

PENN STATE UNIVERSITY

COLLEGE OF HEALTH AND HUMAN
DEVELOPMENT



KINESIOLOGY
GRADUATE PROGRAM

PROSPECTIVE STUDENT INFORMATION
2009-10

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Penn State University

THE UNIVERSITY

Founded in 1855, Penn State is Pennsylvania's only land-grant university and has a broad mission of teaching, research and public service. It enrolls more than 90,000 students at 24 campus locations statewide, and offers instruction in more than 160 baccalaureate, and 160 graduate programs. The University Park campus, with an enrollment of some 40,000 students, is Penn State's administrative and research hub. There are approximately 10,000 graduate students at University Park. International students compose just about 25% of the graduate student population.

Location

The campus is located in a rural area of Pennsylvania, adjacent to the community of State College (population about 80,000, excluding students) and overlooked by majestic Mount Nittany. The area offers many cultural, education, recreation, and sports events, as well as outdoor activities, including hiking, boating, hunting, fishing, and camping.

COST OF STUDY

Tuition in 2009-2010 for a full-time graduate student is approximately \$7,723 per semester for Pennsylvania residents and approximately \$13,699 for out-of-state residents.

HOUSING

One and two-bedroom apartments, which rent for about \$465-850 per month, are available on campus for married graduate students. Additional housing for single students is available at various costs. Off-campus housing is available for a wide range of costs. The Graduate School sends housing information to all students who are admitted to the Program.

THE COLLEGE OF HEALTH AND HUMAN DEVELOPMENT

The Department of Kinesiology is part of the College of Health and Human Development. Although the College is relatively new, its roots are deep and strong. Several of the Colleges' programs are among the oldest of their kind in the nation, and many of its faculty members are internationally renowned. The College boasts eight academic units consistently ranked among the top of their kind in the nation; nine highly successful research centers addressing major societal problems and influencing policies geared toward tackling those problems; twenty nine laboratories conducting leading edge research providing undergraduate and graduate students world class faculty and facilities to enhance their academic and professional interests; and nine units providing various clinical and other services which have an immediate impact on those they serve. These units span a variety of disciplines with one common goal: improving the health and well being of our society.

THE DEPARTMENT OF KINESIOLOGY

The Department of Kinesiology is part of the College of Health and Human Development. The Graduate Program is nationally and internationally prominent in several research areas within the broad field of Kinesiology. This prominence is due to individual faculty excellence, the production and dissemination of quality research, and the mentoring and graduation of excellent graduate students. In the most recent survey of Doctoral Programs in the United States by the *American Academy of Kinesiology and Physical Education* (AAKPE) (<http://www.aakpe.org>), our program achieved the #1 ranking.

The program emphasizes research and scholarly activity in a chosen area of emphasis. This emphasis on research is strengthened by continuing collaborations between the Kinesiology graduate faculty and faculty in other departments which contribute to the science of the discipline (e.g., engineering, history, medicine, physiology, psychology).

The mission of the Graduate Program in Kinesiology at The Pennsylvania State University is threefold: (1) to recruit, advise, and mentor top-quality graduate students, emphasizing Ph.D. candidates, with the goal of developing future outstanding scholars and researchers; (2) to create and disseminate new knowledge through research and related scholarly activity; and (3) to provide quality instruction of graduate students in the Department of Kinesiology. Such instruction takes place on different levels, many of which are not in a formal classroom setting (specifically working one-on-one with graduate students).

AREAS OF STUDY

There are six Areas of Study within the Kinesiology Graduate Program.

- Athletic Training and Sports Medicine
- Biomechanics
- Exercise Physiology
- History and Philosophy of Sport
- Motor Control
- Psychology of Movement and Sport

Student interests coupled with graduate faculty interests and expertise determine individual programs. A key feature is program flexibility, which allows students to pursue a M.S. or Ph.D. degree within one of these areas as structured by a chosen advisor with input from the student.

THE GRADUATE FACULTY

There are 24 tenure-track or tenured Graduate Faculty members in Kinesiology. This core is supplemented by a number of Affiliate, Adjunct and visiting faculty. Several faculty members also have graduate faculty appointments in other graduate programs, such as Biobehavioral Health, Nutrition, Bioengineering, and Physiology.

APPLICATION AND ADMISSIONS PROCESS

In order to pursue graduate study at the Pennsylvania State University, you must apply to both the Graduate School at Penn State and the Kinesiology Graduate Program.

NOTE: You will need Adobe Acrobat Reader to access the application, as well as some of the required forms.

To apply to the Graduate School at Penn State:

1. Apply online. To find current nonrefundable application fee please click the following link:

<http://gradsch.psu.edu/prospective/apply.html>

If you do not pay by credit card, you need to mail in a generated APPLICATION FEE FORM along with your payment. Please do not send cash. Make checks payable to The Pennsylvania State University. Be sure that international money orders or checks are drawn on a U.S. bank. Your cancelled check will serve as your receipt.

The web site to apply online is: <http://gradsch.psu.edu/portal/>

2. To apply to the Department of Kinesiology Graduate Program, mail or e-mail the following items to:

Kinesiology Graduate Program
266 Recreation Building
The Pennsylvania State University
University Park, PA 16802

- One official transcript from all institutions of higher education attended, both undergraduate and graduate. International applicants must submit official or attested university records, with certified translations if the records are not in English. Notarized copies are not sufficient.
- Graduate Record Examination (GRE), general test. These scores can be sent to us directly by Educational Testing Service if you authorize it, the relevant information for doing this is,
The code for Penn State University is 2660.
The code for the Department of Kinesiology is 0623.
- Three (3) letters of recommendation for Ph.D. consideration; two (2) for master's consideration. These should come from academic referees and be mailed to the Kinesiology Graduate Program.
- Statement of your background and professional goals, including specific research interests and contacts that you have made with individual faculty members. Also include whether you will be seeking a graduate assistantship. There is no separate application for a graduate assistantship in Kinesiology.

Questions regarding the application process for the Kinesiology Graduate Program may be directed to:

kinesgrad@psu.edu

Note for all applicants the Graduate School makes the final admission decision.

International Applicants

The following is information specific to International applicants.

- ***Test of English as a Foreign Language. (TOEFL)*** All international application whose first language is not English or who have not received a baccalaureate from an institute in which the language of instruction is not English must take the TOEFL.
- The Graduate School require a minimum score of 550 (paper)/213 (computer) on the TOEFL iBT exam a total of 80 with at least 19 on speaking section. A minimum score of 650 (paper) is required if you would like to receive a Teaching Assistantship (this score is equivalent to 280 computer based; or a score of 23 on speaking section and 114 total on iBT exam).

