

**Tufts University, Friedman School of Nutrition Science and Policy**

**NUTR 272 -- Physical Activity, Nutrition, and Health  
Spring 2018**

- Class Meetings:** Thursday 1:30 - 4:15pm  
Jaharis Building, 150 Harrison Ave, Room 156
- Instructor(s):** Kieran Reid, PhD, MPH  
(Contact info: 617-556-3081/[kieran.reid@tufts.edu](mailto:kieran.reid@tufts.edu))
- Office hours:** By appointment (or drop-in with advanced notice)  
Location: Nutrition, Exercise Physiology & Sarcopenia Laboratory,  
HNRCA, 13th Floor, Room 1321C.
- Teaching Asst.:** Townsend Benard, MS  
(Contact info: 617-556-3303/[townsend.benard@tufts.edu](mailto:townsend.benard@tufts.edu))
- Office hours:** By appointment (or drop-in with advanced notice)  
Location: Nutrition, Exercise Physiology & Sarcopenia Laboratory,  
HNRCA, 13th Floor, Room 1321A.
- Graduate Credits:** 1.0
- Prerequisites:** NUTR202 or NUTR245/246 required and undergraduate-level  
physiology recommended

**Course Description:** This course is designed to give students an understanding of the fundamental principles of exercise physiology and how physical activity influences health throughout the lifespan. Students will also have the opportunity to examine how nutrition and exercise can work both synergistically and independently to improve human performance and health outcomes. In addition, the course will evaluate how the built environment influences physical activity behavior and the importance of theory-based motivational strategies for exercise. Students will learn the key elements of exercise prescription and attend a laboratory practical to observe state of the art methods for assessing physical fitness and human performance. The course will also cover the latest trends in physical activity related research including wearable technology, sedentary behavior, mind-body exercise and lifestyle medicine.

**Course Objectives/Outcomes:**

By the end of this course, students will:

1. Describe the acute and chronic physiological responses to exercise and the influence of factors such as age, sex and chronic disease
2. Summarize the major components of the current physical activity guidelines and specify the proportion of various population subgroups who adhere to these guidelines (e.g. children, older adults)

3. Explain basic exercise physiology definitions and terminology
4. Describe the mechanisms of how physical activity and exercise improves health and minimizes the risk of various chronic diseases
5. Identify, analyze and interpret how the built environment influences physical activity participation for individuals and communities
6. Measure, describe and interpret their own physical activity levels
7. Discuss the basic principles of exercise prescription and develop an individualized exercise prescription plan
8. Describe how important measures of human performance are assessed in the laboratory
9. Explain how various behavioral strategies can increase and sustain physical activity levels among individuals
10. Demonstrate critical thinking skills around current trends and controversies in physical activity and nutrition such as fit versus fat, individual responsibility versus environmental causes of obesity, exercise duration versus intensity, ergogenic aids in sports nutrition, the utility of wearable technology, etc.

**Texts or Materials:**

**Primary Textbook** (Recommended): Physiology of Sport and Exercise, 6th Edition, edited by Jack Wilmore and David Costill. Human Kinetics, 2015. Available at the Tufts University Health Sciences Bookstore. On reserve at Health Sciences Library.

**Additional References/Selected Chapters** (Available online and/or on Canvas):

- Physical Activity and Public Health Practice, edited by Barbara Ainsworth and Caroline Macera. CRC Press, 2012.
- Physical Activity and Health, 2nd Edition, edited by Claude Bouchard, Steven Blair, and William Haskell. Human Kinetics, 2012.
- Physical Activity Across the Lifespan: Prevention and Treatment for Health and Well-Being, edited by Aleta Meyer and Thomas Gullotta. Issues and Children's and Family's Lives, 2012.
- Social Neuroscience and Public Health: Foundations for the Science of Chronic Disease Prevention, edited by Peter Hall. Part V: Exercise Neuroscience. Springer, New York. 2013.
- Policy Document: Physical Activity Guidelines Advisory Committee Report, 2008 (683 pages). Haskell WL, Nelson ME, Dishman RK, Howley ET, Kohrt WM, Kraus WE, Lee I, McTiernan A, Pate RR, Powell KE, Regensteiner JG, Rimmer JH, Yancey AK. Submitted to U.S. Health and Human Services Secretary Michael Leavitt on June 18, 2008. Available online and on Canvas.

Articles: Weekly journal articles corresponding to class lectures, debates, and/or presentations will be available in advance of class on Canvas. PLEASE READ THEM PRIOR TO CLASS. They will be the basis for class discussion.

**Academic Conduct:** Each student is responsible for upholding the highest standards of academic integrity, as specified in the Friedman School's Policies and Procedures manual (<http://nutrition.tufts.edu/student/documents>) and Tufts University policies (<http://students.tufts.edu/student-affairs/student-life-policies/academic-integrity-policy>). It is the responsibility of each student to understand and comply with these standards, as violations will be sanctioned by penalties ranging from failure on an assignment and the course to dismissal from the school.

