What is Exercise Physiology?

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1. An Academic Program of Study, and a Course in Exercise Science
The study of how exercise and physical activity alters the structure and function (physiology) of the human body.

2. A Profession
A profession of appropriately trained individuals who have studied a suitable curriculum within the exercise sciences, with an emphasis in exercise physiology.
Development of Exercise Physiology

Beginnings ........................... ? - 1960

Era of Sports and Athletics ........ 1960 - 1980

Era of Medical Awakening ......... 1970 - present

Present Status of Exercise Physiology
Research and Knowledge .......... 1990 - present


In early history, fitness was synonymous with survival

Ancient Greece

Ancient Egypt

**Archibald V. Hill**: “maximal oxygen consumption”

“In running the oxygen requirement increases continuously as the speed increases, ....; the actual oxygen intake, however, reaches a maximum beyond which no effort can drive it. The oxygen intake may attain its maximum and remain constant merely because it cannot go any higher owing to the limitations of the circulatory and respiratory system.”

Harvard Fatigue Laboratory 1927-1947

David Bruce Dill (Director)

Initial research focused on how different occupations affected the body, environmental physiology (altitude, dry, moist heat), metabolism during exercise and aging, blood gas transport, acid-base balance, and nutrition.

May 6, 1954
(Iffley Road, Oxford, England)

Roger Bannister crossing the finish line for the mile in 3:59.4
Physical Education Heritage

1970s
- Exercise physiology

21st Century
- Medicine
- Physical therapy
- Occupational therapy
- Research
- Nutrition
- Teaching
- Wellness

Employment: Physical education, fitness consultant, coaching

Employment: Physical education, academics, research, community fitness, personal training, corporate fitness, clinical

1970's Physical Education Topic Curriculum

History of PE
Sports Psychology
Sociology and Sport
Violence and Sport
Child Psychology
Adapted Physical Education
Dance
Gymnastics
Play and Games
Motor Control and Development
Health Education

Biomechanics
Recreation
Exercise Physiology
Athletics
Statistics
Teacher Training
Growth and Development
Laboratory Exercise Testing
Kinesiology
Human Anatomy
Fitness
Era of Sports and Athletics. 1960 - 1980

Research progressed to applied questions that concerned exercise.

- Diet, exercise and *muscle glycogen*
- **Metabolic demands** of differing exercise intensities
- **Determinants** of exercise performance
- Effects of **training** on function and performance
- Exercise in various **environmental** conditions
- What strategies delay fatigue?

Era of Medical Awakening, 1970 - present
1980’s
Physicians hooked on exercise: Kenneth Cooper & George Sheehan
Covert Bailey: “If exercise could be packaged into a pill, it would be the most prescribed medication in all of history”.
The benefits of exercise training on the following was recognized:

- Health Promotion & Quality of Life
- Blood lipids
- Heart Function in Diseased Populations
- Disease Prevention & Rehabilitation

CHD, PVD, COPD, Hypertension, Diabetes, Obesity, Cancers, Depression/Mood States, ..

Medical-Pharmaceutical Complex Still Struggling With Exercise & Disease Prevention

http://www.youtube.com/watch?v=xsuK7BeOyvQ
Present Status of Exercise Research and Knowledge ........ 1990 - present

• Role of exercise in supporting body functions in microgravity

• Exercise in special populations: disabled, elderly, children, pregnant women, etc.

• Development of new equipment, technologies and techniques: stable isotopes (substrate use and cellular metabolism); magnetic resonance imaging and spectroscopy (muscle metabolism and blood flow)
NASA & Exercise Physiology

Exercise Physiology is the Ultimate Physiological Science

CONTENT
- Metabolic Biochemistry
- Skeletal
- Cardiovascular
- Pulmonary
- Nutrition
- Neuromuscular
- Body Composition
- Calorimetry
- Pharmacology
- Health and Disease
- Exercise Testing and Prescription

APPLICATION
- Exercise Modes
- Exercise Intensities
- Fitness Components
- Environments
- Special Populations
  - Age
  - Sex
  - Disease
  - Elite
- Sports
- Athletics
Exercise Physiology Topic Curriculum

