



# Human Physiology

The mission of the Department of Human Physiology at Gonzaga is to foster undergraduate education, scientific research, and dissemination of information in the physiological and biomedical sciences. We value the aspirations, individuality, and success of our students, faculty, and staff who work and learn here. We value academic freedom, creative expression, the pursuit of excellence, and the discernment that stems from logic and reason. We value our shared responsibility to steward resources sustainably and responsibly. We aspire to be a preeminent and innovative undergraduate program in the physiological sciences. We seek to enrich the lives of others through teaching, mentoring, scholarship, experiential learning, creative inquiry, and scientific discovery.

## THE PROGRAM

Human physiology is the science of the mechanical, physical, and biochemical functions of humans, and serves as the foundation of modern medicine. As a discipline, it connects science, medicine, performance, and health to create a framework for understanding how the human body adapts to stress, physical activity, and disease. This is an academic major for students who plan to pursue advanced degrees in the health professions and biomedical sciences. The basic, foundational principle for the study of human physiology is the maintenance of homeostasis through the operation of complex control systems. These systems encompass all levels of the hierarchy of human structure and function (i.e. cells, tissues, organs, organ systems, and the organism). Each course in the curriculum emphasizes an integrated study of humans across this hierarchy of structure and function. Consequently, a reductionist approach that separates the curriculum into specific courses such as “molecular physiology,” “cell physiology,” “histology,” or “organ physiology,” has been purposely avoided. Topics covered across the curriculum include:

- General Physiological Concepts - body organization, homeostasis, control systems, biochemistry, cell structure, cell function, histology, metabolism, membranes, and cellular communication
- Systems Physiology - neurophysiology, muscular physiology, cardiovascular physiology, respiratory physiology, renal physiology, fluid and acid-base physiology, digestive physiology, endocrinology, immunology, and reproductive physiology

- Integrative Physiology - exercise physiology, environmental physiology, physiology of aging, biomechanics, and nutrition

The Human Physiology major, along with selected electives from other departments across the University, provides students with preparation for graduate or professional study in a variety of fields. Human Physiology majors express interest in pursuing various careers, such as:

- physiologist
- physician
- physician's assistant
- physical therapist
- occupational therapist
- exercise physiology and biomechanics research
- sports medicine
- pharmacist
- public health
- dentist
- chiropractor
- nursing

The program uniquely emphasizes the scientific basis and mechanisms of human function, adaptation, aging, health and disease, and performance.

## STUDENT RESEARCH PROJECTS

As a part of independent studies and/or requirements for upper-division courses, students complete novel research studies, some of which are accepted for publication and/or presentation at regional and national scientific meetings. The following are examples of student/faculty research that have been accepted for presentation or publication:

Anderson, S., Chamberlain, M., Musgrove, S., Partusch, A., Tice K., & Thorp, D.B. Is VO<sub>2</sub> Suppressed during non-apnoeic facial submersion? *Applied Physiology, Nutrition and Metabolism*. (2016) 41(11):1171-1176.

Bang, N., Kieling, E., Ness, C., Wika, K., & McKenzie, J. Can Yoga Reduce Perceived and Physiological Stress Levels in College Aged Students? ACSM Northwest Region Annual Meeting, Bend, OR. February 2017.

Dinunzio, C., Cordice, D., Van Scoy, J., Porter, N., & McCulloch, R. Kinematic and Muscle Activation Differences Between a Standard Pull-up and a Dynamic Crossfit 'Kipping' Pull-up. 2017 American College of Sports Medicine Northwest Annual Conference, Bend, OR. February 2017.

Fox, A., Bang, N., DeRuyter, M., Ness, C., & Higginson, B. Does cognitive load alter target acquisition and engagement strategies in tactical shooters? American College of Sports Medicine Northwest Annual Conference, Bend, OR. February 2017.

Higginson, B. & Lindecker, P. Effects of military load carriage systems on shooting performance during a simulated tactical engagement. American Society of Biomechanics Annual Conference, Boulder, CO. February 2017.

Minnie, B., Quiroga, N., Kim, H., Hefty, T., & McCulloch, R. The Effects of Barrier and Maximal Jump Height on Basketball Shot Mechanics in Males. American College of Sports Medicine Northwest Annual Conference, Bend, OR. February 2017.

Quiroga, N., Dinunzio, C., Van Scoy, J., Woolley, B., & McKenzie, J. Effects of Branch Chain Amino Acid Supplementation in Delaying Central Fatigue. Thematic Poster. ACSM Northwest Region Annual Meeting, Bend, OR. February 2017.