**Classroom Conduct:** Please use laptops for note-taking purposes only (i.e. only class lecture slides and/or discussion articles should be open). Please turn Internet off when not in use.

**Assessment and Grading:** Grades will be based on the following:

<b>1. Class participation (Weekly)</b>	<b>20%</b>
<b>a. Attendance</b>	
<b>b. Contribution to class discussion</b>	
<b>c. Canvas posts</b>	
<b>2. Mid-term quiz (March 15)</b>	<b>25%</b>
<b>3. Fitness tracking log (Due: April 5)</b>	<b>10%</b>
<b>4. Hot-topic debate/presentation</b>	<b>20%</b>
<b>5. Final Paper (Due: May 10)</b>	<b>25%</b>

**1. Class participation and discussion:** Includes attendance, verbal in-class participation and Canvas posts. Weekly questions pertaining to that week's material will be provided on Canvas following the lecture and will need to be answered prior to the next lecture for credit. Students should expect their responses to be discussed during class the following week.

**2. Mid-term quiz:** Consists of short answer questions (1 hr allotted)

**3. Hot-topic Debate/Presentation:** Students will sign up for a selected debate topic with 2-4 classmates. Debate topics will be assigned to the relevant lecture. Instructions and grading rubrics will be provided on Canvas. The exact number and length of debates will be determined by the number of students enrolled in the class. Presentations should be emailed to Townsend the day prior to class (Wednesday) by noon.

**4. Fitness Tracking Assignment:** Students will log their own or a friend/roommate/family member's activity or heart rate, using either a fit bit, pedometer and/or heart rate monitor, for one week and draft a 1-2 page summary of quantitative and qualitative results.

**5. Final Paper:** – Students will be given a real-life scenario about an individual who is in need of some lifestyle changes. Students will develop and tailor a comprehensive exercise and lifestyle plan based on the fundamentals of exercise physiology and other knowledge gained from course lectures. A detailed description of this final assignment will be given early within the semester.

Assignments received after their deadline will not be accepted or graded unless extension is approved in advance. Students who are unable to complete an assignment exam on time for any reason should notify the instructor and teaching assistant by email prior to the deadline, with a brief explanation for why the extension is needed.

**Accommodation of Disabilities:** Tufts University is committed to providing equal access and support to all students through the provision of reasonable accommodations so that each student may access their curricula and achieve their personal and academic potential. If you have a disability that requires reasonable accommodations, please contact the Friedman School Assistant Dean of Student Affairs at 617-636-6719 to make arrangements for determination of appropriate accommodations. Please be aware that accommodations cannot be enacted retroactively, making timeliness a critical aspect for their provision.

**Course Schedule:**

Class # Date	Topic	Relevant Book Chapters (W&C 6 <sup>th</sup> Edition)	Lecturer(s)	Student Presentations
Class 1 Jan 18	Course Overview: Introduction to Physical Activity: Definitions, Policies and Trends	n/a	Reid	
Class 2 Jan 25	Muscle Function and Neural Control of Movement	W&C: Ch. 1, 3	Reid	
Class 3 Feb 1	Fuel Metabolism & Hormonal Control	W&C: Ch. 2, 4-5	Reid	
Class 4 Feb 8	Physical Activity and the Built Environment	Ainsworth/Macera: Ch.15, 16 Meyer/Gullotta: Ch. 4	Fenton	Debate 1,2
Class 5 Feb 15	Cardiovascular Control During Exercise / Thermoregulation & Altitude	W&C: Ch. 6 – 8 W&C: Ch.12, 13	Reid	

Class 6 Mar 1	Age and Gender Differences in Exercise Physiology / Fatigue & Stress	W&C: Ch.17, 18, 19	Reid	
Class 7 Mar 8	Sports Nutrition and Ergogenic Aids	W&C: Ch. 15, 16	Reid	Debate 3,4
Class 8 Mar 15	<b>MID TERM QUIZ</b> Mind-Body Therapies in Chronic Disease		Wang	
Class 9 Mar 29	Methods for Assessing Physical Fitness and Function <b>(Practical Day)</b>		Reid <b>LAB DAY</b>	HNRCA LAB
Class 10 April 5	Behavior Strategies	Meyer/Gullotta: Ch.11	Folta	Debate 5,6
Class 11 April 12	Lifestyle Medicine for Physical Activity and Better Nutrition  Sedentary Behavior / Exercise Prescription	2008 PA Committee Report  W&C: Ch. 20, 22	Phillips  Reid	
Class 12 April 19	Pediatric Physical Activity  Exercise and Technology	Ainsworth/Macera: Ch.14, 17, Bouchard: Ch.17	Sacheck	
Class 13 April 26	Physical Activity, Nutrition and Aging: From the Clinic to the Community	W&C: Ch. 18, 21, 22	Reid	
<b>No Class May 3</b>	<b>Reading Period</b>			
Final Class May 10	<b>Final Assignments Due</b>	Written Summary Due		

\* This schedule is subject to modification at the instructor's discretion.