Basic Science Component
- Computer Studies
- Sports Physiology
- Athletic Injuries
- Physics
- Math-Algebra
- Chemistry-Intro.
- Organic & Biochemistry
- Statistics
- Kinesiology
- Human Anatomy

Exercise Physiology Component
- Body Composition
- Electrocardiography

Resistance Exercise
- Exercise Biochemistry
- Exercise Physiology-Intro.
- Exercise Physiology-Adv.
- Growth and Development
- Laboratory Exercise Testing
- Clinical Exercise Testing
- Fitness
- Aerobics Instruction
- Exercise Prescription
- Exercise and Disease Prevention
- Aging and Exercise
- Motor Development
- Professional Issues
### Suggested undergraduate course content preparation for study in exercise physiology

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>Core Curriculum</th>
<th>Electives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science Pre-requisites</td>
<td>Kinesiology</td>
<td>Molecular biology</td>
</tr>
<tr>
<td>Human biology/physiology</td>
<td>Historical and professional issues</td>
<td>Cell biology</td>
</tr>
<tr>
<td>Human anatomy</td>
<td>Fitness assessment and exercise prescription</td>
<td>Calculus</td>
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<tr>
<td>Organic chemistry</td>
<td>Clinical exercise testing</td>
<td>Trigonometry</td>
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<tr>
<td>Biochemistry</td>
<td>Exercise and disease prevention</td>
<td>Nutrition</td>
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<td>Physics</td>
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<tr>
<td>Algebra</td>
<td>Electrocadiography</td>
<td>Motor development</td>
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<tr>
<td>Biomechanics</td>
<td>Strength training and assessment</td>
<td>Computer programming</td>
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<tr>
<td>First Aid</td>
<td>Body composition</td>
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<tr>
<td>Computer skills</td>
<td>Pediatric/Aging and Exercise</td>
<td>Business</td>
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<tr>
<td>Human nutrition</td>
<td>Exercise physiology-Intro</td>
<td>Sports administration</td>
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<td></td>
<td>Advanced</td>
<td>Athletic injuries</td>
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<td></td>
<td>Cardiac/Pulmonary/Diabetes rehabilitation</td>
<td>Statistics</td>
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<tr>
<td></td>
<td>Personal training</td>
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<td></td>
<td>Sports physiology</td>
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### Suggested graduate course content preparation for study in exercise physiology

<table>
<thead>
<tr>
<th>Graduate</th>
<th>Exercise and metabolic biochemistry</th>
<th>Molecular biology laboratory techniques</th>
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</thead>
<tbody>
<tr>
<td>All undergraduate science and core curriculum</td>
<td>Environmental physiology</td>
<td>Epidemiology</td>
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<td></td>
<td>Advanced human physiology (neural, muscular, cardiovascular, pulmonary, endocrine, renal)</td>
<td>Pharmacology</td>
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<td>Advanced exercise physiology</td>
<td>Medical physiology</td>
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<td></td>
<td>Statistics- ANOVA, multiple regression, multivariate</td>
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<td></td>
<td>Advanced laboratory techniques</td>
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<td></td>
<td>Advanced clinical exercise testing</td>
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What is Clinical Exercise Physiology?

A sub-component of exercise physiology that involves the application of exercise physiology principles, knowledge and skills for purposes of the rehabilitation or diagnosis of disease or disability in humans.
U.S. Health Status

- 5 leading causes of death - Heart, Cancers, stroke, COPD, unintentional
- population >65 years - 12%
- overweight adults - 65%
- obese adults - 28%
- highest obesity by race - 50% Non-Hispanic black women
- adult men and women who are inactive - 22% Men; 28% Women
- New Mexico’s ranking for raising children - 48th
- population <65 years with no health insurance - 16%
- HS students not enrolled in PE - 53%
New Frontiers in Exercise Physiology

In the future an exercise physiologist will be required to master the following:

