Consortium for Health and Military Performance (CHAMP)

Patricia A. Deuster, PhD, MPH, FACSM, Professor and Director
Consortium for Health and Military Performance
Department of Military and Emergency Medicine
Uniformed Services University
Objectives

• Introduce history and concept of human performance optimization

• Describe CHAMP and its objectives

• Introduce a model for human performance research and application

• Speculate on the future of human performance research
Human Performance Optimization (HPO) & DoD

- **2005: Office of Net Assessment Report**
  - Critical need to further develop & understand components of HPO

- **2006: DoD Quadrennial Review**
  - Identified need to promote warrior wellness & apply emerging technologies

- **2006: USU Report to Health Affairs (HA)**
  - Based on HPO conference as tasked by HA

- **2007: Integrated Product Team Report from OSD/HA**
  - Convened to review USUHS report
2006: USU and HPO

• **A pivotal conference** in June 2006 “to chart a course” for the future

• **Urgent need to:**
  – Define HPO
  – Identify valid metrics for HPO
  – Translate research results into operational technologies
  – Improve communication among medical, research, and operational communities

What is CHAMP?

- A Defense Center of Excellence
- Leading educators, health professionals, and researchers in Human Performance Optimization (HPO) committed to:
  - Improving Force Health Protection and Readiness
  - Collaborating on operational research initiatives
  - Communicating and consensus building on issues of best practices
  - Influencing policy based upon evidence
  - Affecting organizational structure changes
  - Changing culture and training based on research
Vision and Mission Statements

“To be the premier Department of Defense (DoD) translational biomedical resource in the area of military-unique Human Performance Optimization (HPO) for maximizing warrior performance in the operational environment and resilience of the global military family.”

“To conduct and translate basic and clinical research in military human performance, so as to inform the development of educational products, clinical products, clinical care pathways, operational guidelines, and health policies. The goals of these efforts are to maximize deployability, expedite warrior return to duty, and optimize resilience and performance of warriors and military families.”
Four Major Areas of Effort

- Education & training
- Research & scholarship
- Leadership
- Service

With a focus on translation for health and performance
Bridge HPO Information Gap Through Translation and Communication

Academic and Research Community

Communication

Joint Medical Community

CHAMP

Leaders and Operators
Continuous Engagement with HPO Community of Practice
Education & Training

“Learning to Care for Those in Harm’s Way”

- **Integrate** HPO into USUHS Curriculum
- **Develop** ongoing clinical training for providers
- **Facilitate** integrative conferences among thought leaders that impact warrior human performance and identify research gaps
- **Translate** evidence-based educational products for warriors
- **Host** Human Performance Resource Center (HPRC)
Facilitate integrative conferences among thought leaders that impact warrior human performance and identify research gaps.
Warfighter Nutrition: Current Opportunities and Advanced Technologies Report From a Department of Defense Workshop

Patricia A. Deuster, PhD MPH*; Ali A. Weinstein, PhD†; Annette Sobel, MD‡; Andrew J. Young, PhD§

ABSTRACT The Uniformed Services University hosted a conference in July 2008 entitled “Warfighter Nutrition: Advanced Technologies and Opportunities” with Health Affairs and the Defense Advanced Research Projects Agency to develop strategic and tactical plans that could enhance Force Health Protection (FHP) by optimizing warfighter nutrition within the Department of Defense (DoD). The conference focused on three aspects of military nutrition: (1) fueling the forces, or garrison feeding; (2) performance optimization or operational feeding during deployment; and (3) nutritional interventions to support health reset and healing. Presentations by speakers addressed practical interventions (i.e., ready for implementation now) and advanced technologies (i.e., approaches meriting prioritized research and development).