## **Course Topics, Learning Objectives and Assignments**

\* This schedule is subject to modification at the instructor's discretion.

### **CLASS 1: January 18<sup>th</sup>**

#### **Course Overview/ Introduction to Physical Activity: Definitions, Policies and Trends**

This class will provide students with an overview of the course for the entire semester and orient the students to the latest physical activity definitions, policies and trends.

#### Learning Objectives:

- Define basic physical activity and physical fitness terminology
- Describe how physical activity is measured
- Summarize current physical activity and exercise patterns of different age groups and genders within the US
- Describe organizational and governmental recommendations regarding physical activity and exercise

### **CLASS 2: January 25<sup>th</sup>**

#### **Muscle Function and Neural Control of Movement**

This session will orient the students to the basis of human movement at the muscular and neurological level.

#### Learning Objectives:

- Describe the structure and function of skeletal muscle – from the microscopic to organ level
- Explain how muscles function during exercise and how force is generated to create movement
- Understand the complexity of how the nervous system plans, initiates and coordinates human movement
- Summarize the muscular and neurological changes that occur with exercise training (both resistance and cardiovascular)

### **CLASS 3: February 1<sup>st</sup>**

#### **Fuel Metabolism & Hormonal Control**

This session will familiarize students with how the body meets the energy needs of our skeletal muscles and orient students to how hormones play a key role in exercise responses.

#### Learning Objectives:

- Examine how our primary source of energy, ATP, is provided through three energy systems
- Describe how energy expenditure and the source of this energy changes from rest to exercise
- Explain the mechanisms of fatigue when this occurs from excess energy demands
- Summarize the role of endocrine glands and their hormones in controlling energy metabolism and fluid and electrolyte balance

#### **CLASS 4: February 8<sup>th</sup>**

##### **Physical Activity and the Built Environment**

**Guest Lecturer: Mark Fenton**

During this class we will provide the latest research on effective strategies for influencing physical activity behaviors at the individual and community level.

##### Learning Objectives:

- Describe the various behavioral strategies for influencing physical activity patterns at both the individual and community level
- Discuss strategies for individual and community program development
- Explain how the built environment influences physical activity participation
- Identify key factors that can improve the built environment

#### **CLASS 5: February 15<sup>th</sup>**

##### **Cardiovascular Control During Exercise/ Thermoregulation & Altitude**

This session will cover how the cardiovascular and respiratory systems provide oxygen and fuel to active muscles and rid the body of carbon dioxide and metabolic wastes and how these systems adapt to exercise training. We will also discuss thermoregulation during exercise and how altitude impacts physiology and responses to exercise at altitude.

##### Learning Objectives:

- Describe the structure and function of the cardiovascular system: the heart, blood vessels, and blood
- Summarize how the cardiovascular system provides active muscles with an adequate blood supply that varies with the intensity of work
- Define the mechanics and the regulation of breathing, how gases are exchanged in the lungs and in the muscles, and how oxygen and carbon dioxide are transported in the blood
- Explain the biological changes that occur that contribute to “endurance capacity” and how this may impact performance
- Describe how thermoregulation is controlled at rest and during exercise
- Summarize the physiological changes that occur when exercising at altitude

#### **CLASS 6: March 1<sup>st</sup>**

##### **Age Specific Exercise Physiology and Gender Differences in Exercise/Fatigue and Stress**

This class will focus on understanding both age and gender differences in terms of physiological responses to exercise and metabolic functional differences and any special life-stage considerations. We will also discuss how the immune system and inflammation mediate exercise responses and stress that can occur with exercise.

##### Learning Objectives:

- Describe the specific gender differences in the physiological responses to exercise
- Summarize how physical activity and regular training can affect growth and maturation

- Discuss exercise recommendations and considerations for pregnant and post-partum women
- Distinguish the types of exercise that may produce oxidative stress and inflammation
- Differentiate the signs and symptoms of fatigue versus overtraining

**CLASS 7: March 8<sup>th</sup>**

**Sports Nutrition and Ergogenic Aids**

This session will focus on how people who exercise can optimize athletic performance through proper nutrition, but also potentially through ergogenic aids including some legal and some illegal substances.