The code for Penn State University is 2660.

The code for the Department of Kinesiology is 0623.

- The Department will make a decision concerning your admission into its program. If applicable, you will be sent an offer letter and information concerning an assistantship. This information will also be forwarded to the Graduate School and the University Office of Global Programs (UOGP).
- After the Graduate School has reviewed your eligibility, approved and processed the offer they will automatically notify University Office of Global Programs for action to commence the visa paperwork process.
- University Office of Global Programs will contact you if more information is needed. UOGP will issue your visa related documents.

ADMISSION CRITERIA

The following guidelines are applied when reviewing an application for graduate work in the Department of Kinesiology:

1. Undergraduate GPA of 3.0 or better.
2. The Graduate Record Examination (GRE). Admission is competitive, your GRE scores (verbal, quantitative and analytical writing) should ideally be above the 50th percentile to be considered for admission. It is recommended that applicants schedule the GRE by December to apply for the following Fall Semester.
3. For the TOEFL the Graduate School require a minimum score of 550 (paper)/213 (computer) on TOEFL iBT exam a total of 80, with at least 19 on speaking section. A minimum score of 650 (paper) is required if you would like to receive a Teaching Assistantship from the Department of Kinesiology. This score is equivalent to 280 computer based; or a score of 23 speaking section and 114 total on IBT exam.
4. This is a mentor-based program. Therefore, individual faculty members screen applicants who meet acceptance criteria, each of whom make his/her own acceptance decisions and become the student's advisor. For this reason your statement of background and professional goals should be as detailed as possible.
5. Due to characteristics of the mentor system, prospective students are strongly encouraged to make personal contact with specific faculty members.
6. An interview with one or more graduate faculty members is desirable but not mandatory.
7. It is the applicant's responsibility to ensure that application materials are submitted to the Department (e.g., recommendation letters have been sent to the Department of Kinesiology Graduate Program).
8. Students applying for graduate study in the Athletic Training and Sports Medicine area need to be NATABOC certified.

SPECIAL INFORMATION FOR INTERNATIONAL STUDENTS

International students accepted for admission to the University will be sent pertinent information from the University Office of Global Programs once the application is verified and processed by the Graduate School. This packet will contain such information as: student visas, admission requirements and procedures for international students, U.S. Government regulations, shipping personal effects, general information regarding the University Office of Global Programs, insurance and taxes, extracurricular activities, etc. You may visit the web site for the University Office of Global Programs at:

<http://www.international.psu.edu>

MASTER'S DEGREE PROGRAM OF STUDY

The M.S. program of study requires a minimum of 30 graduate level credits including courses in the basic core, area of study, and related areas as specified below. A 3.0 (B) grade point average is required for graduation. In most circumstances the M.S. degree can be completed in four semesters.

Regardless of the program area, the following courses are required of all Kinesiology master's degree candidates.

- 6 credits in the core area of study selected from the Department areas of study for all of which a student must receive a quality letter grade
- 6 credits of supporting courses (taken outside of the Department of Kinesiology) for all of which a student must receive a quality letter grade
- KINES 530 Research Methods: 3 credits
- KINES 590 Graduate Colloquium (2 semesters): 2 credits
- KINES 600 Thesis Research: 6 credits
- Additional credits to obtain a minimum total of 30 credits (from for example colloquium, statistics, research, etc.)
- Scholarship and Research Integrity (SARI) training (10 hours)

NOTE: Most courses are worth 3 credits.

For master's students the program of study is designed to meet the individual needs of each student, it is planned in consultation with the student's adviser.

DOCTORAL DEGREE PROGRAM OF STUDY

In the doctoral program the general requirements include, sequentially, the candidacy examination, demonstration of competency in English, courses in the program of study, comprehensive examination, dissertation proposal, dissertation, and final oral examination. During the course of the doctoral program each student must have attended Penn State in residence for a minimum of two consecutive semesters. Generally the time for completion of the Ph.D. program, including the dissertation, is three years. This period is determined by the extent of background courses that must be included and by the nature of the research problem undertaken.

Candidacy Examination and English Competency

The Ph.D. Candidacy Examination must be taken before the end of the third semester following entry to the Doctoral program; this does not include summer sessions. A student must be either a part-time or fulltime student at the time of the examination. For students entering the program directly from their baccalaureate degree they must have completed at least 18 credits of graduate work. A 3.0 (B) grade point average is required for graduation. The candidate is required to demonstrate a high-level of competence in their area of study as well as use of the English language, both written and oral.

Courses in the Program of Study

Regardless of the area of study, the following are required of all Kinesiology doctoral degree candidates.

- 15 credits selected from the six Department of Kinesiology areas of graduate study for all of which a student must receive a quality letter grade (typically this comprises 5 classes)
- 6 credits selected from classes offered outside of the Department of Kinesiology for all of which a student must receive a quality letter grade (typically this comprises 2 classes)
- KINES 590 - Graduate Colloquium, all semesters until the comprehensive exam has been passed
- Scholarship and Research Integrity (SARI) training (10 hours)

A student can take a minor in another department in which case the credit load from outside of the Department will be greater. Students who enroll in the doctoral program after completing the master's program within the Department may petition to apply extra credit hours accumulated during the master's program to satisfy the doctoral program requirements.

NOTE: Most courses are worth 3 credits.

Comprehensive Examination

After completing substantially all of the recommended course work, a candidate is required to take a comprehensive examination covering the major area of specialization is both written and oral.

Dissertation Proposal, Dissertation and Final Oral Examination

The ability to do high quality independent research and achieve competence in scholarly exposition must be demonstrated by the preparation of a dissertation on a topic related to the core area of their specialization. A final oral examination, given by the student's doctoral committee members, covers the dissertation and knowledge of areas related to the student's specialization.

For doctoral students the program of study is designed to meet the individual needs of each student, it is planned with the adviser in consultation with the Doctoral Committee members.

FREQUENTLY ASKED QUESTIONS

How do I get selected for admission to the program?

We have a mentor based program, which means one of our graduate faculty must select you from the other applicants to get admitted to the program. That person then acts as your advisor. Therefore it is a good idea to make contact with members our graduate faculty who work in your area of interest.

What are the standards for admission?