Sherman, P., Wolfram, E., Fiscus, C., Sessler, M., & Higginson, B. Effects of texting on muscle activation while maintaining walking velocity. American College of Sports Medicine Northwest Annual Conference, Bend, OR. February 2017.

Smith, E., Napier, M., Miller, A., Wrolstad, K., & Higginson, B. Electromyographic analysis of the VMO/VL ratio on stable vs unstable surfaces. American College of Sports Medicine Northwest Annual Conference, Bend, OR. February 2017.

Woolley B, Waszak K, Wika K & McCulloch R. Does a Split-step Effect a Baseball Player's Force Production, Muscle Activation, and Overall Reaction Time? American College of Sports Medicine Northwest Annual Conference, Bend, OR. February 2017.

Anderson, S., Chamberlain, M., Musgrove, S., Partusch, A., Tice, K., & Thorp, D. Is Vo<sub>2</sub> Suppressed During Non-Apneic Facial Submersion? Thematic poster. American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Bell, D., Fijalka, A., Woodworth, K., & Higginson, B. Effects of various inclines on muscle activation while walking with a constant load. American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Bell, D., Dominguez, I., Fijalka, A., Wallace, B., Woodworth, K., Zimney, M., & McKenzie, J. Effects Of Self-Selected, Varying Tempo Music On Performance And Perceived Exertion In Collegiate Rowers. American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Chamberlain M., Anderson S., Clay S., Musgrove S., Sanburg J., & McCulloch R. The Effects of Suspension Exercise on Knee Stabilization in Females." American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Cummins, A., Clay, S., Coad, B., Nelson, K., Cariño, B., & Thorp, D. Studying While Exercising: The Effect Of Moderate Exercise On Long-Term Memory. American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

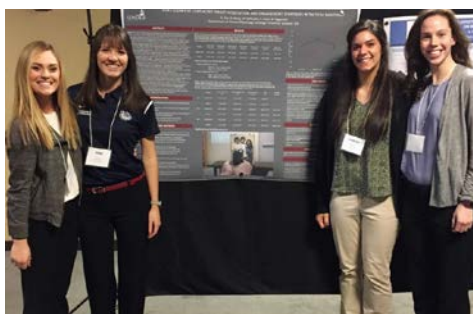
Cummins, A., Nelson, K., & McCulloch, R. Effect of Isolated Hamstring Strengthening on Unanticipated Drop-landing Knee Kinematics in Females. American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Sander, S., Taisey, C., Sander, K., Cary, J., Hamer, Z., & Higginson, B. Does indirect self-myofascial release and static stretching have an additive effect on hip range of motion? American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Sander, K., Sander, S., Cherry, T., Wimer, V., Higgins, A., Lavigne, S., & McKenzie, J. Does Caffeine Have Ergogenic Effects On Wall Sit Duration In College-Aged Males? American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Wimer, V., Higgins, A., Cherry, T., LaVigne, S., & Higginson, B. The Quantified Measurement of Backpack Instability Using Improper Fit Straps. American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.

Zimny K, Carino B, Tice B, Wallace, B & McCulloch R. Relative Muscle Contributions During a Simulated Single Arm Rock Climbing Hold Exercise. American College of Sports Medicine Northwest Annual Conference, Tacoma, WA. April 2016.





## GRADUATE SCHOOLS

### Biomedical Sciences

- Creighton University

### Biomechanics

- University of Alberta-Calgary
- University of Oregon
- University of Western Australia  
Cardiac Rehabilitation
- University of Oregon

### Chiropractic Medicine

- Life Chiropractic College West
- Palmer College of Chiropractic

### Dental School

- Oregon Health & Science University
- University of British Columbia

### Exercise Physiology

- Baylor University
- Boise State University
- Central Washington University
- Long Beach State University
- Montana State University
- Oregon State University
- Northern Colorado University
- San Diego State University
- San Jose State University
- Springfield College
- University of Denver
- University of Oregon
- University of Utah
- Western Washington University

### Medical School

- Creighton University
- Georgetown University
- Loma Linda University
- Northwest Osteopathic Medical  
School
- Medical College of Wisconsin
- Oregon Health & Science University
- Tulane University
- University of Colorado

- University of Nevada
- University of Southern California
- University of Vermont
- University of Washington
- Virginia Commonwealth University
- Wake Forest University

### Molecular Physiology

- University of Vermont

### Neurophysiology

- University of California, Davis

### Occupational Therapy

- Belmont University
- Colorado State University
- Creighton University
- Eastern Washington University
- George Washington University
- Idaho State University
- Midwestern University
- Nova Southeastern University
- Oregon State University
- Tufts University
- Tulane University
- University of Puget Sound
- University of Southern California
- University of Washington

