THE DEPARTMENT OF **SPORTS SCIENCE** AND **CLINICAL BIOMECHANICS**

Photo: Steen Frydenlund

ACTIVE AND HEALTHY LIVING

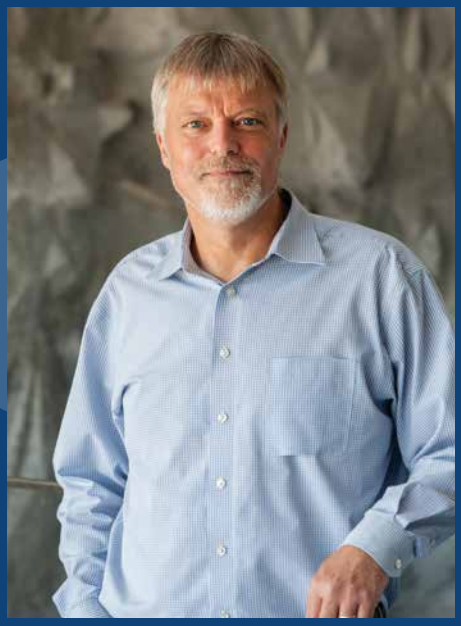
SYDDANSK UNIVERSITET
UNIVERSITY OF SOUTHERN DENMARK

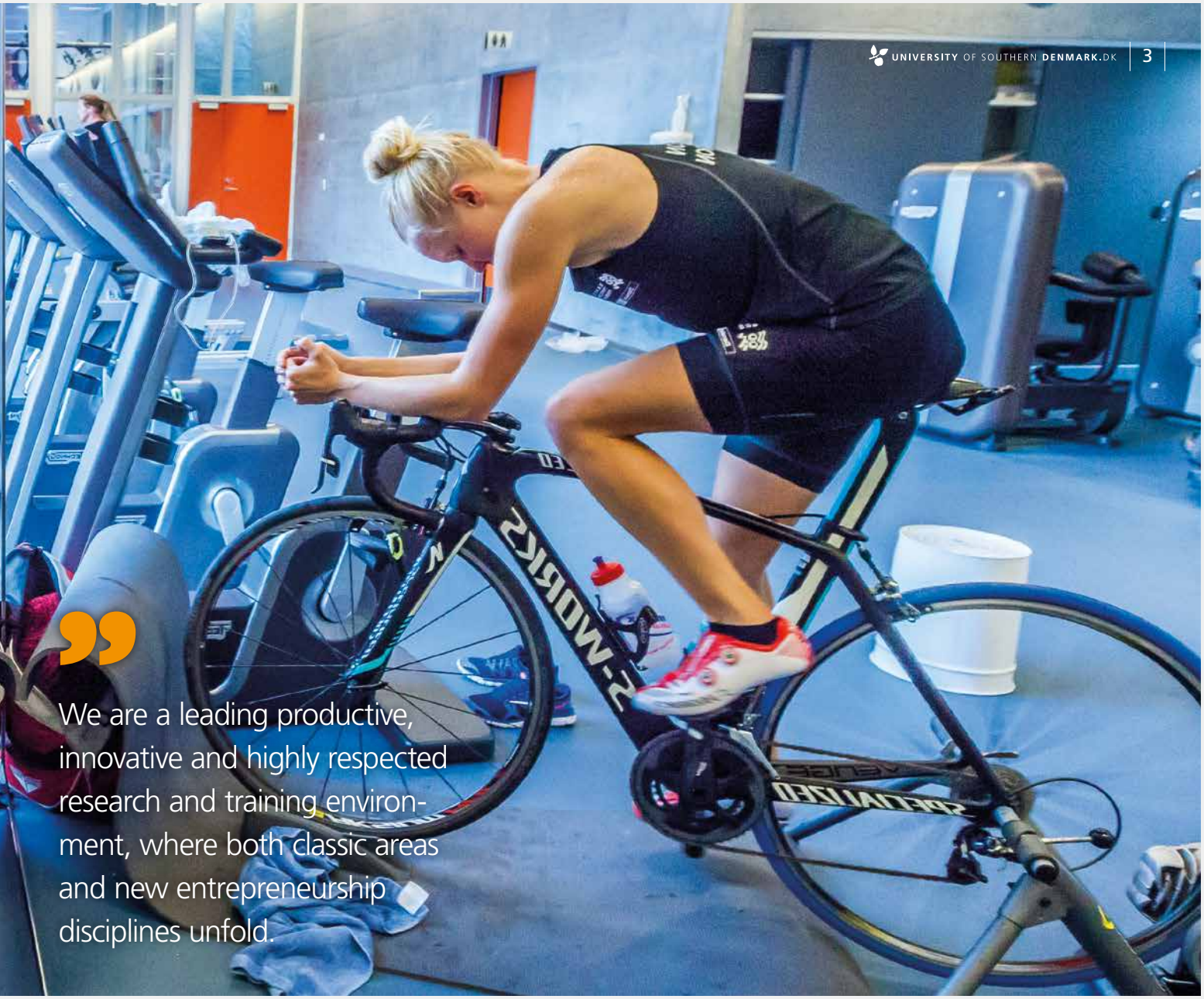
The Department of Sports Science and Clinical Biomechanics conducts research, innovation, education and knowledge-sharing, based on state of the art facilities for advanced basic and applied research, and active learning for students. The Department aims to maintain and expand its position as a leading productive, innovative and highly respected research and educational environment, where both classic disciplines and new entrepreneurial methods intermingle. It carries out projects with both public and private partners through intensive national and international research collaborations.