Francis G. O’Connor1, Douglas J. Casa2, Michael F. Bergeron3, Robert Carter III4, Patricia Deuster1, Yuval Heled5, John Kark6, Lisa Leon4, Brendon MCDermott7, Karen O’Brien8, William O. Roberts9, and Michael Sawka4

1Military and Emergency Medicine, Consortium for Health and Military Performance, Uniformed Services University, Bethesda, MD; 2Korey Stringer Institute, Neag School of Education, University of Connecticut, Storrs, CT; 3Sanford School of Medicine of the University of South Dakota, Sioux Falls, SD; 4U.S. Army Research Institute of Environmental Medicine Thermal and Mountain Medicine Division, Natick, MA; 5Heller Institute of Medical Research, Sheba Medical Center, Tel-Hashomer, Israel; 6Department of Hematology, Thomas Jefferson University, Philadelphia, PA; 7Department of Health and Human Performance, University of Tennessee at Chattanooga, Chattanooga, TN; 8Command Surgeon, U.S. Army Training and Doctrine Command; 9Department of Family Medicine and Community Health, University of Minnesota, Minneapolis, MN

O’CONNOR, F.G., D.J. CASA, M.F. BERGERON, R. CARTER, P. DEUSTER, Y. HELED, J. KARK, L. LEON, B. MCDERMOTT, K. O’BRIEN, W.O. ROBERTS, and M. SAWKA. American college of sports medicine roundtable on exertional heat stroke — return to duty/return to play: conference proceedings. Curr. Sports Med. Rep., Vol. 9, No. 5, pp. 314–321, 2010. On October 22–23, 2008, an ACSM Roundtable was convened at the Uniformed Services University (Bethesda, MD) to discuss return-to-play or return-to-duty for people who have experienced exertional heat illness (EHI) and to develop consensus-based recommendations. The conference assembled experts from the civilian sports medicine community and the Department of Defense to
Return to Duty: 15 Months to 6 Months!

2. Purpose: To reduce the length of time to return to duty following a heat injury (HI) and heat stroke (HS) and DA Form 3346 (Physical Profile) requirements.

3. Proponent: The proponent for this policy is the Director, Health Policy and Standards, Office of the Surgeon General (OTSG).

4. Policy:

a. HE is defined as a syndrome of heat illness (core temperature at time of event usually equal to or less than 40°C or 104°F) with physical collapse or delirium occurring during or immediately following exercise in the heat, with no more than minor central nervous system (CNS) dysfunction (e.g., headache, dizziness). HE resolves rapidly with minimal cooling intervention.

   (1) Single episodes of HE are not cause for referral to an MSE; however, Soldiers who experience 3 episodes of HE in less than 24 months require referral to an MSE.

   (2) Soldiers diagnosed with HE are individually profiled as determined by the treating physician. Soldiers with HE pending referral to an MSE will be profiled using guidance provided in enclosure 1 and sample DA Form 3346 in enclosure 2.
• **Problem:**
  – Anecdotal reports of injury from warfighter participation in High Intensity Training/HIT

• **Solution:**
  – Held Joint Conference with DoD and American College of Sports Medicine on 13-14 September 2010 at USU to address HIT issues

• **Deliverables:**
  – Recommendations for future research
  – Policy guidance to the HA/DHA
Further Research Needed:
- Collect prospective injury data
- Address physiological & biomechanical stressors
- Study effects on performance

CJS Tasking

- Asked by Chairman of Joint Chiefs of Staff (CJS) Office to hold conference and construct CJS Instruction on Total Fitness for 21st Century Warfighter
CHAIRMAN’S TOTAL FORCE FITNESS FRAMEWORK

References: See Enclosure E.

1. **Purpose:** This instruction identifies a framework for adopting and implementing total force fitness (TFF). The TFF framework is a methodology for understanding, assessing, and maintaining Service members’ well-being and sustaining their ability to carry out missions. This instruction identifies terms, definitions, descriptions, and responsibilities.

2. **Cancellation:** None.

