

## Post-meeting report of the 2022 On-site Padua Days on Muscle and Mobility Medicine, March 30 - April 3, 2022, Padua, Italy

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### Abstract

Despite COVID-19 outbreak, the program of the 2022 Padua Days of Muscle and Mobility Medicine (PDM3) was confirmed On-site in February from March 30 to April 2, 2022 to be held at the University of Padua *Aula Magna* and at Conference Hall of the Hotel Petrarca of Thermae of Euganean Hills (Padua), Italy. Over 130 abstracts, including the last-minute submissions listed below, convinced organizers to extend the program to five days. The sponsorship of the University of Florida and the willingness of attendees to meet friends after two years of virtual conferences were the keys of success, despite concerns for current events in East Europe. Only fourteen Virtual presentations were in the final program, eight due to last-minute Coronavirus infections and six for East Europe problems. The first two days of the program included scientists and clinicians of the University of Florida, USA and their invitees from Canada, France, Italy, Sweden, Swiss, UK and USA. Researchers and clinicians from Austria, Belgium, France, Germany, Iceland, Ireland, Italy, Russia, Slovakia, Slovenia, UK and USA filled the program of last three days more oriented to aging and rehabilitation. The large majority of abstracts was e-published before the meeting; here are last-minute abstracts and the final program. The program of the 2023 On-site PDM3 was informally designed during the Meeting, but will be circulated during 2022 summer. Fix the dates in your agenda from Thursday March 28 to Friday March 31. For now, please, submit Communications to the European Journal of Translational Myology, PAGEpress, Pavia, Italy and Original Articles or Reviews to the Journal *Diagnostics*, MDPI, Basel, Swiss. Both journals will host Special PDM3 Sections and will apply 50% discount on editorial processing fees to the first 15 accepted typescripts.

**Key Words:** Translational Myology and Mobility Medicine; Padua Days of Muscle & Mobility Medicine (PDM3 On-site); last minute program and abstracts.

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Meetings on muscle biology, physiology, medicine and rehabilitation, called Padua Muscle Days (PMDs), started

30 years ago, as a series of two days Seminars, specifically to provide advice on Basic and Applied Myology (BAM). From 2010 when the Journal BAM

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was renamed European Journal of Translational Myology (EJTM) the Meeting was renamed Padua Days of Muscle and Mobility Medicine (PDM3). Always the interest was on implementing basic research and clinical trials to helping prevent, manage and rehabilitate girls, boys, young adults and elderly persons suffering with mobility disorders. In the autumn of 2021, the 2022 Padua Days of Muscle and Mobility Medicine (PDM3) were planned to be held from March 30 to April 2, 2022. Despite the COVID-19 outbreak continued to impose restrictions, the meeting was confirmed as an on-site event in late February, 2022. Meantime, over 130 abstracts, including the last-minute submissions here included, were submitted and convinced organizers to extend the program to five days to provide time slots to young PhD trainees and post-docs. The willingness of attendees to meet friends after two years of virtual conferences is the key of success. Despite concerns of recent events in East Europe only 13 Virtual presentations are listed in the final program (see below), 6 of them due to last-minute Coronavirus infections of the Speakers. The day one and two of the final program included scientists and clinicians of the University of Florida, USA and their invitees from Canada, France, Italy, Sweden, Swiss, U.K, and USA. Researchers and clinicians from Austria, Belgium, France, Germany, Iceland, Ireland, Italy, Russia, Slovakia, Slovenia, UK and USA filled the program of the last three days more oriented to Aging and Rehabilitation. The abstracts collected up to February 28, 2022 were e-published in the European Journal of Translational Myology (EJTM), 32 (1) 2022 (Link to: <https://www.pagepressjournals.org/index.php/bam/article/view/10440>), together with the program of the 2022 On-site PDM3 organized in the *Aula Magna* of the University of Padua (March 30) and for March 31 - April 3 at the Conference Hall of the Hotel Petrarca, Thermae of Euganean Hills (Padua), Italy. Indeed, 130 abstracts, including the last-minute submissions listed below, convinced organizers to extend the program to five days. The Program ended on late morning of Sunday April 3, 2022 with invitation to join the 2023 PDM3, at the Thermae of Euganean Hills (Padua), Italy. During fruitful informal after-dinner discussions among Potential Organizers the Program of the 2023 On-site PDM3 was almost designed, but it will be circulated in summer 2022. Anyhow, you are invited to fix the dates in your agenda from Thursday March 28 to Friday March 31, 2023. In this report, beside the 2022 On-site PDM3 program and the last-minute abstracts, the Emails of all attendees are listed, together with some of the messages that were sent to thank the local organizers. For now, please, submit Communications to the European Journal of Translational Myology, PAGEpress, Pavia, Italy (Link to: <https://pagepressjournals.org/index.php/bam/about/submissions>) and Original Articles or Reviews to the Journal *Diagnostics*, MDPI, Basel, Swiss (Link to: <https://www.mdpi.com/journal/diagnostics/instructions>). Both journals will host PDM3 Special Sections and will