Employees of the Department share a focus on Healthy and Active Living and seek to contribute to the development of this research focus, both on a national and global scale. The interdisciplinary research and education environment is based on effective organization and respect for one another's skills and areas of academic focus.

The Department is an open environment, and is known for creating and maintaining close relationships with the surrounding community and beyond. It is a workplace for 160 employees and a centre of learning for more than 1,200 students.

Head of department, Jørgen Povlsen





We are a leading productive, innovative and highly respected research and training environment, where both classic areas and new entrepreneurship disciplines unfold.

When the Department was first established, our focus was on the physiology of exercise and social science in the field of sport, movement and physical activity. Over the last decade, our strategy has been to expand this focus to include various aspects of health research. These now include epidemiological and clinical research, strengthening our translational research capability to educate the community about public health interventions and best practice health care.

Today, high profile researchers with backgrounds in sports science and psychology, social science, humanities, public health, chiropractic, physiotherapy, medicine and occupational health actively collaborate with each other across research units, faculties and with other universities nationally and internationally, as well as with private enterprise and public institutions to address interdisciplinary scientific problems.

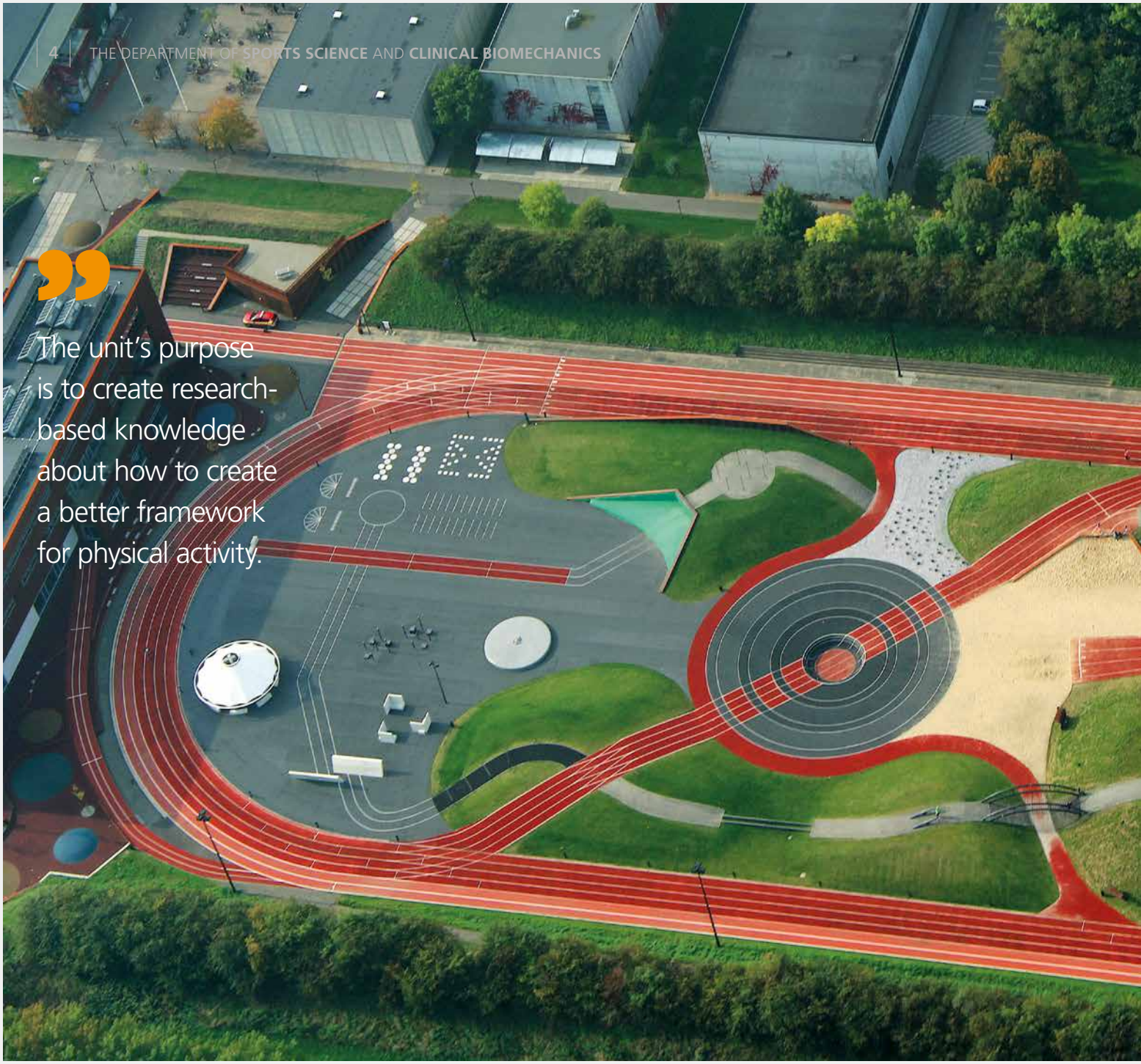
Our research and innovation are based upon studies of the human body and movement, with a particular focus on the sport and exercise, musculoskeletal and cardiovascular systems, active living, movement, and include investigation into physiological, psychological,social, cultural, political, and pedagogical aspects.