Admission is competitive and based on demonstrated relevant experience and motivation, and your GPA and GRE scores. We require a minimum GPA of 3.0, and a combined minimum GRE score (verbal + quantitative) of 1000. These are only minimums, but the higher the better for example most of the students we admit have GRE scores that exceed the 50th percentile.

What financial support is available?

We have assistantships available that cover tuition and a stipend. These normally require some teaching duties, although some faculty do support students from their grants. There are also some fellowships available for the very best students. The assistantships and fellowships are normally allocated early in the spring semester, so to be considered for one of these you should endeavor to complete all of the paperwork before the end of the fall semester if you are planning commencing your studies in the following fall.

Should I get a master's (M.S.) or doctorate (Ph.D.)?

Completion of a master's degree in typically requires two years of study beyond the B.S., and another three years (at least) beyond the master's are required for the Ph.D. Depending on the program, you may be permitted to enter the Ph.D. program directly, without getting a master's degree first, but the more usual course is to obtain a master's degree along the way to getting a Ph.D.

Having a master's degree in hand will make you a more attractive candidate for prospective employers, and many jobs require a master's degree. Specific figures for kinesiology are difficult to obtain, but a 1999 survey conducted by the National Science Foundation reported that master's degree holders in "life and related sciences" have about 20% greater median income than their bachelor's-degreed counterparts. The Ph.D. is the credential that permits you to teach at a university, and in general gives you the ability to decide on the direction of a research program, whether in academia or in industry.

How important is it to do research while an undergraduate?

This is very important. Applying to graduate school in the sciences is a little like applying for a job as a research apprentice. An applicant with previous experience in a research laboratory (and a positive letter of recommendation from an undergraduate research advisor) will have a decided advantage over those without such experience.

What if my first degree is not in Kinesiology or Movement Science?

We have many graduate students in our program whose first degree is not in Kinesiology, Movement Science, or some similar topic. But if you come from an area outside of kinesiology you would still be expected to have taken many of the classes considered important for your chosen specialization, typically the ones specified on the following pages from outside a Department of Kinesiology. Similarly previous experience in a research laboratory is very important.

What if I am not obtaining my current degree from Penn State?

For those who are not obtaining their current degree from Penn State in the following pages where a Penn State course is listed ideally a similar or higher level class should be taken at their current institution.

FINANCIAL AID

GRADUATE ASSISTANTSHIPS

Assistantships are competitive and are awarded on the following criteria: (1) scholarship, (2) experience, and (3) specific ability desired for tasks for which assistantships are allocated. Preference is given to Ph.D. candidates. Department assistantships involve teaching and research. Representative teaching during a semester may consist of conducting or assisting with an undergraduate Kinesiology laboratory or teaching a lower level undergraduate course. Usually a person who has academic deficiencies which require a semester or longer to complete will not be considered for an assistantship until such deficiencies are completed.

The Department offers a limited number of half-time assistantships that require 20 hours of service per week each semester. The stipends range from \$13,590-\$15,705 for the academic year and grant-in-aid for tuition. Half-time assistants must carry at least 9 credits per semester during each semester of service and may apply for a tuition grant for the succeeding summer to cover a maximum of 6 credits. Applicants interested in being considered for an assistantship should indicate on their Statement of Background and Professional Goals. Early application is advisable to ensure consideration for an assistantship in the following year. Students seeking a departmental assistantship for fall semester admission should endeavor to have their application submitted by the end of the previous fall. A visit to the Penn State Campus is recommended.

MINORITY GRADUATE SCHOLARS AWARDS

Fellowships, assistantships, and fellowship supplements for minorities are granted as part of the University's comprehensive education opportunity program. Stipends and qualifications are similar to other fellowships and assistantships. For further information, contact the Graduate School Fellowship Office, 313 Kern Building, University Park, PA 16802, Phone - 814-865-2514.

GRADUATE WORK-STUDY PROGRAM

Students who qualify for this program receive an hourly wage for assisting faculty in their research and instructional duties. To be eligible for work-study positions, a student must demonstrate financial need through a formal need analysis (Financial Aid Form---FAFSA) and meet specific job qualifications established by a faculty supervisor. To apply, contact the Office of Student Aid, 314 Shields Building, University Park, PA 16802, Phone - 814-865-6301.

UNIVERSITY GRADUATE FELLOWSHIP

The Department nominates scholastically outstanding incoming graduate students for this award. In prior years, typical award winners had an average Jr/Sr GPA of 3.8 and average GRE scores (total of verbal and quantitative) of 1400. These are not the only selection criteria, but are noted to illustrate the competitiveness of this Fellowship. Nominees must submit a career/goal statement, which is carefully reviewed. Early submission of a student's application is required to be considered for this process.

CONTACT INFORMATION

Graduate Program Staff Assistant: Kristy Boob
 Department of Kinesiology Graduate Program
 The Pennsylvania State University
 276 Rec Hall
 University Park, PA 16802

Phone: 814-863-0874
 E-mail: kinesgrad@psu.edu

WEB SITES for Prospective Graduate Students

Department of Kinesiology	http://www.hhdev.psu.edu/kines
College of Health and Human Development	http://www.hhdev.psu.edu/
Graduate School	http://www.gradsch.psu.edu
Graduate School Application	http://gradsch.psu.edu/portal/
GRE and TOEFL Exams	http://www.ets.org
University Office of Global Programs	http://www.international.psu.edu
Penn State Registrar	http://www.registrar.psu.edu
Penn State On-campus Housing	http://www.hfs.psu.edu
State College (community)	http://www.statecollege.com
Centre Daily Times (local newspaper)	http://www.centredaily.com
Collegian (student newspaper)	http://www.collegian.psu.edu
Computer Information for New Students	http://computerstore.psu.edu/newstudents.htm
Affirmative Action Office	http://www.psu.edu/dept/aaoffice/

Areas of Study

- Athletic Training and Sports Medicine
- Biomechanics
- Exercise Physiology
- History and Philosophy of Sport
- Motor Control
- Psychology of Movement and Sport

For those who are not obtaining their current degree from Penn State in the following pages where a Penn State course is listed ideally a similar or higher level class should be taken at the student's current institution.