provide 50% discount on the editorial processing fees to the first 15 accepted typescripts.

We invite all EJTM authors and readers to join us to the 2023 On-site PDM3 hoping that it will be even more successful than the events of recent years.<sup>1-5</sup>

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### After meeting thanks from 2022 PDM3 Friends

Dear Ugo,  
Safely back from the impressive Padua Days we once more like to thank you for giving us the opportunity to take part in the event. We felt the combination of such high internationality on a high scientific level with the family atmosphere is really unique. Congratulations on this successful event and again many thanks for integrating us into the community. We hope you will find some rest for recovery after the intensive days.  
With warmest regards.

Frank Bittmann, Laura Schaefer

Department of Sports and Health Sciences, Section Regulative and Preventive Physiology, University of Potsdam, Potsdam, Germany.

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Laura Schaefer: [lschaefer@uni-potsdam.de](mailto:lschaefer@uni-potsdam.de)

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Dear Ugo,  
GRAZIE MILLE for your great event and your kind cooperation! Hope to continue participating in your Annual PDM3! As I am in the World Dental Federation, Riccardo and I can invite dentists from all over the world for your Dental Session who work in the functional field

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(muscles of head and neck, and now full body regarding the medical position of dentists).

Have a nice evening!

All the best wishes,

Elena P. Ivanova

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Dear Ugo!

I want to thank you by all my heart for your embracing welcome of me and my wife. As you know, me and Paolo are very close friends from the first day of our cooperation in Iceland and I have all the time had such a great pleasure working with him and all the clever Italian students. This congress was in general very interesting especially the results from our studies. We have still a lot more to do and therefore we will meet again „next time“! Our stay at the Hotel Terme delle Nazioni was very nice and the distance was of no problem. I hope you are well and recovering after all the heavy work that needs for such a meeting to be successful as this one was!

Sincerely yours,

Halldór Jónsson jr, Chairman Orthopaedic Institution, Landspítali University Hospital, Reykjavik, Iceland

Email: [halldor@landspitali.is](mailto:halldor@landspitali.is)

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Dear Ugo!

Thank you for the excellent organization of the congress bringing together basic science, clinical work and international cooperation. Very impressive was your demonstration that immobilization and inactivity lead to early short-term degeneration of the neuromuscular junction. But you pointed out the importance of the early onset of the translational therapy to avoid/counteract denervation and muscle wasting.

Helmut Kern,

Ludwig Boltzmann Institute for Rehabilitation Research and Institute for Physical Medicine and Rehabilitation, Physiko und Rheumatherapie, St. Pölten,, Austria.

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What an amazing conference, the science presented was and is at its best! Thanks to Professor Carraro for his leadership in making this meeting happen. Thanks to the local organizing staff and Christa Stout from the Myology Institute to make the program run pretty much

flawless. Thanks for tolerating my daughter Arianne Leeuwenburgh playing with Benjamin Mackey in the dining area. They certainly had a blast. Hope to see many of the speakers and attendees next year between Thursday March 28 to Friday March 31, 2023.

Warmest Regards.

