



USAMRMC STRATEGIC COMMUNICATION PLAN

MILITARY OPERATIONAL MEDICINE RESEARCH PROGRAM (MOMRP)

MISSION

MOMRP develops effective countermeasures against stressors and maximizes health, performance, and fitness. MOMRP protects the whole Soldier — head-to toe, inside and out, at home, and on the battlefield.

BACKGROUND

MOMRP conducts biomedical research to deliver products and solutions to the Soldier that address health and fitness throughout the deployment cycle. MOMRP is centered on cutting-edge scientific research and bringing science to the Soldier on the battlefield in a relevant, timely manner. MOMRP research is focused on four program areas: Injury Prevention and Reduction, Psychological Health and Resilience, Physiological Health, and Environmental Health and Protection.

Soldiers are susceptible to physical, sometimes debilitating, injuries. Head and neck injuries, including severe brain trauma, have been reported in one-fourth of all evacuated service members. MOMRP Injury Prevention and Reduction research develops models to predict the degree of injury from known threats, develops design guidelines and performance specifications for protective equipment, and identifies countermeasures to prevent or mitigate injury to the Soldier. Threats addressed include blast overpressure, blunt and penetrating trauma, musculoskeletal and training injuries, and neurosensory injury. This program area focuses on (1) thoracic and pulmonary injury protection through modeling blast and blunt trauma, (2) protection that prevents or reduces neurosensory injury, (3) validated standards to assess performance for return to duty, and (4) training doctrine based on physiological mechanisms that underlie musculoskeletal injury to identify and mitigate injury risks.

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The behavioral health of Soldiers is critical to force health and readiness. MOMRP Psychological Health and Resilience research focuses on prevention, screening, assessment, diagnosis, treatment, and recovery to sustain and restore Soldier and family behavioral health. Research in this program area focuses on providing evidence-based recommendations for policy and ensuring optimal delivery of behavioral health training and services across the continuum of care and life cycle for Soldiers and their families. Threats addressed include occupational stress and trauma, suicide, concussion, alcohol and substance abuse, family separation, and violence.

The rapid pace of operations and the need for repeated deployments have a profound effect on the physiological health and performance of Soldiers. MOMRP Physiological Health research focuses on developing medical standards, predictive models, and countermeasures to prevent or mitigate the effects of physiological stressors on the performance and fitness of Soldiers. These stressors include inappropriate nutrition, poor physical fitness, sleep loss, sleep deprivation, fatigue, and burnout. This program area (1) evaluates threats and stressors in both the garrison and operational environments and surveys nutritional health dietary supplement use, (2) develops interventions to mitigate threats to operational health, (3) addresses biomedical modeling and networked physiological status monitoring capabilities, (4) uses a comprehensive sleep and performance management system based on effects of chronic sleep restriction and acute total sleep deprivation, and (5) identifies individual physiological differences in personal resilience.

Soldiers train and fight while exposed to a range of harsh environmental conditions. They are also at risk for exposure to toxic chemicals and materials in the operational environment. These harsh environmental conditions, alone or combined with other operational stressors, degrade military physical and cognitive performance. MOMRP Environmental Health and Protection research develops medical standards, predictive models, and countermeasures to prevent or mitigate the effects of extreme environments and toxic material exposure in the military. Threats addressed by this program include extremes of heat/cold and hydration, high altitude, and toxic environmental hazards such as industrial chemicals and materials. Current research projects focus on methods that sustain operational performance in extreme heat and cold and at high altitudes to prevent and manage heat, cold, altitude sickness, and hydration-related injuries. This research also includes detecting, monitoring, and assessing the risk of the Soldier's toxic environmental exposure during combat operations.

KEY THEMES AND MESSAGES

MOMRP conducts biomedical research to deliver products, capabilities, and solutions to the warrior that address health and fitness throughout the deployment cycle.

MOMRP is centered on cutting-edge scientific research and bringing science to the Soldier on the battlefield in a relevant, timely manner.

MOMRP is divided into four research focus areas: Injury Prevention and Reduction, Psychological Health and Resilience, Physiological Health, and Environmental Health and Protection.



In addition, MOMRP works with extramural partners to conduct more diverse research using different techniques and specialized points of view.