### Optometry

- Ferris State University
- Midwestern University
- Pacific University
- University of Michigan
- University of Southern California
- Western University of Health  
Sciences

### Physical Therapy

- Chapman University
- Columbia University
- Creighton University
- Duke University
- Eastern Washington University
- Emory University
- George Washington University
- Northwestern University
- Old Dominion University
- Pacific University
- Regis University
- Sacred Heart University
- Samuel Merritt University
- St. Catherine University
- University of Illinois
- University of Maryland
- University of Minnesota
- University of Montana
- University of New England
- University of Pittsburgh
- University of Puget Sound
- University of St. Augustine
- University of Southern California
- University of Utah
- University of Washington
- Washington University in St. Louis

### Physician's Assistant

- Midwestern University (Phoenix, AZ)
- University of New Mexico

### Public Health

- George Washington University
- Oregon State University
- University of Washington



## THE PEOPLE

Faculty in the Department of Human Physiology are scientists, teachers, and scholars whose academic and professional expertise is invaluable to Human Physiology students.

## FACULTY CONTACTS, RESEARCH INTERESTS, & PUBLICATIONS

### Daniel J. McCann | Dept. Chair

Ph.D., University of California, Davis  
Professor

Research Interests: metabolism, exercise physiology, dimensional analysis, and environmental physiology  
mccann@gonzaga.edu

#### Publications in peer-reviewed journals:

Research Quarterly for Exercise and Sport (2014), Current Sports Medicine Reports (2008), International Journal of Sports Medicine (2004), Medicine & Science in Sports & Exercise (2003, 2002, 1997, 1995), Sports Medicine & Rehabilitation (2001).

### Stephen B. Conant

M.S., Montana State University, Bozeman  
Senior Lab and Technical Specialist  
conant@gonzaga.edu

ACSM - Northwest Chapter Past President, ACSM National Health and Science Policy Committee, ACSM-certified Health/Fitness Specialist®, National Strength & Conditioning Association-Certified Strength & Conditioning Specialist.

### Patrick L. Crosswhite

Ph.D., University of Oklahoma  
Assistant Professor

Research Interests: understanding the role of chromatin remodelers and how they impact blood pressure  
crosswhite@gonzaga.edu

#### Publications in peer-reviewed

**journals:** Clinical Investigations (2016), Hypertension (2010, 2013, 2014), J. Hypertension (2010), Molecular Medicine (2014).

### Brian K. Higginson

Ph.D., Oregon State University  
Associate Professor

Research Interests: biomechanics, ergonomics, and energetics of load carriage; kinematic and muscle adaptation during prolonged exercise (cross-country skiing and cycling); and physiological and biomechanical determinants of shooting performance in competitive shooters  
higginson@gonzaga.edu

#### Publications in peer-reviewed journals:

Current Sports Medicine Reports (2009, 2008), Journal of Experimental Biology (2007), Journal of Applied Physiology (2005), European Journal of Applied Physiology (2004, 2001), Sport Biomechanics (2004), Journal of Exercise Physiology (2003). Other peer-reviewed publications: Proceedings of the ACSM-NW Annual Conference (2013), Congress Proceedings of the 2nd International Congress on Science and Nordic Skiing (2012).

### Ryan S. McCulloch

Ph.D., University of North Carolina Chapel Hill; NC State University  
Assistant Professor  
Research Interests: biomechanics, orthopedics, prosthetics  
mcculloch@gonzaga.edu

#### Publications in peer-reviewed journals:

Arthritis (2014), Journal of Animal Science and Biotechnology (2012), Veterinary Surgery (2011), International Journal of Industrial Ergonomics (2009).

### James McKenzie

Ph.D., Indiana University, Bloomington  
Lecturer

Research Interests: exercise physiology, thermoregulation, environmental stress  
mckenziej@gonzaga.edu

#### Publications in peer-reviewed journals:

Medicine and Science in Sports and Exercise (2005, 2006, 2007, 2009, 2012, 2014, 2015), Journal of Applied Physiology (2007).

### David Thorp

Ph.D., University of Western Ontario  
Associate Professor

Research Interests: the role of exercise in intracellular signaling and improvement of myocardial tolerance to ischemia, the human dive reflex, exercise and cognitive function  
thorp@gonzaga.edu

#### Publications in peer-reviewed journals:

Applied Physiology, Nutrition, and Metabolism (2016), Journal of Sport Science and Medicine (2012), Canadian Journal of Physiology and Pharmacology (2011), Cell Stress Chaperones (2009), American Journal of Physiology: Heart and Circulatory Physiology (2007, 2006), American Journal of Physiology: Integrative and Comparative Physiology (2007), Journal of Molecular Cardiology (2004), Experimental Physiology (2001).