Christiaan Leeuwenburgh

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Dear Sandra and dear Ugo,

After being at the Abano Rehabilitation Meeting as one of my first conferences in 1985 and participating in most of the Padua muscle days since, I missed them a lot during the forced break of the past 2 years. Thank you very much for reactivating them On-site with the first window of opportunity and congratulation for the great success. It has been a special highlight, I am sure for all of us, to meet again in this multidisciplinary format for intellectual exchange and optimistic grows of new ideas and joint intentions, in the unique substrate of cultural heritage and hospitality. The Padua-spirit was back present with the first minute, and to be enjoyed throughout the five creative days. Many thanks again and looking forward to the next edition in Spring 2023,

Winfried Mayr

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The On-site Padua Muscle Days 2022 meeting, organized by the University of Padua in collaboration with the University of Florida, was an excellent event from multiple points of view. This meeting, thanks to its vast program, attracted some of the most renowned scientists in the fields of muscle biology, physiology, pathophysiology, therapy and rehabilitation offering incredible research ideas and creating the opportunity to develop prime collaborations. Organizing the conference in a hotel rather than in a convention center allowed the organizers to group all attendees in the same venue for the entire duration of the meeting offering further networking opportunities. Furthermore, opening the conference at the Aula Magna of the University of Padua was very scenic and for the speakers was exciting to have the opportunity to present their work where Galileo, almost 400 years ago, was presenting his results and

theories inspiring scholars such as Copernicus. I really thank the organizer for the incredible opportunity.

Mattia Scalabrin

Research Fellow, Institute of Biological Sciences, University of Leeds, Garstang Building, office 5.59, 6 Claredo Way, Leeds (LS2 9NH), United Kingdom.

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Dear Ugo,

Just wanted to say thank you! For the wonderful people you have gathered together, for the great scientific discussions, the food, the welcoming venue. It was a great opportunity for me (thanks to Gillian too!) to talk about our latest work and exchange with such an extraordinary international community of muscle experts. Being back to this conference where I started knowing the muscle field, reminded me of the passion that was shared and pushed me to continue investigating the muscle and its fascinating regulatory mechanisms. This event made me appreciate even more the value of live meetings and I am sure it will be the seed of many great collaborations.

Thank you again for all your infatigable energy and efforts to organize the Padua Muscle Days.

With the warmest regards,

Piera Smeriglio

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### List of acronyms

BAM – Basic and Applied Myology

EJTM - European Journal of Translational Myology

MDPI - Molecular Diversity Preservation International

PDM<sub>3</sub> - Padua Days on Muscle & Mobility Medicine

PMDs - Padua Muscle Days

### Acknowledgments

We thank Attendees, Speakers, Chairs and Organizers, who succeed in dealing with new problems even after those of the COVID pandemics became a minor treat.

All Attendees of the 2022 On-site PDM<sub>3</sub> thanks the Gastaldello Family, owners, and the staffs of the Hotel Petrarca, Montergrotto, Thermae of Euganean Hills, Padua, Italy for the family atmosphere and the professional managements of all Hotel Services.

### Funding

The 2022 PMD<sub>3</sub> are supported by the University of Florida Myology Institute and Wellstone Center, Gainesville, FL, USA and by Physiko- & Rheuma-

therapie, Institute for Physical Medicine and Rehabilitation, St. Pölten, Austria, Centre of Active Ageing—Competence Centre for Health, Prevention and Active Ageing, St. Pölten, Austria and Ludwig Boltzmann Institute for Rehabilitation Research, St. Pölten, Austria.

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### Conflict of Interest

None.

### Ethical Publication Statement

We confirm that we have read the Journal's position on issues involved in ethical publication and affirm that this report is consistent with those guidelines.

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**2022 PDM3 On-site, March 30 – April 3, Euganean Hills & Padua, Italy**

## **2022 Padua Days on Muscle & Mobility Medicine** **Hosts the University of Florida Myology Institute and Wellstone Center** **University of Padua & Thermae of Euganean Hills (Padua, Italy)**

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## PROGRAM

**WEDNESDAY March 30, 2022**

**Aula Magna Galileo Galilei, Padua University (Padua), Italy**

**9:00 AM Openings**

*Daniela Mapelli*, Rettrice Magnifica of the Padua University

*H. Lee Sweeney*, Head of the University of Florida Myology Institute

*Marco Narici*, Head of the Padua University IRC - Myology

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**09:20 AM Lecture:** *The crucial role of force transmission in muscle function:  
Focus on cytoskeleton and myotendinous junction*

**A: Stefano Schiaffino**, University of Padua, Italy: Cytoskeletal specialization and mechanoprotection in fast and slow skeletal muscles. Insights from single-fiber proteomics and comparison with cardiac muscle.