QUESTIONS & ANSWERS

Q *What are some key MOMRP products supporting current operations?*

A Key MOMRP products include:

- Resilience Training programs (formerly Battlemind), focusing on stress mitigation and psychological resilience, help facilitate smooth transitions.
- Operational guidelines to prevent heat-stress casualties among warriors deployed to Iraq.
- Operational guidelines to prevent altitude-induced injuries among warriors operating in the mountains of Afghanistan.
- TGAS (Toxic Gas Assessment Software), a warrior survivability assessment tool, predicts vehicle crew incapacitation from toxic fire gas exposures behind defeated armor.
- Intelligent Aquatic Biomonitor System (iABS): continuously monitors changes in fish behavior to rapidly detect a wide range of toxic chemicals in water; useful for many applications, including drinking water protection and watershed and effluent monitoring.
- Environmental Sentinel Biomonitor (ESB) system: uses biologically based sensors to rapidly identify toxicity associated with a broad spectrum of industrial chemicals in water in support of Army field water production equipment operation, thus augmenting current preventive medicine detection capabilities and providing additional data to support health risk assessments during deployments.
- Coliform Analyzer: used for routine testing of Army field drinking water supplies for microbial contamination is required for protecting the health of deployed personnel; will significantly improve current testing capabilities, reducing detection times for bacteria indicative of contamination from 24 hours to 8 hours or less.
- Body Armor Blunt Trauma Performance Standard and Testing Method: will enable the development of lightweight body armor.
- INJURY: software tool to predict thoracic injuries from exposure to blast overpressure from high-powered weapon systems.
- Guidelines for Nutritional Supplements in rations sustain performance and health.



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Q Does MOMRP collect data on injuries? If so, how does MOMRP use that information?

A The Total Army Injury Health and Occupational Database (TAIHOD) is used to track and store the demographic, occupational, and health information of Army members over the course of their active duty careers. It is a major research capability used by the Military Performance, Thermal Mountain Medicine, and Nutrition Divisions at U.S. Army Research Institute of Environmental Medicine. TAIHOD is a database for answering epidemiological questions of injury and health outcomes relevant to the Army. It contains information on individual service member demographic and occupational characteristics, health outcomes, and health behaviors collected over the course of an Army member's active duty career for all Army members who have served on active duty since 1971—approximately 5 million individuals.

Q What predictive models, software, or devices has MOMRP developed for its research?

A MOMRP has developed the following:

- **Toxic Gas Assessment Software–Performance Evaluation (TGAS-PE):** tool that predicts impairment, incapacitation, and lethality following exposure to toxic gases; also predicts probability of total incapacitation, immediate lethality, and delayed lethality from inhalation of a mixture of seven common fire gases (i.e., low O₂, CO, CO₂, NO₂, HCN, HC₁, and Acrolein).
- **INJURY Software:** tool assessed the effects of armor materials on blast lung injury, so that protection concepts can be developed to mitigate blast overpressure injuries for Warfighters.
- **Method for Evaluation of Vibration Containing Multiple Shocks:** tool used to predict injuries sustained by service members who ride in Army tactical ground vehicles at high speeds over rough terrain.
- **Predictive Models of Visual Performance:** used with sensor and display systems in operational environments to create design guidelines for advanced imaging and display technologies.
- **Advanced Blast Test Device:** collects blast overpressure and impulse noise data to assess blast overpressure hazards to prevent occupational injuries for military personnel during weapon firing exercises.

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- **Injury Prevention and Restraint Technologies** — being developed for ground vehicles and helicopters (Inflatable Restraint Systems).
- **Facial and Ocular Countermeasure Safety (FOCUS)** — a biofidelic test headform used to measure blunt impact forces on the face and eye.
- **Body Armor Blunt Trauma Performance Testing Method** — consists of two components: (1) the Anthropomorphic Test Module that measures the distribution of forces and motions behind body armor systems during a ballistic impact and (2) a biomedically valid, human blunt trauma injury prediction model packaged in web-based software called Behind Armor Blunt Trauma Assessment.

Q Who funds the Injury Prevention and Reduction program?

