

External Federal Partners

- *Centers for Disease Control and Prevention*
- *Department of Homeland Security*
- *Department of Justice*
- *Department of Agriculture*
- *Drug Enforcement Administration*
- *Federal Trade Commission*
- *Food and Drug Administration*
- *National Heart, Lung, and Blood Institute*
- *NIH Office of Dietary Supplements*
- *Department of Veterans Affairs*

Academic Institutions

- *George Mason University*
- *National Defense University*
- *Linda Loma University*
- *Heller Institute of Medical Research*
- *The Kinsey Institute*
- *Stanford University*
- *Tufts University*

- *University of Arkansas for Medical Sciences*
- *University of Connecticut*
- *University of Maryland*
- *University of North Texas*
- *University of Mississippi, Oxford*
- *University of South Alabama*
- *University of Tennessee, Chattanooga*
- *University of Toronto*

Professional Associations

- *American College of Sports Medicine*
- *American Medical Society for Sports Medicine*
- *National Collegiate Athletic Association*
- *National Strength and Conditioning Association*
- *National Athletic Trainers Association*

Partners

- *Biotechnology Performance Computing Software Applications Institute*
- *Military Children's Collaborative Group*
- *Military Family Learning Network*
- *TRC Healthcare*
- *PsychArmor Institute*
- *The Institute for Integrative Health*

CHAMP GOALS FOR 2020

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YEARS OF TOTAL FORCE FITNESS
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As we reflect on our accomplishments in 2019, CHAMP looks forward to what's ahead:

- *Engage in HPO and TFF teaching opportunities and curriculum development: CHAMP's OPSS team will develop an online health professional educational module for dietary supplements. The Warfighter Nutrition Basics course for Army and Air Force Diet Techs is set to launch in fall of 2020.*
- *Implement "Year of the CHAMPion" strategic communication theme, where the organization's staff will push to re-engage our current partners and collaborators and create new relationships throughout the military, research, and academic communities related to HPO and TFF.*
- *Continue to act in accordance with CHAMP values and strategic objectives.*
- *Advance integration of HPO and TFF at all levels.*
- *Maintain a strong and active military presence and expand our global network at multiple venues.*
- *Forge new relationships with diverse operational military communities.*
- *Advance implementation of TFF in 2020 through disseminating educational materials and serving as SMEs.*
- *Disseminate research findings through peer-reviewed scientific journals, the HPRC and OPSS platforms, and service-specific channels to reach our military, medical, and scientific audiences.*



- *Refine and expand the Capability Based Blueprinting and Targeting methodology.*
- *Promote and socialize our efforts on psychosocial and spiritual fitness.*
- *Develop two apps: OPSS One Stop Shop and mNEAT.*
- *Develop the OPSS professional dietary supplement education module for DoD.*
- *Provide up-to-date guidance and resources to improve the military nutrition environment through the Go for Green® program and mNEAT.*
- *Determine efficacy of ketone-ester supplementation on preventing and treating TBI-related neuropsychiatric impairment.*
- *Continue becoming a purpose-driven organization by collecting feedback and data to show the impact of our programs and products across communities.*
- *Expand reach and engagement of the Warrior Heat- and Exertion-Related Events Collaborative.*
- *Advance science and clinical recognition of Exercise Collapse Associated with Sickle Cell Trait.*
- *Remain excellent stewards of funding.*



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YEARS OF TOTAL FORCE FITNESS
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...TO OUR NEXT DECADE,
AND BEYOND!



CHAMP

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