We strive for excellence in all our research domains, and have identified the following areas as being of particular strategic importance in our 2015-2020 research strategy:

- Health and physical activity across the lifespan
- Prevention and management of muscle and joint disorders
- Sport and physical activity in society
- Muscle function and performance

Our staff, which includes some 60 doctoral students, will conduct high-quality scientific studies in these key domains by:

- Determining the effectiveness and cost-effectiveness of interventions
- Studying muscle physiology and biomechanics
- Developing, validating and using objective measurements of behaviour and health
- Studying movement and health in the context of cultural changes
- Developing, validating and using active living technologies and solutions
- Relating our findings to societal trends in personalized health and sport



> The unit's purpose is to create research-based knowledge about how to create a better framework for physical activity.

ORGANIZATION

The Department is divided into eight research units, each led by a Head of Research (in parentheses):

- Active Living (Associate Professor, PhD Jens Troelsen)
- Exercise Epidemiology (Associate Professor, PhD Anders Grøntved)
- Physical Activity and Health in Working Life (Professor, PhD Karen Søgaard)
- Clinical Biomechanics (Professor, PhD Jan Hartvigsen)
- Muscle Physiology and Biomechanics (Associate Professor, PhD Niels Ørtenblad)
- Movement, Culture and Society (Professor, lic.phil. Jørn Hansen)
- Physical Education and Sports Psychology (Associate Professor, PhD Lars Elbæk)
- Musculoskeletal Function and Physiotherapy (Professor, PhD Ewa Roos)

The department has a number of centers for applied research and innovation.

The Danish ambassador in China, Friis Arne Petersen, visits the department in 2014.

