

10 Years of Progress: research and Development in Human Performance

Brian J. Sharkey, Brent Ruby, Steven Gaskill

Abstract

In the late 1950s the Aerial Fire Depot in Missoula began working on equipment for smoke jumping and air-cargo. This led to the development of the Missoula Technology and Development Center (MTDC). In the 1960s, recognizing the importance of the human/equipment interaction, MTDC established a relationship with the University of Montana Human Performance Laboratory. Since 1964 MTDC has maintained a cooperative agreement (MOU) with the University of Montana. The agreement provides for cost-effective, evidence-based studies to solve equipment, health and safety problems. The purpose of this presentation is to summarize recent work and to identify priorities for future study.

Energy, Performance and Health A Department of Defense grant funded two studies to determine total energy expenditure and hydration demands during five days of wildfire suppression. The studies demonstrated elevated rates of daily energy expenditures (3,000-6,300 kcal/day), and an overall loss of total body water and body weight. Analysis of fire camp meals indicated sufficient energy was available, if firefighters consumed the calories required to meet elevated daily requirements. We began field studies of supplemental carbohydrate (CHO) drinks/rations in order to provide energy throughout the work shift. Crossover studies demonstrated maintenance of blood glucose and an increase in self-selected work output when supplemental carbohydrates were consumed throughout the day. We have also demonstrated that immune function, as measured by salivary immunoglobulin A (sIgA), the first line of defense against upper respiratory infections, was better maintained during CHO supplementation.

Fitness, Fatigue, Cognitive Function Using sIgA as an objective measure of fatigue we found recovery was adequate after a 14 hour shift, but not after 21 hours of arduous work. The 21 hour shift led to several days of suppressed immune function. Studies of firefighter fitness demonstrated that those with higher levels were less fatigued and able to do more work when compared to less fit firefighters. Laboratory and field studies demonstrate maintenance of blood glucose, immune and cognitive function, mood, and work output when firefighters utilize liquid and solid carbohydrate supplements.

New Directions We are continuing work on 1) temperature regulation and hydration; 2) supplemental feeding, fatigue, cognitive function, work performance, and recovery; and 3) relationships among diet, fitness and immune function. We are hoping to extend these studies to include the role of micronutrients, vitamins and minerals, and their relationship to performance and health in WLFF. We propose field studies of food intake, body composition, and energy expenditure; development of a nutritional guidance program; and, if needed, introduction of a ration component to meet micronutrient needs.

Brian Sharkey works for the USDA Forest Service Missoula Technology Development Center in Missoula, MT. He can be reached at bsharkey@fs.fed.us Brent Ruby and Steven Gaskill are with the University of Montana Human Performance Laboratory.

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The Author

BRIAN J. SHARKEY, Ph.D.

University of Maryland, Ph.D., Exercise Physiology, 1965.
Post-doctorate in R&D, Pennsylvania State University, 1967-68.

Professor Emeritus, University of Montana, Missoula, Montana (directed the University's
Human Performance Laboratory, 1964-1994)

Physiologist, USDA Forest Service, Technology and Development Center

Areas of expertise: Exercise Physiology; Fitness, Health and Performance in work and sport; Research and Development in Human Performance.

Dr. Sharkey has published 10 books (e.g., **Fitness and Health**, 6th ed. In press with Steve Gaskill, Human Kinetics; **Fitness and Work Capacity**, USDA/MTDC, 1997) and has written numerous research papers. He has worked as a consultant with the Forest Service and other agencies in areas of Health, Fitness and Work Capacity since 1965. He has studied the demands of wildland firefighting, developed work capacity tests and training programs, conducted laboratory and field studies, and coordinated multi-agency projects (e.g., Health Hazards of Smoke).

Professional ties include: Fellow and Past-President (1991-92), American College of Sports Medicine; NCAA Sports Medicine Committee; NFPA committee on respiratory protection.

His current project "Wildland Firefighter Health and Safety," deals with work/rest, fatigue, work capacity, nutrition, and health.