A Army research, development, testing, and evaluation CORE and the Defense Health Program (DHP) Joint Program Committee-5 Military Operational Medicine (including congressional special interest [CSI] money) is used to fund the Injury Prevention and Reduction Program. Projects fit into the following research areas: basic research (6.1), applied research (6.2), and development of candidate solutions and prototypes (6.3).

Q What's on the horizon for the Injury Prevention and Reduction Program?

A Future Injury Prevention and Reduction work will include the development of predictive models for Warfighter training and operational performance to reduce overuse and exertional musculoskeletal injuries, as well as continued development and support in three main areas: (1) validation of predictive injury models against animal and human cadaver data to better predict physiological response; (2) improvement of blast, noise, blunt trauma, and toxic gas dosimeters to be deployed in the field for accurate measurement of the mechanical insults that cause injury; and (3) improvements in biofidelic anthropomorphic test devices for updating military hearing, helmet design, and body armor protection standards and to test the effectiveness of new military protective armor and other protective equipment designs.

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Q *Why is Psychological Health and Resilience important to the military?*

A The inability to remain psychologically resilient during training and in operational environments can completely disable a Warfighter. Over one-third of enlisted Warfighters fail to complete their first term of enlistment, often due to mental, psychosocial, or behavioral problems. Even those Warfighters considered to be resilient can be affected by traumatic events common on the modern battlefield. MOMRP's Psychological Health and Resilience Research Program Area develops evidence-based solutions and capabilities to mitigate threats that Warfighters face. Research is aimed at identifying modifiable factors predicting negative and positive behavioral health outcomes. In addition, field tests of strategies are designed to reduce attrition rates and psychiatric morbidity associated with poor mental health.

Q *What are some examples of products from the Psychological Health program area?*

A **Products from the Psychological Health program area include:**

- Unit Behavioral Health Needs Assessments
- Mental Health Advisory Team Reports
- Post-Deployment Health Assessment and Post-Deployment Health Reassessment Updates
- Evidence-based skills-based interventions for promoting resilience
- Evidence-based treatment guideline and policy recommendations
- Doctrine/Training: Findings/recommendations that led to the revision of combat and operational stress control doctrine/medic training courses

Q *What are meant by mission reset and recovery?*

A Sustained combat operations such as those in Iraq and Afghanistan cause physical and mental fatigue due to the physically demanding work as well as to lack of sleep. Mission reset and recovery are terms that are used to describe the need for adequate rest, nutrition, and fitness to ensure that warriors are functioning at their highest possible level of physical readiness and mental alertness.

Q *Who funds the Psychological Health and Resilience research program? How much funding did it receive in 2010? How much funding will it receive in 2011?*

A Psychological Health and Resilience research is supported by the Army and the Health Affairs DHP. In fiscal year 2011, approximately \$87M of combined Army and DHP funds supported the Psychological Health and Resilience research program efforts. It is anticipated that in fiscal year 2012, approximately \$87M will go toward Psychological Health and Resilience research.



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Q *What's on the horizon for the Psychological Health and Resilience research program?*

A The goals of the Psychological Health and Resilience research program are to reduce negative risk-taking behaviors and improve effectiveness and optimize treatment for post-traumatic stress disorder, suicide, substance abuse, and other behavioral health disorders. Efforts will continue to focus on evidence-based novel techniques for sustaining and enhancing resilience in Warfighters and their families.

Q *What are some examples of products from the Psychological Health program area?*

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- **SPARNET – Spartan Sensor Network:** system of mobile, networked wearable sensors that will provide real-time medical status and situational awareness information to Commanders in training scenarios. This product is currently being tested in Ranger Training Brigade with future implementation planned for Basic Combat Training and Advanced Individual Training.
 - **Sleep Watch Actigraph:** wrist-worn digital signal-processing device, provides real-time quantitative estimates of warrior physical and cognitive readiness and performance based on sleep/wake history. The actigraph is a risk assessment decision aid for Commanders.
 - **First Strike Ration (FSR):** lightweight, efficient ration that provides optimal nutrition to sustain cognitive and physical performance of warriors. In conjunction with the FSR, a new liquid-based Nutrient Delivery System will improve on demand access to essential nutrients.
 - **21st Century Fueling (Soldier Fueling Research Center or Dining Facility of the 21st Century):** integrated research program that promotes optimal health and fitness, prevents degraded performance, prevents and treats obesity, injury and disease, and supports post-deployment health reset over the military career. The goal is to establish holistic community-based nutrition programs for warriors and their families.