3. **Applicability:** This instruction applies to the Military Services, the Office of the Chairman of the Joint Chiefs of Staff, the combatant commands, Defense agencies and DOD field activities, other organizations in DOD where Service members are assigned, and Service members. The terms “Service member” and “Armed Forces” refer to the Active and Reserve Components of the U.S. Army, Navy, Air Force, Marine Corps, and U.S. Coast Guard, while that Service is serving with DOD under the provisions of federal statute.

4. **Policy**
   a. Establishes the TFF framework as a key readiness component.
   b. The instruction establishes TFF as a key component to the DOD’s Force Health Protection Program and the Chairman’s Health of Force (HoF) priorities in accordance with CJCS Guidance for 2011.
   c. The TFF framework is designed to enhance and support the Secretary of Defense force health policies and Service Title 10 responsibilities.
   d. This instruction supports, augments, and informs the responsibilities defined in references f-m in Enclosure E.
Request from US Army TRADOC

- Two soldier deaths during basic training associated with sickle cell trait (SCT)
- December 2010

- DA: Request the Uniformed Services University of the Health Sciences Center for Health and Military Performance (CHAMP) collaborate with the American College of Sports Medicine (ACSM) and Office of the Surgeon General to review recent fatalities in both military and athletic training and provide the following products: (1) Clinical management guidelines for first responders and medical providers and (2) additional recommendations for risk mitigation.
ACSM and CHAMP Summit on Sickle Cell Trait: Mitigating Risks for Warfighters and Athletes

FRANCIS G. O’CONNOR¹, MICHAEL F. BERGERON², JOYCE CANTRELL³, PHILIPPE CONNES⁴, KIMBERLY G. HARMON⁵, EDWARD IVY⁶, JOHN KARK⁷, DAVE KLOSSNER⁸, PETER LISMAN¹, BRYCE K. MEYERS⁹, KAREN O’BRIEN¹⁰, KWAKU OHENE-FREMPOG¹¹, ALEXIS A. THOMPSON¹², JAMES WHITEHEAD¹³, and PATRICIA A. DEUSTER¹

¹Department of Military and Emergency Medicine, Uniformed Services University of the Health Sciences, Bethesda, MD; ²National Institute for Athletic Health and Performance, Sanford USD Medical Center, Sioux Falls, SD; ³Department of Preventive Medicine and Biometrics, Uniformed Services University of the Health Sciences, Bethesda, MD; ⁴UMR Inserm 665, Universite Antilles-Guyane, Pointe-a-Pitre, GUADELOUPE; ⁵Departments of Family Medicine and Orthopaedics and Sports Medicine, University of Washington, Seattle, WA; ⁶National Heart, Lung, and Blood Institute, Bethesda, MD; ⁷Hematology–Oncology Division, Howard University Hospital, Washington, DC; ⁸National Collegiate Athletic Association, Indianapolis, IN; ⁹Division of Preventive Medicine, Walter Reed Army Institute of Research, Silver Spring, MD; ¹⁰Madigan Army Medical Center, Tacoma, WA; ¹¹Comprehensive Sickle Cell Center, Children’s Hospital of Philadelphia, Philadelphia, PA; ¹²Feinberg School of Medicine, Northwestern University, Chicago, IL; and ¹³American College of Sports Medicine, Indianapolis, IN

ABSTRACT

Preventing Injury through Functional Movement Assessment: What We Know, What We Don’t Know, and Where We Go From Here.

September 13-14, 2012
Uniformed Services University
Bethesda, MD

Deydre Teyhen, PT, PhD, OCS¹; Michael F. Bergeron, PhD, FACSM²; Patricia Deuster, PhD, MPH, FACSM³; Neal Baumgartner, PhD⁴; Anthony I. Beutler, MD⁵; Sarah J. de la Motte, PhD, MPH, ATC⁵; Bruce H. Jones, MD, MPH⁶; Peter Lisman, PhD⁵,⁷; Darin A. Padua, PhD, ATC⁸; Timothy L. Pendergrass, PT, DScPT⁹; Scott W. Pyne, MD, FACSM¹⁰; Eric Schoomaker, MD, PhD, FACP¹¹; Timothy C. Sell, PT, PhD¹²; and Francis O’Connor, MD, MPH, FACSM³