**B: Abigail Mackey**, University of Copenhagen, Denmark: The myotendinous junction: the weakest link of the muscle-skeleton force transmission chain?

**10:00 AM - SESSION I: Molecular mechanisms regulating muscle mass** - Marco Sandri, Andy Judge, Chairs

**10:00-10:20 AM Daniel Taillandier:** Mechanisms of muscle atrophy: from UPS implication in rodent models to human biomarkers (Virtual presentation)

**10:20-10:40 AM Pascal Maire:** A fast Myh super enhancer dictates adult muscle fiber phenotype through competitive interactions with the fast Myh genes

**10:40-11:00 AM Marco Sandri:** Novel players in muscle mass regulation

**11:00-11:10 AM Daria Neyroud et al.:** Loss of MuRF1 prevents skeletal muscle wasting and weakness, and slows the rate of tumor growth, in mice bearing pancreatic tumors

11:10 Open Bar

**11:20-11:40 AM Marcus Ruegg:** Insights into the mechanisms of muscle wasting at high age

**11:40-12:00 AM Andy Judge:** Molecular mechanisms of cancer-induced muscle wasting

**12:00-12:20 AM Marco Narici:** Neuromuscular basis of disuse muscle atrophy and weakness

**12:20-12:30 AM Bert Blauw:** Activation of Akt-mTORC1 signaling reverts cancer-dependent muscle wasting

**2:00 PM - SESSION II: Muscle metabolism, mitochondria** - Andy Judge, Christiaan Leeuwenburgh, Chairs

**2:00-2:20 PM Antonio Zorzano:** Mitochondrial fusion proteins and their role in metabolism and in inflammation

**2:20-2:40 PM Jorge Ruas:** Dynamic regulation of muscle mass by dark matter DNA

**2:40-3:00 PM Antonio Musarò:** The role of IL-6 signaling in muscle growth, atrophy, and wasting

**3:00-3:20 PM Ashley J. Smuder et al.:** Diaphragm ABCB6 overexpression preserves respiratory function following doxorubicin chemotherapy treatment

**3:20-3:40 PM Mattia Scalabrin et al.:** Skeletal muscle homeostasis in an experimental model of hind limb ischemia

**3:40-4:00 PM Feliciano Protasi:** Exercise-dependant remodelling of the sarco-tubular system: the role of temperature and pH.

4:00 PM Open Bar

**2:00 PM - SESSION II: Muscle metabolism, mitochondria, continue** - Christiaan Leeuwenburgh, Andy Judge, Chairs

**4:15-4:35 PM Elisabeth Barton:** Form vs. function: strategies to deliver IGF-I for muscle therapeutic

**4:35-4:55 PM Leonardo Ferreira:** Metabolic link between mitochondrial and contractile abnormalities

**4:55-5:15 PM Christiaan Leeuwenburgh:** Higher abundance of deletions and strand break damage within specific mitochondrial ETC genes are associated with functional performance in older adults

**5:15-5:30 PM Massimo Ganassi:** Molecular Antagonism between DUX4 and DUX4c Highlights a Potential Pathomechanism in Facioscapulohumeral muscular dystrophy

**5:30-5:45 PM Rosanna Piccirillo et al.:** The p97/Nplc4 ATPase complex plays a role in muscle atrophy during cancer and amyotrophic lateral sclerosis

**5:45 - 6:00 PM Roberta Sartori et al.:** Deciphering the cachexia-inducing signature

6:00 PM Adjourn

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## 2022 PDM3 On-site, March 30 - April 3, PROGRAM

**THURSDAY March 31, 2022**

**Hotel Petrarca, Montegrotto, Euganean Hills (Padua), Italy**

**9:0 AM - Session III: Muscle diseases**

**H. Lee Sweeney, Gillian Butler-Browne, Chairs**

**9:00-9:20 AM Francesco Muntoni:** The challenges of AAV gene therapy in DMD (Virtual presentation)

**9:20-9:40 AM Kevin Flannigan:** Alternative gene therapy approaches for DMD

**9:40-10:00 AM H. Lee Sweeney:** Limitations to micro-dystrophin gene therapy for DMD

**10:00-10:15 AM: Young il Lee et al.:** Micro-dystrophin-mediated utrophin displacement from cardiomyocyte sarcolemma in the D2.mdx mouse model of DMD

