Journal of Musculoskeletal and Neuronal Interactions JMNI

In Memory of Professor Dr. med. Jörn Rittweger (1962–2025)

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It is with deep sadness that we bid farewell to Professor Dr. Jörn Rittweger, who passed away suddenly and unexpectedly on Easter Monday, April 21st, 2025 at the age of 63. With his passing, the international scientific community has lost one of its most visionary minds in the fields of space physiology and musculoskeletal research.

Jörn Rittweger was an exceptional scientist, physician, and physiologist. His translational work consistently bridged the gap between basic research and clinical application. He studied medicine at the Ludwig Maximilian University in Munich and completed his specialist training in physiology at the Free University of Berlin, where he also habilitated under Professor Langhorst. He was one of the founding members of the Berlin Center for Space Medicine and Extreme Environments (ZWMB). Between 2003 and 2009 he worked at Manchester Metropolitan University initiating and leading the work on bone mechanics and Master Athletics, fields of research still going strong at Manchester Metropolitan University. Since 2009, he headed the Department of Space Physiology – later renamed Muscle and Bone Metabolism – at the Institute of Aerospace Medicine of the German Aerospace Center (DLR) in Cologne. With profound expertise and boundless curiosity in a calm and reflective manner, he guided the department's scientific vision and left a lasting imprint on the institute. Jörn Rittweger also held a professorship in Pediatrics and Adolescent Medicine at the University of Cologne and was instrumental in establishing the muscle laboratory at the University Hospital's rehabilitation center for children and adolescents. His passion for helping children regain mobility through innovative therapies that integrate medicine, robotics, and sport was deeply felt. "Getting kids back on their feet" was not just a slogan – it was a mission.

A central focus of his research was the function and plasticity of skeletal muscle and bone, and how these tissues are affected by conditions such as space microgravity, aging, disease, and exercise. Viewing these systems through a translational and interdisciplinary lens, he explored the active mechanical properties of skeletal muscle, such as force development and shortening velocity, in relation to the passive properties such as plasticity, elasticity, and damping capacity. He emphasized the crucial role of muscle mechanics for overall health – an aspect often underestimated in medicine – and highlighted the importance of understanding functional loss due to immobilization, aging, illness, or prolonged time spent in space. He paid particular attention to intramuscular connective tissue and its vital role in load-bearing and movement. Among his many scientific contributions, he developed a mesoscopic muscle model to gain insight into the interplay between muscle mechanics and blood flow. His leadership in international studies led to the creation of innovative diagnostic and training methods now used in space medicine, rehabilitation, and sports science. He founded and actively led KNIMS (Competence Network on Immobilisation-Related Muscle Disorders), a platform that brought

together clinical practitioners and researchers to collaboratively advance the diagnosis and therapy of disuse-induced muscle loss – a growing concern in modern medicine.

Jörn Rittweger was also a pioneer in applying vibration and neuromuscular training techniques to counteract muscle and bone wasting due to disuse – a challenge particularly relevant in long-duration spaceflight. He was an internationally respected expert, frequently consulted by NASA and ESA. As Principal Investigator, he led experiments on the International Space Station (ISS) and initiated several more – an outstanding testament to his scientific vision and leadership. In addition, a number of bedrest and long-term immobilization experiments were carried out. Hundreds of muscle biopsies from astronauts and volunteers were collected and analyzed. These efforts contributed significantly to our understanding of human physiology and helped to shape targeted countermeasures. Jörn Rittweger authored over 300 peer-reviewed publications. But more than numbers, he left behind inspiration: in projects launched, ideas sparked, careers nurtured, and friendships forged. He will be remembered as a brilliant thinker, a dedicated mentor and someone who stood for scientific correctness.

Beyond his scientific achievements, Jörn Rittweger was known for his warmth, humility, and deep care for others. He loved people, and his genuine interest in those around him was unmistakable. His word was his bond. He was particularly committed to supporting young scientists, providing them with excellent opportunities to present and discuss preliminary data with the scientific community, for example at the annual Human Physiology Workshop he founded. Through other meetings such as the KNIMS network meeting, he tirelessly promoted interdisciplinary dialogue and supported the next generation of scientists. During the Track-and-Field Masters Athletic Cohort (TaFMAC) study he initiated, he connected effortlessly with aging athletes speaking to them in Italian, Spanish, French, English, Dutch or German. Many of us observed him spend hours explaining test results and encouraging them to get better, faster, and stronger. In several cases, his astute clinical insight during routine ECG analyses uncovered serious heart irregularities and likely saved lives. Even as he neared retirement, his passion for helping others remained unwavering. He contemplated on founding a center for exercise and wellness, a place to assist people of all ages and abilities in becoming healthy, functional, and fit. He also had a rare gift for building community. He celebrated colleagues' pregnancies and births with genuine joy and pride, often remarking – half joking but fully delighted – that his department might be the most child-rich department in the Institute.

We extend our deepest condolences to his wife, his children, family, friends, and all those who had the privilege to know and work with him. Professor Dr. Jörn Rittweger's legacy will endure in space and here on Earth.