Department of Kinesiology
Graduate studies in
Athletic Training and Sports Medicine

PROGRAM

The Athletic Training Research Laboratory (ATRL) was founded in 1996 and serves as a clinical research unit within the internationally renowned Department of Kinesiology at The Pennsylvania State University, University Park Campus. The ATRL agenda focuses upon investigating the delivery of clinical health services to physically active individuals including the pathoetiology, prevention, assessment, and treatment of common athletic and orthopaedic injuries. Specific themes of research include: the mechanical and functional instabilities of joints, skeletal muscle pathophysiology, clinical therapeutic modalities, athletic training education and sports injury epidemiology.

Graduate students become actively involved with research projects under the direction of faculty members. Collaborative arrangements exist with faculty and clinicians in other areas of the University including the Penn State Center for Sports Medicine, the Department of Orthopedics and Rehabilitation, and Intercollegiate Athletics. Didactic coursework in athletic training and sports medicine is complemented by courses in biomechanics and locomotion studies, motor control, exercise physiology, and statistics and research design.

FACILITIES

The ATRL feature a broad range of biomedical equipment such as a wet lab space for biochemistry and histology, a surface electromyography and electrogoniometry system, a force platform, an isokinetic dynamometer and other relevant clinical assessment tools. A physical exam and treatment area, a functional testing area and computer equipment are also located in the laboratory. In Addition to the ATRL, the Department of Kinesiology houses associated collaborative research facilities such as a Biomechanics Laboratory, Motor Control Laboratory, Exercise and Sports Psychology Laboratory as well as the Noll Physiological Laboratory.

Furthermore, the ATRL is within close proximity to physicians and physical rehabilitation clinics at Penn State Hershey Orthopaedics State

College, Center for Sports Medicine. The convenient proximity of the ATRL to Penn State Hershey

Orthopaedics State College, Center for Sports Medicine facilitates collaborative efforts and interactions between physicians, therapists, and laboratory personnel in conducting translational sports medicine research.

SPECIFIC INFORMATION

Students applying for graduate studies in the Athletic Training and Sports Medicine area of Kinesiology need to be National Athletic Trainers' Association Board of Certification (NATABOC) certified.

The students should also take as many 400 level classes relevant to athletic training research (e.g., biomechanics, motor control, and physiology), as they can fit into their schedule. The student should also consider taking supplemental courses in statistics and or research methods.

FACULTY

W. E. Buckley, Ph.D., ATC, Professor (web5@psu.edu) Research areas: Health aspects of sport and athletic training with a focus in sport injury risk assessment and epidemiology; development of sport injury risk assessment models to apply to various subset athletic populations (women, disabled, senior participants); drug use in athletics; quality assessment for athletic training; and curriculum design.

Department of Kinesiology

Graduate studies in

Biomechanics

PROGRAM

The science of biomechanics has expanded rapidly over the past twenty-five years. Its roots can be traced to various established disciplines including engineering, anatomy, aerospace, rehabilitation, medicine, orthopedics, sport science and many others. The Biomechanics Laboratory at Penn State was founded in 1967 by Dr. Richard Nelson, and has since been at the forefront of the development of biomechanics within the field of exercise and sport science. The research, scholarly activities, and impact of faculty members and graduate students hailing from the Laboratory are internationally recognized.

The Center for Locomotion Studies (CELOS) was established by Dr. Peter Cavanagh in 1986 to focus faculty and graduate student research efforts in the areas of gait and human locomotion. The Center was dedicated to the discovery and development of biomechanical solutions for pathological conditions of the feet and lower extremities and as such extended the techniques developed in sports medicine to other populations and to health-related problems reaching beyond the competitive arena.

The Biomechanics Laboratory and Center for Locomotion Studies moved to new adjoining facilities in the Recreation Building on the University Park campus in 1997. These state-of-the-art facilities are expressly designed for the measurement and investigation of human motion in sport, health, and disease. In an effort to increase operational efficiency and enhance collaborative relationships the resources and faculty of CELOS were absorbed and combined into the Biomechanics Laboratory in 2004. The present day Biomechanics Laboratory, with roots in both the traditional Biomechanics Laboratory and the Center for Locomotion Studies, boasts an illustrious history of accomplishments. Over 70 Master of Science and over 70 doctoral students have completed their degrees to date and are contributing to the progress being made in this relatively young scientific field. Seventy-two visiting scholars and researchers from 27 foreign countries have participated in the research programs of the laboratories for periods ranging from two months to two years.

The Biomechanics Laboratory hosts a broad array of research foci that encompass several sub-domains of the discipline. The laboratory provides resources

for six resident investigators and several more affiliated researchers. Major thrusts include the application of biomechanical principles to motor control and neurological problems, understanding how muscle properties dictate the coordination of movement, exploring the mechanical behavior of musculoskeletal structures at the tissue level, and exploring innovative solutions to orthopaedic problems.

SPECIFIC INFORMATION

Biomechanics is the study of living systems using the principles of mechanics. It is a very broad area that includes such diverse branches as cell biomechanics and cardiovascular biomechanics. An undergraduate training in kinesiology prepares you especially well for the following sub-disciplines,

- Movement biomechanics
- Sport biomechanics
- Orthopaedic biomechanics
- Musculoskeletal biomechanics

Graduate training in biomechanics involves advanced coursework and a research project carried out under the direction of a research advisor. Graduate study in biomechanics is offered through a number of different departments that vary depending upon the university. These can include departments of kinesiology, exercise science, biology, physiology, orthopaedics, mechanical engineering, and biomedical engineering.

KINES 202 (Functional Anatomy) and **KINES 384** (Biomechanics) are the required courses that should give you a basic understanding of biomechanics principles, but additional coursework will be necessary to give you the deeper understanding of the field you will need to choose a graduate school and succeed once you get there. **KINES 484** (Advanced Biomechanics) and **KINES 488** (Mechanics of Locomotion) are elective courses that will introduce you to advanced topics in biomechanics; take both of these if you can.

In addition, you should strongly consider taking supplemental courses in mathematics, physics, and engineering. Having these courses on your transcript will increase your marketability to your potential graduate school advisors because they will give you the background and the skills necessary to do biomechanics research. Take as much math as you

can, and take calculus (**MATH 110, 111, 140, 141**) if at all possible. You should take physics (calculus-based such as **PHYS 211** is better, but **PHYS 250** or even **PHYS 1** will help) and a mechanics course will be more useful than electricity and magnetism. Among the engineering courses, the most relevant are statics, dynamics, and strength of materials (**E MCH 211, 212, 213**, respectively; note that all of these require calculus). You will almost certainly be doing some form of computer programming in graduate school, either in your research or in a graduate course, so a course in programming (**CMPS 101, 201**) or computing basics (**CMPS 100**) would be useful if you can fit in.