**10:15-10:30 AM David W. Hammers:** NOX4 inhibition reduces skeletal muscle fibrosis in a severe murine model of Duchenne muscular dystrophy

**10:30-10:45 AM David Israeli et al.:** The co-administration of simvastatin does not boost the benefit of gene therapy in the mdx mouse model for Duchenne muscular dystrophy

**10:45 Open Bar**

**10:55-11:10 AM Tanja Taivassalo et al.:** Therapeutic potential of combined cycling and isometric strength training in patients with DMD: preliminary findings

**11:10-11:25 AM Piera Smeriglio et al.:** Uncovering the epigenetic control of paracrine crosstalk between motor neurons and skeletal muscles in SMA

**11:25-11:40 AM Alexis Boulinguez et al.:** Targeting ER stress to resolve aggregates accumulation in oculopharyngeal muscular dystrophy.

Lunch

**2:00 PM - Session IV: Trainee Data Blitz Session**

**H. Lee Sweeney, Gillian Butler-Browne, Chairs**

**2:00-2:09 PM Cora C. Hart et al.:** D2.mdx mice undergo a transient period of left ventricular restriction prior to heart failure

**2:09-2:18 PM Alessandra Norris et al.:** Uncovering a novel mechanism for intramuscular fat formation

**2:18-2:27 PM Christopher A. Wolff et al.:** Muscle clocks change with age: A potential contributor to sarcopenia?

**2:27-2:36 PM Chandler Callaway et al.:** Cancer cell-derived IL-8 and CXCL1 mediate cachexia in mice bearing human pancreatic tumors

**2:36- 2:45 PM Vinicius M. Mariani et al.:** Succinate impairs skeletal muscle isometric and isotonic contractile function

**2.45 PM - Session IV: Trainee Data Blitz Continued,**

**Andy Judge, Marco Sandri, Chairs**

**2:45- 2:50 PM Miguel A. Gutierrez-Monreal et al.:** Skeletal muscle specific rescue of Bmal1 is sufficient to extend the lifespan of the Bmal1 KO mouse

**2:50-2:59 PM Chih-Hsuan Chou et al.:** The role of muscle IGF-I after a single bout of exercise on AMPK $\alpha$  in mouse skeletal muscle

**2:59 – 3:08 PM Giulia Trani et al.:** Peroxisomal-mitochondrial interaction impinging on muscle homeostasis

**3:08 – 3.17 PM Miriam Mistretta et al.:** Dysregulation of heme synthesis-export axis in skeletal muscle reshapes energetic metabolism and results in impaired motor performance

**3:17-3:26 PM Davide Steffan et al.:** Identification of a novel TFEB and exercise dependent gene

**3:26-3:37 PM Camilla Pezzini et al.:** Understanding BMP signaling in cancer cachexia

**3:37-3:46 PM Hui Jean Kok et al.:** IGF-I from satellite cells is critical for skeletal muscle growth and regeneration

3:50 Open bar

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### 4:50 PM - Session V: Other European Contributions to Muscle Diseases, Corrado Angelini, Marija Meznaric, Chairs

3:50 - 4:10 PM *Francesco Girardi*: Video killed the Imaging star

4:10 - 4:23 PM *Sonia Albini et al.*: A Dual-AAV gene therapy strategy for Duchenne Muscular Dystrophy

4:23 - 4:36 PM *Roberta Costa et al.*: Pathogenetic mechanism of Limb Girdle Muscular Dystrophy D2: functional characterization of Transportin 3 in cellular and animal models of disease

4:36 - 4:49 PM *Sara Missaglia et al.*: Neutral Lipid Storage Diseases: a patient clinical follow-up and presentation of two novel cases

4:49-5:02 PM *Eylem Emek Akyürek et al.*: Human Brody disease and novel therapeutic approaches of its animal model cattle pseudomyotonia

5:02-5:15 PM *Martina Scano et al.*: The strength and the broadness of CFTR correctors for the treatment of sarcoglycanopathies

5:15-5:28 PM *Mark Viggars et al.*: The timecourse of adaptive change in gene expression across 30d of daily programmed resistance exercise in rats