ACTIVE LIVING

Head of Research: **JENS TROELSEN,** jtroelsen@health.sdu.dk

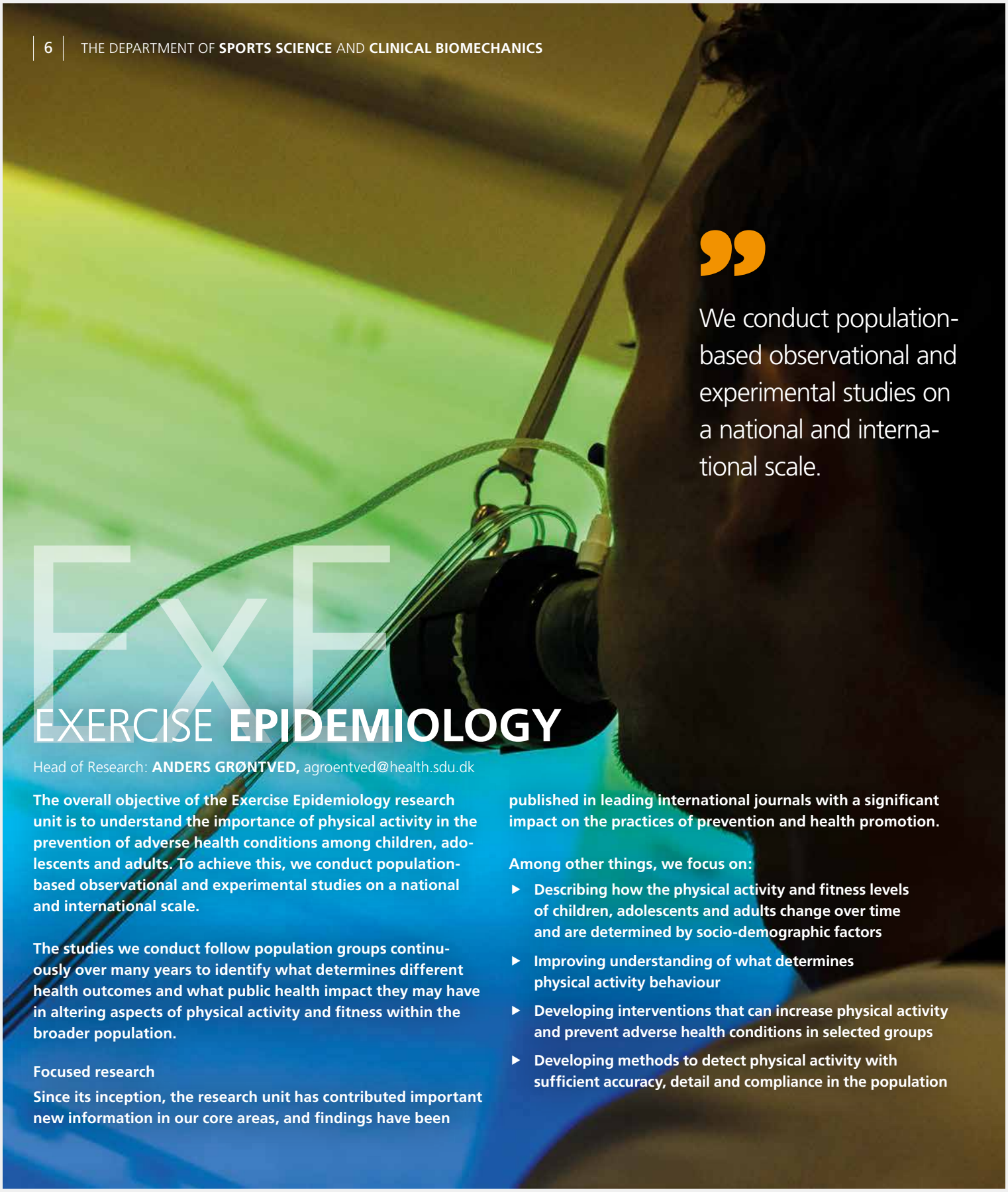
This research unit centers on the concept of Active Living, which, since 2000, has strongly expanded its efforts to counteract the negative effects of sedentarism and physical inactivity. After smoking, physical inactivity is considered to be the greatest threat to public health in the Western world. Active Living is a combination of different types of physical activity associated with work, home, travel and leisure. Emphasizing the integration of physical activity into everyday actions can help create a healthy, active lifestyle.

An everyday framework of activity

Active Living is based on a paradigm of prevention and health promotion by providing a framework and creating opportunities to mobilize the resources and abilities of children, adolescents, adults and the elderly in order to become more physically active in everyday life. The research unit's purpose is to create research-based knowledge about how to build a better framework for physical activity. A special focus is on play, active transportation and recreational activities. The research is based on the importance of physical, organizational and social contexts for physical activity and health. We perform quantitative and qualitative analyses of the interaction between the individual and the environment, as well as social and cultural norms related to physical activity.