Abstract
Prevention of musculoskeletal injuries (MSKI) is critical in both civilian and military populations to enhance physical performance, optimize health, and minimize health care expenses. Developing a more unified approach through addressing identified movement impairments could result in improved dynamic balance, trunk stability, and functional movement quality while potentially minimizing the risk of incurring such injuries. Although the evidence supporting the utility of injury prediction and return-to-activity readiness screening tools is encouraging, considerable additional research is needed regarding improving sensitivity, specificity, and outcomes, and especially the implementation challenges and barriers in a military setting. If selected current functional movement assessments can be administered in an efficient and cost-effective manner, utilization of the existing tools may be a beneficial first step in decreasing the burden of MSKI, with a subsequent focus on secondary and tertiary prevention via further assessments on those with prior injury history.

and society at large. With military personnel, MSKI have the added consequence of directly impacting force readiness and, in turn, national defense. MSKI can result from a single, acute macrotraumatic overload event/exposure (e.g., noncontact anterior cruciate ligament (ACL) tear or ankle sprain), a chronic repetitive exposure or overuse that leads to subtle microtrauma (e.g., shin splints or stress fractures), or a combination of an acute-on-chronic presentation (153). Both traumatic overload- and overuse-related injuries can predispose individuals to posttraumatic degenerative osteoarthritis — the most common and costly disability in the U.S. Military
Women In Combat

• Tasked to describe and prioritize research and policy gaps for optimizing performance of WIC
• Provide actionable policy recommendations to the Assistant Secretary of Defense for Health Affairs (ASD(HA)) through the DoD Human Performance Optimization Committee
- Translate evidence-based educational products for warriors
- Host Human Performance Resource Center (HPRC)
Educational Arm: HPRC

- **Mission:** Build & maintain an information/communication bridge across Human Performance communities of interest - commanders, warriors, medical, researchers

- **Vision:** The right performance information, to the right customer, at the right time

http://hprc-online.org/
The Edge You Need For Total Fitness

HPRC’s human performance optimization (HPO) website is for U.S. Warfighters, their families, and those in the field of HPO who support them. The goal is Total Force Fitness: Warfighters optimized to carry out their mission as safely and effectively as possible.

FEATURED UPDATES

Natural Medicines Comprehensive Database App

Healthcare provider app to get answers and data on natural medicines at any time.

hprc-online.org/
Operation Supplement Safety: OPSS
A DoD wide educational initiative
OPSS is available through the Human Performance Resource Center (HPRC) website
hprc-online.org/OPSS
OPSS Overview

• **Purpose**
  - Increase awareness within the DoD community about dietary supplements

• **Provide tools to be “smart” supplement users**
  - Service members
  - Leaders
  - DoD civilians
  - Family members
  - Healthcare providers
  - Retirees
FREQUENTLY ASKED...

 Supplement FAQs

Answers to frequently asked questions about supplements

FOR THE WARFIGHTER

Infosheets, videos, and more to keep Warfighters informed

FOR THE PROVIDER

In-depth information for those who want to know more

FIND OUT how your supplement RATES

IS YOUR DIETARY SUPPLEMENT CLEAN?

ASK THE EXPERT

HIGH-RISK SUPPLEMENT LIST

Follow us on Facebook for the latest Operation Supplement Safety information.

Report adverse events to dietary supplements here.

OPSS Campaign Press Kit

An overview and background on the Operation Supplement Safety (OPSS) campaign, campaign materials, and suggested activities for local installations.
Frequently Asked...  

Supplement FAQs
- Serving Size
- Ascorbic Acid
- Cholecalciferol

Answers to frequently asked questions about supplements

For the Warfighter

Infosheets, videos, and more to keep Warfighters informed

For the Provider

In-depth information for those who want to know more

Find out how your supplement rates

Is your dietary supplement clean?