In summary, the following table lists the courses you should consider taking to optimize your preparation for attending graduate school to study biomechanics. You need not take all of these, but the more you take the better prepared you will be.

Undergraduate Class Recommendations for Prospective Biomechanics Graduate Students	
Class	Code
<i>Required Classes in Kinesiology</i>	
Functional Anatomy	KINES 202
Biomechanics	KINES 384
<i>Elective Classes in Kinesiology</i>	
Advanced Biomechanics	KINES 484
Mechanics of Locomotion	KINES 488
<i>Non-Kinesiology Classes (Ideally taken)</i>	
College Algebra through to Calculus with Analytic Geometry	MATH 21, 22, 26, 40, 41, 110, 111, 140, 141
The Science of Physics	PHYS 1
General Physics: Mechanics	PHYS 211
Introductory Physic	PHYS 250
Statics	E MCH 211
Dynamics	E MCH 212
Strength of Materials	E MCH 213
Computer Fundamentals and Applications	CMPS 100
Introduction to C++ Programming	CMPS 101
Programming for Engineers with C++	CMPS 201

Biomechanics information available online

American Society of Biomechanics

<http://asb-biomech.org/>

International Society of Biomechanics

<http://www.isbweb.org/>

FACULTY

John H. Challis, Ph.D., Professor

(jhc10@psu.edu) Research areas: Measurement and simulation modeling of the human musculo-skeletal system, with the aim of examining the role, function, and coordination of muscle in vivo; development of improved biomechanical measurement protocols.

Jinger S. Gottschall, Ph.D., Assistant Professor

(jsg20@psu.edu) Research areas: Cardiovascular physiology, neuromuscular physiology, and mechanical engineering. Current projects are an integrative and innovative study of walking and running. Specifically, how do humans and animals transition between various terrains.

Robert B. Eckhardt, Ph.D., Professor

(eyl@psu.edu) Research areas: Interaction of genetic and environmental influences on growth and development in human populations; musculo-skeletal structures are of primary interest. Current study techniques emphasize computer imaging and analysis of two-dimensional and three-dimensional data representing anatomical structures. Particular emphasis is placed on integration of molecular and morphological perspectives on development.

Stephen J. Piazza, Ph.D., Associate Professor

(sjp12@psu.edu) Research areas: Kinematic and dynamic computer simulation applied to the study of normal and pathological human gait; effects of design and surgical variation on the mechanics of total knee replacements; modeling of articular contact.

Neil A. Sharkey, Ph.D., Professor

(nas9@psu.edu) Research areas: Functional aspects of the musculoskeletal system viewed from an orthopaedic perspective; normal, pathologic, and reconstructed function of bones and joints; mechanisms of injury to bone, ligament, and tendon and associated healing responses; laboratory modeling of skeletal and diarthroidal joint loading; internal biomechanical behavior of the foot and ankle, knee, hip and shoulder.

Vladimir M. Zatsiorsky, Ph.D., Professor

(vxz1@psu.edu) Research areas: Biomechanical basis of motor control, in particular biomechanics of standing posture and manipulation at hand-held objects; sport biomechanics and conditioning of athletes; science of training athletes, especially strength training. Dr. Zatsiorsky has considerable experience in working with elite athletes.

Department of Kinesiology
Graduate studies in
Exercise Physiology

PROGRAM

The faculty is devoted to research, graduate education, and service in integrative physiological disciplines. Research focuses on insulin, glucose, and protein metabolism; skeletal muscle function; environmental stress; and the impact of exercise and other forms of physiological strain on the development of chronic conditions associated with advancing age such as hypertension, non-insulin dependent diabetes mellitus, heart disease, osteoporosis and thermal intolerance.

Graduate students become involved with research projects that are designed to yield information for publication in the scientific literature and for presentation at professional meetings. Collaborative arrangements are frequently made with faculty from other areas of the University such as the Hershey Medical Center and the Geisinger Medical Center as well as foreign laboratories.

FACILITIES

The Noll Physiological Laboratory is a free-standing, three story facility with 45,000 square feet of research and office space. It features animal care and research areas, including a two-compartment hypo-hyperbaric chamber; three environmental chambers providing precise control of temperature, humidity and air movement; as well as treadmills, ergometers, 24 hr human indirect calorimeter and an underwater weighing tank. The Lab also contains a physical examination area, two general testing areas, a biochemistry laboratory, areas for special projects, and mechanical and electrical shops for instrument fabrication, maintenance and repair. The Elmore Clinical Research Wing of Noll Laboratory houses the University Park component of the Penn State General Clinical Research Center (GCRC). The GCRC provides University-wide support for human clinical research.

Graduate students also conduct research in conjunction with other research units within the College of Health and Human Development and the University. Research topics include the underlying physiological mechanisms of injury and effectiveness of therapeutic interventions, and the role of the endocrine system in muscle tissue repair and remodeling.

SPECIFIC INFORMATION

Physiology is the study of life processes. Physiologists study how organ systems, tissues, cells, and molecules within cells work and how their functions are integrated to regulate the body's internal environment. Exercise physiology is a sub-discipline of physiology that examines how the body responds and adapts to muscular activity. Questions of interest to the exercise physiologist include, but are not limited to:

- How does a muscle generate force and how is this force controlled?
- How does the body provide the energy necessary to perform exercise?
- How does the body regulate its internal environment (temperature, acidity, blood pressure, etc) during exercise?
- How does exercise training influence physiological systems? How do these changes impact health?
- Can exercise training reverse the losses of cardiovascular fitness, bone, or muscle associated with bed rest, space flight, aging, etc?
- How do genes determine variation in the responses to exercise training among individuals?

What do exercise physiologists do?

An exercise physiologist conducts controlled investigations of responses and adaptations to muscular activity utilizing humans or animals as research subjects. Typically, exercise physiologists also provide instruction, to varying degrees, in courses and laboratory research experiences for students pursuing degrees in exercise science, physiology, medicine, and other health-related fields. However, there are a growing number of individuals with research interests in exercise who are being employed by pharmaceutical, industrial and governmental agencies.

Individuals trained in exercise physiology can also be employed in many non-research (applied) settings. These include, but are not limited to, physical rehabilitation programs (cardiopulmonary rehabilitation, physical therapy), corporate settings (employee fitness, health clubs, etc) and competitive sports programs (sports medicine, athletic teams,

strength coaches, etc). These professionals base much of their work on knowledge of exercise physiology and the research conducted by exercise physiologists.