We conduct population-based observational and experimental studies on a national and international scale.

Scan the QR code to watch a video presentation of our new athletics and movement stadium.



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EXERCISE **EPIDEMIOLOGY**

Head of Research: **ANDERS GRØNTVED,** agroentved@health.sdu.dk

The overall objective of the Exercise Epidemiology research unit is to understand the importance of physical activity in the prevention of adverse health conditions among children, adolescents and adults. To achieve this, we conduct population-based observational and experimental studies on a national and international scale.

The studies we conduct follow population groups continuously over many years to identify what determines different health outcomes and what public health impact they may have in altering aspects of physical activity and fitness within the broader population.

Focused research

Since its inception, the research unit has contributed important new information in our core areas, and findings have been published in leading international journals with a significant impact on the practices of prevention and health promotion.

Among other things, we focus on:

- **Describing how the physical activity and fitness levels of children, adolescents and adults change over time and are determined by socio-demographic factors**
- **Improving understanding of what determines physical activity behaviour**
- **Developing interventions that can increase physical activity and prevent adverse health conditions in selected groups**
- **Developing methods to detect physical activity with sufficient accuracy, detail and compliance in the population**

Photo: Das Büro for Team Danmark

PHYSICAL ACTIVITY AND **HEALTH IN WORKING LIFE**

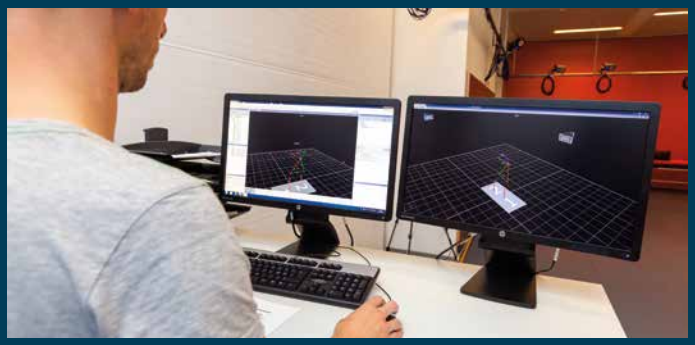
Head of Research: **KAREN SØGAARD,** ksogaard@health.sdu.dk

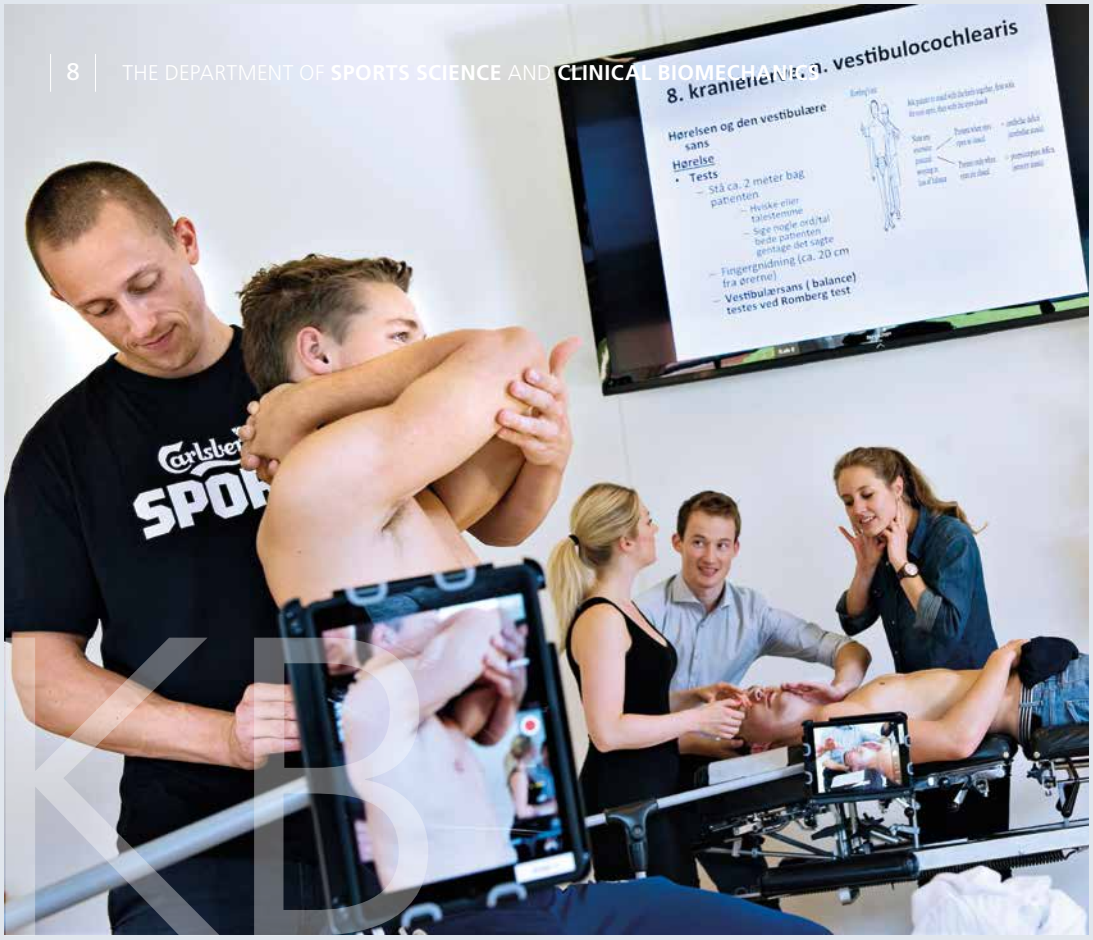
The level of physical activity in the workplace has changed dramatically in recent decades. As a consequence of our automated world, much of our work is becoming increasingly inactive, which increases the risk of a number of lifestyle diseases. At the same time, the body is burdened daily by static or repetitive stress and required to conform to awkward positions, and many jobs still require standing/walking while pulling, pushing and heavy lifting.