Learning Objectives:

- Describe the dietary needs of persons who exercise and those of athletes
- Explain how nutritional supplementation and diet manipulation may potentially improve performance
- Summarize the various pharmacological, hormonal, and physiological agents that have been proposed to improve performance
- Identify potential benefits, proven effects, and health risks that have been associated with the use of ergogenic aids

**CLASS 8: March 15<sup>th</sup>**

**\*\*\*QUIZ\*\*\* (first hour)**

**Mind-Body Therapies in Chronic Disease**

**Guest Lecturer: Chenchen Wang, MD, MSc**

This session will focus on mind-body practices and how Tai Chi exercise enhances the mind's positive impact on the body, particularly among individuals with chronic pain conditions.

Learning Objectives:

- Explain the principles of Tai Chi exercise
- Summarize the role of Tai Chi exercise for pain relief and well-being in chronic disease
- Describe the physical and psychological benefits of mind-body exercise

**CLASS 9: March 29<sup>th</sup>**

**Methods for Assessing Physical Activity, Fitness and Function (HNRCA 13<sup>th</sup> FLOOR BACK LAB)**

During this laboratory practical, we will learn about various physical fitness and human performance assessment methodologies.

Learning Objectives:

- Observe and interpret the assessment of maximal aerobic capacity testing
- Discover how to measure joint flexibility and assess lower extremity muscle strength, muscle power and muscle contraction velocity.
- Compare and contrast the utility of anthropometric measures of body composition (skinfolds, circumferences, body fat percentage)

- Discover how to objectively measure physical functioning in older adults

**CLASS 10: April 5<sup>th</sup>**

**Behavior Strategies**

**Guest Lecturer: Sara Folta, PhD**

Most people have at least a rudimentary understanding of the benefits of exercise, yet few are meeting the physical activity guidelines. In this class, we will examine the gap between knowledge and behavior and learn strategies based on behavioral theory to bridge this gap.

Learning Objectives:

- Describe the fundamentals of Self-Determination Theory
- Explain the fundamentals of Transtheoretical Model (Stages of Change) and Self-Efficacy
- Define the stage of change for exercise
- How to apply strategies for moving others through the stages of change

**CLASS 11: April 12<sup>th</sup>**

**Lifestyle Medicine to Promote Physical Activity and Better Nutrition**

**Sedentary Behavior / Exercise Prescription**

**Guest Lecturer: Edward Phillips, MD**

This session will discuss the promotion of physical activity and better nutrition in the clinical setting.

Learning Objectives:

- Assess the impact of lifestyle behaviors on the rates of death, disease and health care costs.
- Describe how evidence-based practices in health coaching can foster sustained behavior change for increasing physical activity and better dietary habits.
- Discuss the emergence of “Lifestyle Medicine” and how it may improve the personal lifestyle choices of healthcare providers, and thus, can positively impact patients.

**Sedentary Behavior / Exercise Prescription**

The session will discuss the latest evidence on the impact of sedentary behavior on health and the basics for developing exercise prescriptions for individuals of varying age and health status.

Learning Objectives:

- Discuss the epidemic of surplus sedentary time
- Contrast the independent effects of physical activity and sedentary behavior on health
- Define the major principles of exercise prescription
- Identify the importance of medical clearance and risk stratification
- Describe how to monitor exercise intensity
- Explain the five general principles of exercise training

**CLASS 12: April 19<sup>th</sup>****Pediatric Physical Activity / Exercise and Technology****Guest Lecturer: Jennifer Sacheck, PhD**

This session will cover key physiological differences in pediatric exercise physiology and also the principles for conducting PA-related research in community settings. Particular emphasis will be given to programming for high-risk (e.g. overweight/obese, low-fit, low-income) pediatric populations.

Learning Objectives:

- Explain the challenges in keeping children physically active
- Summarize emerging evidence linking physical activity and brain development, cognitive functioning, and academic performance and achievement among children and adolescents
- Identify the challenges in promoting physical activity among certain pediatric demographics and in different environments (school-time, etc.)
- Discuss the benefits and challenges of conducting research in uncontrolled community settings
- Describe the potential uses and benefits of emerging technologies in promoting physical activity

**CLASS 13: April 26<sup>th</sup>****Physical Activity, Nutrition and Aging: From the Clinic to the Community**

This session will focus on how the physical activity reduces risk of developing chronic diseases associated with aging, with a significant focus on mobility-disability and cognitive decline. We will also discuss the impact of translating effective physical activity and nutrition interventions from the clinical setting to real-world community-based settings.

Learning Objectives:

- Summarize how physical activity/exercise reduces risk of age related chronic disease and functional decline in adults and older adults
- Discriminate the proposed mechanisms for the role of exercise in improving symptoms of chronic conditions
- Discuss the importance of physical activity for people with disabilities and exercise guidance
- Compare the relationship between acute, long-term, and active living physical activity patterns for mobility and cognition in aging humans
- Describe the local impact of the Fit-4-Life Program – an award winning community-based physical activity and nutritional counselling program for older adults