- broad pure science academic base (molecular biology, biochemistry, neurophysiology, cardiology, pulmonary physiology, endocrinology)
- broad applied academic base (body composition, exercise prescription, athletic/sport training)
- sophisticated equipment & technologies
- superior research skills

Professional Issues

<table>
<thead>
<tr>
<th>Organizations</th>
<th>Web site</th>
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</thead>
<tbody>
<tr>
<td><strong>U.S.A.</strong></td>
<td></td>
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<tr>
<td>American Society of Exercise Physiologists (ASEP)</td>
<td><a href="http://www.asep.org">www.asep.org</a></td>
</tr>
<tr>
<td>American College of Sports Medicine (ACSM)</td>
<td><a href="http://www.acsm.org">www.acsm.org</a></td>
</tr>
<tr>
<td>American Physiological Society (APS)</td>
<td><a href="http://www.the-aps.org">www.the-aps.org</a></td>
</tr>
<tr>
<td>American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR)</td>
<td><a href="http://www.aacvpr.org">www.aacvpr.org</a></td>
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<tr>
<td>In addition, within the U.S., there are more than 300 additional organizations or businesses that certify candidates in the fitness industry regardless of university education qualifications</td>
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<tr>
<td><strong>Canada</strong></td>
<td></td>
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<tr>
<td>Canadian Society of Exercise Physiology</td>
<td><a href="http://www.csep.org">www.csep.org</a></td>
</tr>
<tr>
<td><strong>Australia</strong></td>
<td></td>
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<tr>
<td>Australian Association of Exercise and Sports Sciences (AAESS)</td>
<td><a href="http://www.aaess.com.au">www.aaess.com.au</a></td>
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<tr>
<td><strong>Brazil</strong></td>
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<tr>
<td>Exercise and Fitness (ENAF) (personal trainers)</td>
<td><a href="http://www.enaf.com.br">www.enaf.com.br</a></td>
</tr>
<tr>
<td><strong>South Korea</strong></td>
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<tr>
<td>Korean Association of Certified Exercise Professionals (KACEP)</td>
<td><a href="http://www.kacep.or.kr">www.kacep.or.kr</a></td>
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ASEP EPC Exam

American Society of Exercise Physiologists

General Information

ASEP Mission Statement
The American Society of Exercise Physiologists, the professional organization representing and promoting the profession of exercise physiology, is committed to the professional development of exercise physiology, its advancement, and the visibility of exercise physiologists.

What is Exercise Physiology?
Exercise Physiology is the identification of physiological mechanisms underlying physical activity, the comprehensive delivery of treatment services associated with the analysis, improvement, and maintenance of health and fitness, rehabilitation of acute diseases and other chronic diseases and/or disabilities, and the professional guidance and control of athletes and others interested in athletics, sports training, and human adaptability to adverse and circulatory conditions.

Who is an Exercise Physiologist?
Exercise Physiologist is a person who has an academic degree in exercise physiology, or who is certified by ASEP in exercise physiology (the Exercise Physiologist Certified Exam [EPCE]), or who has a demonstrable degree with an academic degree or emphasis in exercise physiology from an accredited college or university.

ASEP Newsletters
The ASEP Newsletter is devoted to informative articles and news items about exercise physiology. It includes current events, opinions, professional issues and concerns, and events that shape exercise physiology. While it contains views and opinions of the Editors, it Chief.

Announcements

ASEP Annual Meeting
ASEP Student Research Grant Proposal
ASEP Student Research Grant Guidelines

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Exercise Physiology Research Journals

Acta Physiologica Scandinavia
American Journal of Physiology (APS)
Canadian Journal of Applied Sports Sciences
European Journal of Applied Physiology
International Journal of Sports Medicine
International Journal of Sports Nutrition
Journal of Applied Physiology
Journal

Journal of Exercise Physiology\textsuperscript{online} (ASEP)
Journal of Physiology
Journal of Sports Medicine and Physical Fitness
Journal of Strength and Conditioning Research
Medicine and Science in Sports and Exercise (ACSM)
Professionalization of Exercise Physiology\textsuperscript{online} (ASEP)
Research Quarterly For Exercise and Sport
Sports Medicine