The consequences of this are a very high rate of musculoskeletal disorders among working Danes. As the majority of the adult population spends much of the day at work, this is a natural arena for raising the level of physical activity. Targeted training in the workplace can prevent lifestyle diseases and reduce musculoskeletal pain.

The unit focuses on the following research areas:

- Intervention studies with health-enhancing physical activity
- Development and testing of training programmes for improved physical capacity and prevention of muscle and joint disorders
- Development and testing of training programmes aimed at weight loss, increased physical activity and reduced risk of lifestyle diseases
- Development of health check-ups as the basis for individual Intelligent Motion
- Mechanisms of work-related musculoskeletal disorders
- Objective measurement of physical activity in various occupations
- New technology for focused stress optimization in working life
- Welfare technology including robot-guided training





> Today, back pain is the primary reason for years of living with disability all over the world.

CLINICAL **BIOMECHANICS**

Head of Research: **JAN HARTVIGSEN,** jhartvigsen@health.sdu.dk

Pain, disability and disease from muscles and joints can begin early and continue throughout life - whether they originate in the back, neck or other areas of the body. Today, all over the world, back pain is the primary reason for years of living with disability, causing lower productivity at work and a reduced sense of well-being. A well-functioning musculoskeletal system is one of the prerequisites for a good, healthy, and active life. That's why we focus on the longitudinal perspective – from the cradle to the grave.

We strive to find:

- Factors that influence the prognosis for people with muscle and joint pain, so they can live active and high quality lives
- Better examination procedures and treatments for people suffering from back, neck, and other musculoskeletal conditions
- Methods to ensure that individuals with back and neck pain and other musculoskeletal conditions get the right treatment at the right time
- Innovative strategies that can help people with musculoskeletal conditions remain in the workplace and live active lives
- New ways of collaboration and new technologies that can help in the management of muscle and joint diseases
- Mechanisms that cause pain and disability in muscles and joints
- New methods of transferring knowledge into practice in the health care system and in society in general, so that people benefit directly in their everyday life

MUSCULOSKELETAL **FUNCTION** AND **PHYSIOTHERAPY**

Head of Research: **EWA ROOS,** eroos@health.sdu.dk




The driving force of Musculoskeletal Function and Physiotherapy is its interdisciplinary nature, where physiotherapy, orthopaedic surgery and sport researchers collaborate, using their diverse skills, experience and knowledge to collectively improve patient musculoskeletal health and well-being.

> We seek to answer research questions that arise in the clinic.