5:28-5:41 PM *Stephen Gargan et al.*: Proteomic profiling of the aged diaphragm from the mdx-4cv model of dystrophinopathy

5:41 -5:52 PM *Raphael S. Bonadio, Stefano Cagnin*: New molecular network identified in Amyotrophic Lateral Sclerosis reveals microRNAs involved in the neuromuscular junction development

5:52-6:05 PM *Marija Meznaric, Corrado Angelini*: Differential dysferlin expression in human fast and slow skeletal

6:05-6:18 PM *PM Valentina Pegoraro et al.*: Two brothers with X-linked Charcot Marie Tooth disease and different lifestyle

6:20 PM Adjourn

### FRIDAY April 1, 2022

#### Hotel Petrarca, Montegrotto, Euganean Hills (Padua), Italy

### 9:00 AM - SESSION VI: The curse of inactivity- Marco Narici, Roberto Bottinelli, Chairs

9:00 – 09:20 AM *Gianni Biolo*: Energy balance and skeletal muscle in microgravity

9:20 – 09:40 AM *Bruno Grassi*: Peripheral impairments of oxidative metabolism during exercise following inactivity

09:40 – 10:00 AM *Roberto Bottinelli*: Metabolic dysfunction and exercise preconditioning in disuse

10:00 – 10:20 AM *Giuseppe De Vito*: Alterations in the behavior of individual motor units with inactivity

### 10:20 AM - SESSION VII: Subclinical denervation in aging skeletal muscle - Russell T. Hepple, Raffaele De Caro, Chairs

10:20-10:40 AM *Gregorio Valdez*: A tripartite view of NMJ aging: parsing out the contribution of motor neurons, muscle fibers and synaptic Schwann cells

10:40- 11:00 AM *Richard Robitaille*: Changes of neuromuscular innervation during aging in healthy males

11:10-11:20 AM *Russell Hepple*: Mechanisms of exacerbated denervation in aging muscle

11:20-11:40 AM *Dario Coletti, Ugo Carraro*: Mosole's evidence of transforming muscle fibers coexpressing fast and slow myosin heavy chains in slow type muscle-groupings of life-long active seniors

### 11:40 AM - SESSION VIII: Masters Athletes as a model for Healthy Aging - Russell T. Hepple, Ugo Carraro, Chairs

11:40 – 12:00 AM *Matthew Piasecki*: Motor unit adaptations in Masters Athletes

12:00 – 12:20 AM *Russell Hepple*: Insights to mechanisms of healthy muscle aging in octogenarian track and field athletes

12:20 – 12:40 AM *Giovanna Albertin et al.*: The Venice Marathon 2007-2019 as a model for analyses of Master Athletes

12:40 – 12.50 AM *Ugo Carraro et al.*: Master Athletes' Studies in Padua honor the legacy of Paolo Gava

13:00 PM Break for Lunch

### 2:00 PM - Session IX: Basic and clinical muscle imaging - Simona Boncompagni, Shantanu Sinha, Chairs

2:00 – 2:20 PM *Usha Sinha*: Fiber Strains and Strain Tensor Mapping of Medial Gastrocnemius at Sub-Maximal Isometric Contraction at Different Ankle Angles

2:20 – 2:40 PM *Shantanu Sinha*: Calf Muscle 3D Strain Imaging and Initial Results on Correlation with Histology

2:40 – 3:00 PM *Simona Boncompagni*: New intracellular junctions: The calcium entry units (CEUs) (Virtual presentation)

3:30 - 3:20 PM *Marcus Kruger*: Looking at the proteome landscape in single muscle fibers

3:20 – 3:40 PM *Jonathan C. Jarvis*: PCM1 labelling reveals myonuclear and nuclear dynamics in skeletal muscle across species

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3:40–4:00 PM Amber L. Pond: *The HERG K<sup>+</sup> Channel Increases Intracellular Calcium Concentration in Myotubes by Modulation of IP<sub>3</sub> Signaling (Virtual presentation)*

4:00 – 4:20 PM Lorenzo Marcucci et al.: *Cytosolic calcium as intracellular signal: local and average concentrations and their variations in relation to release from SR. (Virtual presentation)*