Ask the expert

High-risk supplement list

Follow us on Facebook for the latest Operation Supplement Safety information.

Report adverse events to dietary supplements here.

OPSS Campaign Press Kit

An overview and background on the Operation Supplement Safety (OPSS) campaign, campaign materials, and suggested activities for local installations.
Defense Department posts ‘high-risk’ supplement list

February 10, 2015 By Patricia Kime

The Pentagon has published a list of dietary supplements it says contain dangerous ingredients that may cause troops to pop positive on a urine test.

The Defense Department’s Human Performance Resource Center, part of the Uniformed Services University of the Health Sciences, introduced its “High-Risk Supplement List” this week as part of Operation Supplement Safety, the center’s initiative to educate service members and their families about supplements.

The inventory, which contains more than 130 bodybuilding supplements, dietary aids and fat-burners, is nearly identical to the U.S. Anti-doping Agency’s high-risk supplement list and actually was developed in conjunction with that organization, said HPRC senior nutrition scientist Michael Green.
OPSS High-Risk Supplement List

THE HUMAN PERFORMANCE RESOURCE CENTER / HPRC-ONLINE.ORG
USU CONSORTIUM FOR HEALTH AND MILITARY PERFORMANCE (CHAMP)

* First Name: 
* Last Name: 
* Email Address: 
* User Type:  

* I accept all terms and conditions, and opt-in to receive future communications regarding this list

Submit

Terms and Conditions

By accessing and using this section, you signify your agreement to these Terms and Conditions. If you do not agree to all of these Terms and Conditions, do not use this site! The United States Anti-Doping Agency ("USADA") or Operation Supplement Safety ("OPSS") may revise and update these Terms and Conditions at any time. Your continued usage of this site (the "Site") means you accept these changes.

- The Site is being provided pursuant to an agreement between USADA and the Uniformed Services University of the Health Sciences ("USUHS") and is not related to the United States Olympic Committee or any sports or other entity. The Site and the information contained in it shall not be used in connection with any user's activity or in any way outside of OPSS.

- The Site and its contents are provided for informational purposes only. Neither OPSS nor USADA makes any representation or warranty
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<td>IronMagLabs</td>
<td>The Supplement Facts panel lists &quot;1-Androstene 3bol, 17-one&quot;</td>
<td>Anabolic Agents</td>
<td>2014-03-13</td>
<td>The product may contain one or more steroids or steroid-like substances. For more information about these substances please see the OPSS FAQ on anabolic substances.</td>
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<td>Stimulants</td>
<td></td>
<td>This product may contain one or more stimulants. For more information please see the OPSS FAQ on Stimulants.</td>
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<td>ABSolute Fuel</td>
<td>BioScience Institute Inc.</td>
<td>The Supplement Facts panel lists &quot;Citrus Aurantium 30% Synephrine&quot;</td>
<td>Stimulants</td>
<td>2014-04-03</td>
<td>Testing revealed the presence of oxilofrine (also known as methylsynephrine). For more information please see the OPSS FAQ on synephrine and the OPSS FAQ about stimulants.</td>
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<td>2014-04-03</td>
<td>Testing revealed the presence of octopamine, which is a constituent of Citrus aurantium. For more information about Citrus aurantium please see the OPSS FAQ on Citrus aurantium.</td>
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Go For Green

**GO**
- Premium fuel
- Nutrient-packed
- Eat often

**GO FOR GREEN®**
*Performance Food*

**CAUTION**
- Higher in calories, sugar, fat, or salt
- Eat occasionally

**GO FOR GREEN®**
*Watch Quantities*

**STOP**
- Highest in calories, fat, sugar, or salt
- Eat rarely

**GO FOR GREEN®**
*Limit Amounts*
Go for Green® is a joint-service food-labeling program sponsored by DoD for the Military Community. Foods are color-coded Green, Yellow, and Red to help you choose the foods that fuel your body and brain best.
EXPLORING NUTRITIONAL INFORMATION
BY CHOOSING A TYPE OF RATION.