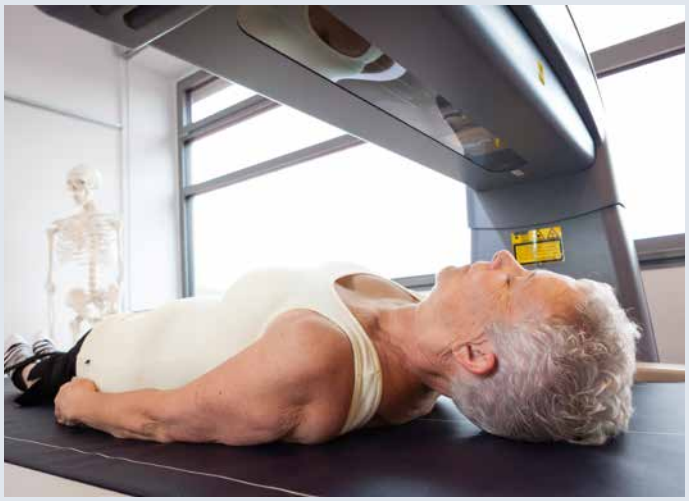
Scan the QR code to visit www.glaid.dk

Together with clinicians, we seek to answer research questions that arise in the clinic, and which are highly relevant for patients with pain and problems in the musculoskeletal system.

A typical aspect of our research projects is the comparison and evaluation of different treatments across professions. Often studies are preceded by a systematic review and analysis of the existing literature. Finally, we examine the underlying mechanisms of exercise, such as treatment of pain and disability in individuals with muscle and joint problems.

A GLA:D approach

As part of the transfer of theory into practice – and as a multidisciplinary flagship for the unit – we have created a method we call GLA:D. "Good Life with (osteo)Arthritis in Denmark", which consists of education for clinicians, as well as a targeted program of training and education for people with knee or hip pain. GLA:D has resulted in pain reduction and better quality of life for its participants. The method is now used throughout the country, and is supported by Gigtforeningen (the Arthritis Foundation). Read more about GLA:D – and see where it is offered – at www.glaid.dk.



BKS

MOVEMENT, CULTURE AND SOCIETY

Head of Research: **JØRN HANSEN,** jhansen@health.sdu.dk

From a cultural and societal framework of understanding, the research unit focuses in particular on movement, physical education and health. The unit's principal research contribution is learning more about current perceptions and practices – related to, for example, health, welfare, volunteering, the public sector and physical activity as rehabilitation.

The Movement Culture and Society research unit carries out research that is primarily directed at sports and health issues, studies of body and movement cultures, and exploration of the processes related to changes in body and movement cultures – for example in fitness, dance and play culture.

Research themes

- International sports policy and mega-events
- Municipal sports policy
- The relationship between health and sports policy
- Changes in club-organized sports policy
- Danish sports and funding structures
- Health culture in modernity
- Disability and movement promotion
- Comparative study of career opportunities for elite athletes
- Play culture
- Cognition and body culture
- Phenomenology, qualitative and quantitative research
- Bodily awareness in dance and elite sports

Photo: Das Büro for Team Danmark

PHYSICAL EDUCATION AND SPORTS PSYCHOLOGY

Head of Research: **LARS ELBÆK,** lelbaek@health.sdu.dk

Photo: Mick Andersson

Our vision is to contribute to innovation and generate knowledge that in turn contributes to the development of sports, activities and learning in physical education and sport pedagogy, as well as in talent environments and sports psychology, both nationally and internationally.

Physical Education and Sports Psychology's research is used as the basis for:

- Educational initiatives promoting physical activity in schools
- Sports psychological interventions
- Elite sport talent development and environments
- Skills upgrading for sports trainers, sports psychologists and leaders in sports

Tomorrow's practices today

The unit aims to set the agenda for future sports practices and policies. Our research is currently used in, among other places, elite sporting environments, schools, institutions for health promotion and education. The unit also cooperates with organizations, government institutions and businesses in the innovation and development of products, services and concepts. The research unit is focused predominantly on a qualitative research paradigm, centering on case-based studies and action research. Its primary methods include interviews, observation, document analysis, interventionist methods, design thinking, user-driven innovation and cultural analysis. In addition, the unit works on the development of research methodology.

We seek to associate pure basic research more closely with applied research, including clinical research.

HEALTH TECHNOLOGY

TECHNOGYM IN COLLABORATION WITH THE DEPARTMENT OF SPORTS SCIENCE AND CLINICAL BIOMECHANICS

Pedan would like to congratulate the Department of Sports Science and Clinical Biomechanics (ISSCB) at the University of Southern Denmark (SDU) on the new visionary facility.