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Q *Regarding nutrition, does MOMRP take into account Soldiers with diabetes or food allergies?*

A Diabetes is taken into account as an adverse outcome of improper feeding practices by Soldiers. This program will provide data that can drive best practices in terms of a Soldier fueling to prevent chronic disorders such as diabetes and lead to optimal Soldier performance as well as a healthy life after military service. All rations and food products are labeled effectively to allow Soldiers with food allergies to self-determine safe consumption.

Q *Who funds the Physiological Health program? How much funding did it receive in 2010? How much funding will it receive in 2011?*

A The Physiological Health program includes both Army and DHP (Core and CSI) as the primary sources of funding while the other services are also developing programs in this area. Collaborative and leveraged efforts will make a comprehensive program that addresses the needs of the U.S. military. The approximate active investment of the Army and DHP in Physiological Health is \$30.4M.

Q *What's on the horizon for the Physiological Health program?*

A As our forces return home in a peacetime tempo, they will have time to focus on such things as nutrition to promote healthy lifestyles in garrison and other permanent duty stations. Research efforts will continue to investigate eating behavior interventions at military dining facilities and the most effective nutrient profile to promote post-deployment physical and psychological recovery. Researchers are also investigating mechanisms to maintain effective sleep patterns that provide the most benefit to Soldiers and promote cognitive readiness.

Q *What are some accomplishments in the Environmental Health and Protection program area?*

A MOMRP has developments in the following areas:

Cold Exposure:

Probability of Survival Decision Aid predicts hypothermia, dehydration, and survival time during prolonged exposure to a wide range of air and water conditions at sea.

- To alleviate the psychomotor and cognitive deficits associated with cold exposure, nutritional supplements were evaluated for their efficacy in prevention during hypothermia.
- Environmental Strain Prediction Models are biomedically valid tools for predicting individual and unit-level performance outcomes based on environmental and operational variables.



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High Altitude:

- High-altitude (terrestrial) exposure guidelines were developed to prevent and reduce hypobaric hypoxia-related illnesses and performance impairments to service members.
- Nutritional supplements were evaluated for their efficacy in improving exercise performance at high altitude, and the effect of dehydration on performance at high altitude was quantified.

Heat Exposure:

- Heat exposure guidelines were developed to prevent and reduce heat-related injuries to service members.
- Nutritional supplements were evaluated for their efficacy in improving exercise performance in the heat, and the effect of dehydration on performance in the heat was quantified.

Toxin Exposure:

- **Intelligent Aquatic Biomonitor System (iABS)** monitors fish behavior as a way to detect toxic chemicals in water. The iABS rapidly detects a wide range of toxic chemicals or chemical mixtures in water sources by measuring changes in fish behavior. Fish are natural integrators of water quality conditions and respond to a wide range of chemicals and mixtures.
- **Rapid Analysis of Water for Select Chemical Contamination** is a solid-phase microextraction and gas chromatography-mass spectrometry sampling and analysis method developed for two insecticides, carbaryl and lindane.

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Q *Aside from heat, cold, and altitude, what other environmental factors are the Army currently investigating to improve Soldier performance?*

A MOMRP is investigating particulate matter, dust, and pollution on the pulmonary health of deployed Warfighter and developing detection biomarkers for environmental hazards, chemical and materiel.

Q *Once the presence of a chemical or biological contaminant are discovered, what happens next? Does the Environmental Health and Protection program develop any treatments for exposure to contaminants?*

A The Army Environmental Health and Protection program is focused on detection and prevention of exposures to hazards in both the training and the operational environments. The U.S. Army Public Health Command has responsibility for surveillance of hazards and appropriate responses to contamination for the Army.

Q *Who funds the Environmental Health and Protection research program?*

A Military Operational Medicine funding comes from various sources including Army research, development, testing, and evaluation (CORE) and the DHP Joint Program Committee-5 Military Operational Medicine.

Q *What's on the horizon for the Environmental Health and Protection research program?*

A Development of biomarkers for exposures to environmental hazards including those that are military relevant.

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