How does one study exercise physiology?

Graduate training in exercise physiology involves advanced coursework and a research project(s) carried out under the direction of a research mentor. Graduate study in exercise physiology is offered through a number of different departments that vary depending on the institution. These can include departments of physiology, applied physiology, exercise physiology, kinesiology, biological sciences and medicine.

What undergraduate courses should I take to prepare for graduate school?

A breadth of preparation in biology, chemistry, biochemistry, physics, mathematics, and physiology is important for most graduate programs of exercise physiology. While all graduate programs may not require each of these courses, they constitute a preferred knowledge base i.e., the more of these courses you take, the better prepared you will be. The table below lists the specific courses you should consider.

Typical Grad School Requirement	Course Equivalent at Penn State
Math (through calculus)	MATH 140 or higher
Physics (1 semester, with lab)	PHYS 251/252 or higher
Inorganic chemistry (2 semesters, with lab)	CHEM 12/14, 13/15
Organic chemistry (2 semesters, with lab)	CHEM 34/35, 36/37
Biochemistry	BMB 211
Biology	BIOL 110
Cell biology	BIOL 240
Anatomy	KINES 202
Physiology of Exercise	KINES 350

Where do I go to find out more about exercise physiology?

American College of Sports Medicine

<http://www.acsm.org/>

American Physiological Society (careers in physiology site)

<http://www.the-aps.org/careers/index.htm>

Some of the information described above was adapted from materials originally published by the American College of Sports Medicine.

CORE FACULTY

Cynthia Bartok, Ph.D., R.D., Assistant Professor (cjb25@psu.edu) Research areas: Body composition assessment in children and adults, relationship between growth patterns early in life and later risk for obesity, emergency of motor control and locomotion in children, weight management in adults, sports nutrition.

Mary Jane De Souza, Ph. D., Professor (mjd34@psu.edu) Research areas: Interactions of energy deficiency, estrogen deficiency and bone health; refeeding amenorrheic athletes; menstrual irregularities and exercise; female athlete triad.

W. Larry Kenney, Ph.D., Professor (w7k@psu.edu) Research areas: Environmental and exercise physiology, particularly human thermoregulation, skin blood flow, and the biophysics of heat exchange.

Donna H. Korzick, Ph.D., Associate Professor (dhk102@psu.edu) Research areas: The singular and combined effects of chronic endurance exercise and senescence on the regulation of cardiac and coronary vascular smooth muscle function. Rodent and porcine models are utilized with particular research emphasis on receptor-second messenger coupling.

James A. Pawelczyk, Ph.D., Associate Professor (jap18@psu.edu) Research areas: Neural control of the circulation, particularly skeletal muscle blood flow, as it is affected by exercise or spaceflight.

David N. Proctor, Ph.D., Associate Professor (dnp3@psu.edu) Research areas: Control of blood flow to exercising skeletal muscles in health and disease; Sex differences in the cardiovascular responses to exercise in old age; Vasoregulation in the aging female.

Nancy I. Williams, Sc.D., Professor (niw1@psu.edu) Research areas: Exercise physiology; mechanisms of metabolic modulation of reproductive function in males and females; neuroendocrinology; clinical issues pertaining to women's health and reproductive status, i.e., amenorrhea, eating disorders, and bone demineralization.

Department of Kinesiology
Graduate studies in
History and Philosophy of Sport

PROGRAM

History of Sport involves the study of historical forces, institutions, and personalities that have shaped sport and physical activity. The focus ranges from sport in early civilizations of antiquity including Greece and Rome to the amateur ideal and Olympism of the 20th Century; and from the influence of religious forces on the mind-body dichotomy to developments in college athletics today.

In the Philosophy of Sport, students examine the nature and values of human movement utilizing the non-empirical methods of philosophers. Areas of emphasis include the ethics of sport, mind-body holism and its implications for professional practice, the significance to tacit knowledge, comparisons of sport with art, and the unique values of games and play.

Some of the faculty have been active in the founding and early years of their respective professional organizations, the North American Society for Sport History and the International Association for the Philosophy of Sport (originally the Philosophic Society for the Study of Sport).

The Penn State program in the History and Philosophy of Sport offers students a unique opportunity to focus on either history or philosophy while gaining breadth through the other area. Excellent working relationships with the history and philosophy departments and extensive library collections further strengthen this program.

The Penn State library has a fine collection of periodicals and books, and a significant collection of newspapers on microfilm. The microfilm collection is particularly strong in the Olympics, women's sports and college athletics. The library also contains a number of rare books in the area of sport and physical education philosophy and in sport history.

In the past decades, students in history and philosophy have had the opportunity to work with Professors on both historical and philosophical grants, with topics ranging from the history of television and big-time college football to ethics in sport.

The Penn State program places strong emphasis on research and writing for the students who have a wide diversity of academic and cultural backgrounds both in America and internationally. Students are recruited from such academic areas as history, literature, philosophy, American studies, classics, geography, sociology and political science, as well as the more traditional fields of physical education and kinesiology.

SPECIFIC INFORMATION

What is History and Philosophy of Sport?

The area of graduate studies in History and Philosophy of Sport represents two areas of study, History of Sport and Philosophy of Sport, which have many complimentary components.

The History of Sport involves the study of historical forces, institutions, and personalities that have shaped sport and physical activity. The focus ranges from sport in early civilizations of antiquity including Greece and Rome to the amateur ideal and Olympism of the 20th Century; and from the influence of religious forces on the mind-body dichotomy to developments in college athletics today.

In the Philosophy of Sport, students examine the nature and values of human movement utilizing the nonempirical methods of philosophers. Areas of emphasis include,

- the ethics of sport
- mind-body holism and its implications for professional practice
- the significance to tacit knowledge
- comparisons of sport with art
- the unique values of games and play

What undergraduate courses should I take to prepare for graduate school?

Students should take KINES 141 and 345, which are required anyway in the undergraduate Kinesiology programs. They should also take KINES 439W, and those with a history specialization should take at least two (preferably more) of the following,

- KINES 441 - History of Sport in American Society
- KINES 442 - Sport in Ancient Greece and Rome
- KINES 443 - The Olympic Games

- KINES 446 - History of Sport in the Modern World

For those planning to specialize in philosophy of their 9-15 credits in the humanities and/or social science they should take at least 6 credits in philosophy with a minimum of one 400-level course. These suggestions are very much minimums, anyone interested in studying the philosophy of sport in graduate school should take as many relevant courses as they can fit into their schedule.