- **MRE™**
  *(Meal, Ready-To-Eat™)*
- **FSR™**
  *(First Strike Ration®)*
- **MCW/LRP**
  *(Meal, Cold Weather/ Long Range Patrol)*

**FAQs**
Menu 1
Chili with Beans
Calories: 1,327

Menu 2
Beef, Barbecue, Pulled
Calories: 1,326

Menu 3
Chicken, Noodles and Vegetables in Sauce
Calories: 1,451

Menu 4
Pork Sausage in Cream Gravy
Calories: 1,372
Research and Scholarship

• Conduct research on:
  – Exercise intolerance and fatigue
  – Heat illness
  – Musculoskeletal injury
  – Rhabdomyolysis (severe muscle damage)
  – Dietary supplements
  – Integrative health and self-care practices
  – Psychological injury
  – Ethnicity and health disparities
  – Human-animal interactions
Service and Leadership

• Facilitate and coordinate medical care for Warriors with unique HPO needs
  – Exercise intolerance
  – Rhabdomyolysis
  – Heat illness
  – Military nutrition
  – Dietary supplements
  – Musculoskeletal injury/prevention

• Serve as SMEs for policy recommendations on heat illness, dietary supplements, exertional rhabdomyolysis, and sickle cell trait.
Clinical Services & Consultative Care

- Heat test service members who have had **exertional heat stroke**
- Evaluate service members with current & recurrent **exertional rhabdomyolysis**
- Assist in developing screening and **return to duty guidelines** for various performance-related events & conditions
- Serve as experts in **exertional heat illness, rhabdomyolysis, and substance abuse**

Heat (■) and thermoneutral (□) tolerance tests

Core Temperature (° C)  Heart Rate (bpm)
Rx3: Rehab, Refit, Return to Duty

Rx3 is a guide to help service members recover from and prevent common musculoskeletal injuries, ultimately improving service members’ overall physical fitness.
For the Provider

The Rx3 program provides a framework for diagnosis and management of common musculoskeletal injuries in the military. Rx3 includes an easy-to-follow algorithm that alerts providers to conditions that may require a specialty evaluation. Most patients will be able to return to full duty by following a step-wise rehabilitation program on their own. The Rx3 is just that program. It is a combination of injury-specific and core-strengthening exercises, cardiovascular endurance training, and flexibility work designed to increase functional capacity, improve range of motion, decrease symptoms of pain, and ultimately return to full duty.

PT Prescription Pad [PDF]
Use this downloadable, printable “prescription pad” as a handout to remind your patients to visit the appropriate web pages of the Service Member section of HPRC’s Rx3 resource.

Choose your patient’s area of injury:
The Way Ahead

“State of the Science” for performance research requires an integrated and holistic approach
Human Performance Optimization

“The process of applying knowledge, skills, and emerging technologies to improve and preserve the capabilities of personnel (and family) to execute essential tasks.”

Mission Focus!
Proposed HPO Model

- Job, training, finances, deployment, family, friends, values, etc.
- External
- Family
- Individual
- Performance Metrics

Demands → Resources → Outcomes
Resources and Demands

Cognitive Factors

Behavioral Factors

Physical Environment

Social Environment

Genetic & Physiologic Factors

Motivational/Emotional Factors
How do we use this model to conduct research on human performance?

What are some options?
Past and Current Research Paradigm

Apply an Intervention

Analyze data for cognitive or physical performance measure(s)

Yes or No based on “mean” change
But data show that we are not all the same!

People respond differently to the same intervention!
Selected Examples of Differential Responses

- Creatine supplementation
- Serum creatine kinase
- Stress reactivity
- Functional movement
- Mindfulness
ACUTE CREATINE MONOHYDRATE SUPPLEMENTATION: A DESCRIPTIVE PHYSIOLOGICAL PROFILE OF RESPONDERS VS. NONRESPONDERS

Daniel G. Syrotuik and Gordon J. Bell
Faculty of Physical Education and Recreation, University of Alberta, Edmonton, Canada.