We are proud to be able to contribute to SDU with practical health technology solutions in the form of the market's latest and most innovative fitness and rehabilitation equipment, coupled with targeted cloud-based applications for the collection and monitoring of relevant training data for research and development, as well as to the motivation of users.

Technogym is a partner in the global organization "Exercise is Medicine" and has a strong focus on developing and promoting evidence-based solutions to improve public health through regular exercise. We are therefore very pleased with the cooperation we have with ISSCB and our common goal of finding the best ways to a healthier life through physical activity.

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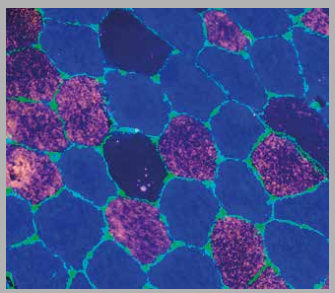
MUSCLE PHYSIOLOGY AND BIOMECHANICS

Head of Research: **NIELS ØRTENBLAD,** nortenblad@health.sdu.dk

The research unit for Muscle Physiology and Biomechanics carries out research and teaching in basic muscle function, from the cellular level to the whole body level. Activities are focused on muscular, neural and biomechanical aspects related to training, physical performance, inactivity, ageing and disease.

The specific research activities undertaken by the Unit describe several neuromuscular, biomechanical and musculoskeletal aspects related to (i) physical activity and health, (ii) muscle function in relation to muscle size, fibre type characteristics, muscle architecture, contractility, metabolism and signaling mechanisms, (iii) training, inactivity and immobilization, (iv) fatigue, (v) congestion in muscles and tendons, (vi) ageing, and (vii) muscle disease.



These aspects are illustrated through basic research, but also in the form of more application-oriented and training scientific research projects. We therefore seek to associate pure basic research more closely with applied research, including clinical research.

HANC

Across disciplines and sectors, we have established the HANC network project – Healthy Ageing Network of Competence – as a platform for cooperation between researchers, users, health professionals and businesses. HANC brings together the many threads of gerontology – such as geriatric medicine, technology, robotics and health sciences – and takes them a step further.

CENTRES FOR APPLIED **RESEARCH** AND **INNOVATION**

Centre for Sports, Health and Civil Society
The Centre is engaged in research with two types of MOVEMENT: Physical movement with a focus on sports policy, sports facilities and physical play, and social movement focusing on club activities, volunteer work and the interaction between volunteers and the public sector.

Centre for Adapted Physical Activity Participation Studies
The Centre conducts research to develop customized sports and physical activity participation for people with impairments and disabilities, with special emphasis on health promotion.

Danish Centre for Active Living with Muscle and Joint Disease
The Centre's mission is to improve the health of people who experience pain and loss of function due to diseases of the musculoskeletal system.

Research in Childhood Health
The Centre has a research focus on health of children and young people, and works closely with ministries, regions and municipalities in connection with the initiation and evaluation of health promotion interventions.

"I have seen more than 40 centres for sports science and research worldwide. This one offers excellence and is easily among the best I've seen".

Jacques Rogge, former IOC president and honorary doctor at the University of Southern Denmark.

Scan the QR code to see an overview of our centres.

Team Denmark Test Centre

The center's activities are directed at the Danish sports elite, and established as a partnership with Team Denmark. The Center tests elite Danish athletes.

University Center for Sports Medicine

The Centre was established in cooperation with Odense University Hospital, and focuses on diagnosis, treatment, research and prevention in the field of sports medicine.

Research and Innovation Centre for Human Movement and Learning

The Centre produces and conveys practice-oriented knowledge of sports, activities and learning. The Centre was established as a partnership between the University College Lillebaelt and the University of Southern Denmark.

Centre for Active and Healthy Ageing

The Centre researches ways to improve opportunities for older people to remain active and healthy, thereby fostering self-reliance and independence among the elderly.

The Department of Sports Science and Clinical Biomechanics has more than 160 employees and provides a framework for education in:

- Sports and Health (undergraduate, graduate and subsidiary subject)
- Clinical Biomechanics (undergraduate and graduate)
- Master of Science in Physiotherapy
- Master in Rehabilitation
- European Master in Health and Physical Activity

OUR VISION IS TO HELP **IMPROVE HUMAN HEALTH**

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