For those planning to specialize in history of their 9-15 credits in the humanities and/or social science they should take at least 6 credits in history with a minimum of one 400-level course. They should also consider taking a course in historical methodology such as HIST 302W, the history department's undergraduate seminar. These suggestions are very much minimums, anyone interested in studying the history of sport in graduate school should take as many courses as possible in the history department in addition to as many of our offerings in the area they can fit into their schedule.

FACULTY

Mark Dyreson, Ph.D., Associate Professor (mxd52@psu.edu) Research Areas: History of sport and culture in the modern world with particular emphasis on the late nineteenth- and twentieth-century United States. Specific research concentrates on the role of sport in the creation of modern societies. Dr. Dyreson is the author of *Making the American Team: Sport, Culture and the Olympic Experience* (1998) and one of the authors featured in *The New American Sport History: Recent Approaches and Perspectives* (1997).

R. Scott Kretchmar, Ph.D., Professor (rsk1@psu.edu) Research areas: Philosophy of sport, with emphases on the ethics of fair play, the mind-body problem, and the nature of play. Both empirical and non-empirical methodologies are utilized and past research activities have ranged from basic to applied. He is the 1994 author of *Practical Philosophy of Sport*. Dr. Kretchmar is a fellow in the American Academy of Kinesiology and Physical Education and was named the 1997 Alliance Scholar.

Undergraduate Class Recommendations for Prospective History and Philosophy of Sport Graduate Students		
Required Classes	Elective Classes	Non-Kinesiology Classes
KINES 141	KINES 439W	HIST 302W (History specialization)
KINES 345	KINES 463	6 credits of history classes (minimum of 3 at 400-level) (History specialization)
	KINES 441	6 credits of philosophy classes (minimum of 3 at 400-level) (Philosophy specialization)
	KINES 442	
	KINES 443	
	KINES 446	

Department of Kinesiology

Graduate studies in

Motor Control

PROGRAM

The research in Motor Control is concerned with issues of control and coordination of such fundamental motor activities as posture, locomotion, multi-joint reaching movement, and prehension. Particular themes of research include: the coordination and control of movements in young healthy individuals, neurophysiological mechanisms of movement control and coordination, the importance of biomechanical factors for motor control, the development of movement control and coordination from a life-span perspective, changes in motor control with aging, and movement disorders. These research programs emphasize both basic and applied elements within the area of production of voluntary movements.

This program allows considerable flexibility in designing the course of study. Students may enroll in any courses offered in the Department as well as in independent study courses designed to promote research involvement in a topic of their particular interest. Graduate students are involved in research under the direction of a faculty member of the Motor Control area. Collaborative research and educational arrangements are also available with a wide range of faculty in other departments of the University. Graduate studies in Motor Control at Penn State have gained national and international recognition through the research and other professional activities of the faculty.

FACILITIES

The faculty in the Motor Control area have well-equipped laboratories for the conduct of their particular lines of research. These include systems for recording the kinematics of human movement, reaction forces during postural and movement tasks, electrophysiological setups for recording electromyographic and electroencephalographic signals, and a variety of other instruments. There is a particular emphasis on the development of new techniques for data processing and visualization including computer-based analysis of time series.

SPECIFIC INFORMATION

What is Motor Control?

Motor control is the study of the processes through which animal and human movements are

planned, executed, and coordinated. Movement control relies largely on central nervous system mechanisms that occur in the spinal cord, brain stem, and cerebral hemispheres. These processes include the planning and execution of goal directed movements, such as reaching for, grasping, and manipulating objects, as well as coordination of more automatic movements, such as walking and cycling. Movements that require a high level of skill, such as sport activities, musical performance, and dance typically require substantial training. Thus, the neural processes associated with motor learning and adaptations are also considered under the topic of motor control. Because movements require that muscle actions interact with the physical apparatus of the body, physiology and biomechanics form essential foundations for the study of motor control.

Graduate training in motor control involves advanced coursework and a research project carried out under the direction of a research advisor. Graduate study in motor control is offered through a number of different departments that vary depending upon the university. These can include departments of kinesiology, exercise science, biology, physiology, neuroscience, neurology, and biomedical engineering.

What undergraduate courses should I take to prepare for graduate school?

KINES 202 and KINES 360 and KINES 384 are the required courses that should give you a basic understanding of biomechanics principles, but additional coursework will be necessary to give you the deeper understanding of the field you will need to choose a graduate school and succeed once you get there. KINES 460 and KINES 463 are elective courses that will introduce you to advanced topics in motor control; take both of these if you can.

In addition, you should strongly consider taking supplemental courses in statistics, mathematics, physics, and biology. Having these courses on your transcript will increase your marketability to your potential graduate school advisors because they will give you the background and the skills necessary to do motor control research. Take as much math as you can, and take calculus (**MATH 110, 111, 140, 141**) if at all possible. You should take physics (calculus-based such as **PHYS 211** is better, but **PHYS 250** or even **PHYS 1** will help) and a mechanics course will be more useful than electricity

and magnetism. Among the biology courses, the most relevant are mammalian physiology (**BIO 472**), neuroscience (**BIO 469, 470**). You'll almost certainly be doing some form of computer programming in graduate school, either in your research or in a graduate course, so a course in programming (**CMPSC 101, 201**) or computing basics (**CMPSC 100**) would be useful if you can fit it.

The following table lists the courses you should consider taking to optimize your preparation for attending graduate school to study motor control. You need not take all of these, but the more you take the better prepared you will be.

Undergraduate Class Recommendations for Prospective Motor Control Graduate Students		
Required Classes	Elective Classes	Non-Kinesiology Classes
KINES 202	Kines 460	MATH 21, 22, 26, 40, 41, 110, 111, 140, 141
KINES 384	Kines 463	PHYS 1, 211, 250
KINES 360		Bio 469, 470, 472
		CMPSC 100, 101, 201

FACULTY

Mark L. Latash, Ph.D., Professor

(ml11@psu.edu) Research areas: Control and coordination of multi-element systems participating in the production of voluntary movements; equilibrium-point hypothesis of motor control; control of posture, multi-joint reaching, finger coordination, and other motor tasks; the neurophysiological mechanisms of the production of voluntary movements; changes in motor control and coordination with age, neurological disorder, and rehabilitation.