Abstract. Syrotuik, D.G., and G.J. Bell. Acute creatine monohydrate supplementation: a descriptive physiological profile of responders vs. nonresponders. J. Strength Cond. Res. 18(3):610–617. 2004.—The purpose of this study was to describe the physiological profile of responders (>20 mmol·kg⁻¹·d⁻¹ increase in total intramuscular creatine monohydrate [Cr] + phosphorylated creatine [PCr]) versus nonresponders (<10 mmol·kg⁻¹·d⁻¹ increase) to a 5-day Cr load (0.3 g·kg⁻¹·d⁻¹) in 11 healthy men (mean age = 22.7 years). Pre-post 5-day cellular measures included total resting Cr content (Cr + PCr), fiber type composition, and fiber type cross-sectional area (CSA) determined from muscle biopsies of the vastus lateralis. Body mass, daily dietary intake, 24-hour urine outputs, urinary Cr and creatinine (CrN), and strength performance measures (1 repetition maximum [1RM] bench and leg press) were also assessed before and after the 5-day loading period. Results indicated that there were 3 levels of response to the 5-day supple-
Role of Race and Gender in Baseline CK Levels

Creatine Kinase (IU/L)

- Caucasian
- African American
- Asian
- Hispanic

Creatine Kinase (IU/L)

- Men
- Women

*p < 0.01

O’Connor FG, Deuster PA, Davis J, Zeno S, McFadden DP, Dillon PJ, Blumling RL, Cariello FP. Ethnic and Gender Differences in CK Distribution for Marine Corps Officer Candidates
Individual Creatine Kinase (CK) Variability
CK Responses by Gender

- Male (n=110)
- Female (n=47)

Creatine Kinase (IU/L)

- Pre
- Post
- 48 Hr
- 72 Hr
Stress Reactivity to Psychological and Physical Stressors

Psychological Stress

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Exercise Stress

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High Reactors

Low Reactors
People move differently!

**Y-Balance Test**

**Landing Error Scoring System**

**Squat Test**

**Functional Movement Screen**
People “attend” differently.

Mindfulness—innate attention to and awareness of present without any judgment or reaction

- Mindfulness-based stress reduction (MBSR) participants with higher levels of trait mindfulness showed a larger increase in mindfulness, subjective well-being, empathy, and hope, and larger declines in perceived stress up to 1 year after treatment.

What is HPO “State of the Science”? 
What should be done?

Analyze data for multiple measure(s) and look for responders/nonresponders and between subject variance.

Who does it work for?

What factors are related to +/- responses?
Control for Selected Intrinsic and Extrinsic Characteristics

- Emotional Stability
- Conscientiousness
- Agreeableness
- Extraversion
- Lifestyle behaviors
- Mindfulness
- Hardiness
- Locus of control
- Sensation-seeking
- Financial habits
Observe and Relate to Biologic Differences

- Genetic variants
- Epigenetics
- Microbiome
- Body composition

- “Omics”
- Nutrient/drug intakes
- Complex interactions
- Biologic responses to stressors
The “Omics”

- Genomics
- Transcriptomics
- Proteomics
- Metabolomics
What about human performance?

Melancholic microbes: a link between gut microbiota and depression?

The microbiome contributes to obesity, 1 diabetes, coeliac disease, rheumatoid arthritis, and some cancers.

The gut microbiome and the brain: gut microbes influence memory, mood, and cognition.

What about human performance?
Summary and Conclusions

• CHAMP continues to address key performance issues and translate “state of the science” research into practice

• CHAMP has come a long way – and will continue to address difficult issues

• Human performance research needs to be integrated for addressing individual differences and identifying personalized solutions
Acknowledgements

COL Fran O’Connor

LTG(Ret) Eric Schoomaker

and many, many others
For more information contact

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