Karl M. Newell, Ph.D., Professor

(kmn1@psu.edu) Research areas: Coordination, control and skill of normal and abnormal human movement across the life-span; development of coordination; acquisition of skill; information and movement dynamics; mental retardation and motor skills; drug exercise influences on movement control.

Robert L. Sainburg, Ph.D., Associate Professor

(rls45@psu.edu) Research areas: The neural mechanisms underlying control of multijoint arm movements in humans. Dr. Sainburg's research combines both psychophysical experiments and biomechanical simulations to determine the neural processes responsible for coordinating the complex mechanics of the musculoskeletal system. Studies in patients with neurological lesions are conducted to determine the contributions of specific neural structures to control.

Department of Kinesiology
Graduate studies in
Psychology of Movement and Sport

PROGRAM

Studies in the Psychology of Movement and Sport focus on one or both sides of the reciprocal relationship between psychological factors and human performance in human movement contexts.

Particular themes of research include determinants of physical activity and adherence, the origins and consequences of individual differences in achievement motivation, and mild traumatic brain injury. Details about specific research themes can be obtained from each faculty members' homepages.

FACILITIES

Facilities in the Psychology of Movement and Sport area include well-equipped research laboratories for examining brain-behavior relationships in a variety of contexts. Systems include recording equipment for whole-body and various segment movement kinematics and forces, and an electrophysiological setup for examining brain electrical activity (EEG) during cognitive-motor tasks. A host of special purpose computer programs are available for computer simulation of visualization of movement dynamics. Facilities exist for conducting timing-intensive computer-based experiments, as well as editing and analyzing behavior observation data. Details about individual faculty laboratories can be obtained by perusing those laboratory homepages.

SPECIFIC INFORMATION

What is Psychology of Movement & Sport?

Psychology of Movement & Sport is the study of human thoughts, feelings, and behavior in movement settings. This broad definition includes such diverse areas as physical activity promotion, youth development, performance enhancement, and psychophysiology. Undergraduate training in kinesiology and psychology prepares you especially well for graduate study in exercise and sport psychology.

Graduate student in exercise & sport psychology is typically offered through kinesiology (or exercise science) departments; some psychology departments also offer graduate programs in exercise & sport psychology. At Penn State graduate training in the Psychology of Movement & Sport involves

advanced coursework, collaborative research experiences, and an independent research project carried out under the direction of a research advisor.

What undergraduate courses should I take to prepare for graduate school?

Students typically prepare themselves for graduate study in the Psychology of Movement & Sport in one of two ways. The first option is to double major in Kinesiology (Movement Science option) and Psychology. This option ensures both breadth and depth of exposure in both fields. The second option is to major in one of those fields of study (Kinesiology or Psychology) and take supplementary coursework in the other (perhaps even earning a minor). A less typical path is to apply to the program without formal coursework in either field, but with significant experience that would prepare you for advanced study in this area.

The Bachelor of Science is the recommended undergraduate degree. The following PSU Kinesiology courses would be especially useful for students interested in exercise & sport psychology:

KINES 321 – Psychology of Movement Behavior
(required for undergraduate KINES majors)

KINES 421 – Exercise Psychology

KINES 422 – Physical Activity Interventions

KINES 423 – Psychology of Sport Injury

KINES 427 – Development Sport & Exercise Psychology

KINES 428 – Motivation & Emotion in Movement

KINES 429 – Psychology of Sport Performance

It is unlikely that any student will be able to take all of the recommended courses but students should strive to take as many as possible based on their specific interests and post-graduate plans. Depending on your specific interests, there may be additional courses that you should consider. You are encouraged to contact a faculty member with interests similar to yours to get advice regarding specific courses to prepare yourself for graduate school.

Some Helpful Internet Links Related to Careers in Psychology of Movement & Sport

The four career tracks identified by the American Psychological Association	http://www.apa47.org/studGradTrain.php
Careers in applied sport and exercise psychology	http://appliedsportpsych.org
Careers in psychology and sports medicine	http://www.acsm.org/Content/NavigationMenu/Education/StudentAffairs/Student_affairs.htm
Careers in psychophysiology	http://www.sprweb.org/student
Careers in public health and behavioral medicine	http://www.sbm.org/careers/

Students interested in graduate training in sport and exercise psychology should consider purchasing the *Directory of Graduate Programs in Applied Sport Psychology*. This directory includes descriptions of Masters and Doctoral programs in sport & exercise psychology, listings of faculty and their interests, information about admission requirements, funding possibilities, etc. It is an invaluable resource if you are thinking of going to graduate school in this field. The directory can be purchased via <http://www.fitinfotech.com> (online subscriptions or a hard copy of the book are available).

FACULTY

David E. Conroy, Ph.D., Associate Professor (dec9@psu.edu) Research areas: Developmental origins and consequences of individual differences in achievement motivation.

Danielle Symons Downs, Ph.D., Associate Professor (dsd11@psu.edu) Research examines the psychosocial determinants of exercise behavior, with a focus on the utility of theoretical models in understanding, predicting, and explaining exercise behavior. Specific research projects include: (1) examining the Theory of Planned Behavior and exercise in: a) pregnant and postpartum women, b) in college-aged ballerinas, c) in a worksite population of deputy sheriffs, and d) in children; (2) examining the Stages of Change Construct of the Transtheoretical Model in college students and children; and (3) examining the Sociocultural Model in explaining the relationship between exercise behavior and body image. In addition, Dr. Down's research focuses on understanding the etiology of primary exercise dependence which is a multidimensional maladaptive pattern of exercise behavior that can lead to physical and psychological problems. Dr. Heather Hausenblas (the University of Florida) and Dr. Downs have developed the Exercise Dependence Scale, and their research has focused on continually examining the scale's psychometric properties in a variety of populations.

Steriani Elavsky, Ph.D., Assistant Professor (sxe16@psu.edu) Research areas: psychosocial determinants and consequences of physical activity with the emphasis on the aging process; physical activity interventions to promote health, psychological well-being and quality of life in middle-aged and older adults; physical activity effects on menopause management; exercise adherence; exercise effects on self-esteem, emotion, symptom reporting, and quality of life.

Semyon M. Slobounov, Ph.D., Professor (sms18@psu.edu) Research areas: Cognitive and affective aspects of motor skill acquisition, psychological causes and consequences of sport injury, psychological effects of exercise, EEG and voluntary movements, computer graphic visualization of movement dynamics.