4:20 PM Open Bar

### 4.30 PM - SESSION X: Artificial Intelligence for myopathology diagnosis & management

Paolo Gargiulo, Michael J. Fischer, Chairs

4:30 – 4:55 PM Paolo Gargiulo: *New paradigms for 3D modelling and surgical planning*

4:55 – 5:20 PM Vincent Grote, Michael J. Fischer: *Prospects for translational research on outcome measures in musculoskeletal rehabilitation: the search for critical success factors*

5:20 – 5:35 PM Carlo Ricciardi, Marianna Amboni: *Gait analysis for the detection of non-motor mental symptom in Parkinson's disease*

5:35 – 5:50 PM Marco Recenti et al.: *A Novel Knee Bone and Cartilage Osteoarthritis Index Extracted from a Patient-Specific Image Feature Analysis*

5:50 – 6:05 PM Andrea Colacino et al.: *Postural Control Assessment through Visual Induced Motion Sickness and a Moving Force Platform*

6:05 – 6:20 PM Carlo Mengucci, Maria Laura Gatto et al.: *Multi-scale Bone Remodeling Prediction in Patients Undergoing Total Hip Arthroplasty*

6:20 – 6:35 PM Magnús Kjartan Gíslason et al.: *Neuromuscular control in the neck muscles in patients suffering from whiplash associated disorders and traumatic brain injury*

6:35 – 6:50 PM Tito Brambullo, Vincenzo Vindigni: *A new CT analysis of abdominal wall after DIEP flap harvesting*

### SATURDAY April 2, 2022

Hotel Petrarca, Montegrotto, Euganean Hills (Padua), Italy

### 9.00 AM - SESSION XI: Active aging and early rehabilitation management - Helmut Kern, Feliciano Protasi, Chairs

9:00 – 9:20 AM Helmut Kern: *Centre of Active Ageing (Austria): current status*

9:20 – 9:40 AM Stefan Loeffler: *AMB-REMOB - study protocol of an early outpatient rehabilitation program*

9:40–10:00 AM Ján Cvečka *Exercise intervention in elderly: a novel system within the Centre of Active Aging in Bratislava*

10:00 - 10:20 AM Nejc Sarabon: *The potential of eccentric training in older adults*

10:20 - 10:40 AM Feliciano Protasi: *Mimicking disuse and rehabilitation in a mouse model*

10:40 - 11:00 AM Sandra Zampieri: *Muscle atrophy and denervation in a mouse model of disuse*

### 11:00 AM- SESSION XII: Climate changes and heat strokes: the next emergency? The role of muscle

Feliciano Protasi, Chair

11:00 - 11:00 AM Piero di Carlo: *Heatwaves in a warming climate: overview and impacts (Virtual presentation)*

11:20 - 11:40 AM Feliciano Protasi: *Environmental Heat Stroke: the role of skeletal muscle*

11:40 - 12:00 AM Matteo Serano et al.: *High-fat diet increases the risk of environmental heatstroke in mice*

12:00 - 12:20 AM Barbara Girolami et al.: *Exertional Heat Stroke: the possible role of external Ca<sup>2+</sup>*

12:30 Break for Lunch

### 2:00 PM - SESSION XIII: Basics of neuromechanics & motor control

Laura Schaefer, Alessandro Del Vecchio, Chairs

2:00 - 2:20 PM Alessandro Del Vecchio: *Integration of Motion, Forces, and the Central Nervous System*

2:20 - 2:40 PM Stéphane Baudry: *On the role of proprioception in the sense of force (Virtual presentation)*

2:40 – 3:00 PM Frank Bittmann, Laura Schaefer: *Adaptive Force in Patients with Long-COVID*

3:00 – 3:15 PM Leonardo Cesanelli et al: *The role of age on neuromuscular performance decay induced by a maximal intensity sprint session in a group of competitive athletes*

3:15 – 3:30 PM Caterina Fede et al.: *Connections between hyaluronan properties and fascial health*

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### 3:30 p.m. - SESSION XIV: Muscle stimulation in rehabilitation - Winfried Mayr, Thordur Helgason, Chairs

3:30 - 3:50 PM Winfried Mayr: *How far can electrical stimuli recruit specific neurons: mechanisms, realistic options and limits*

3:50 - 4:10 PM Ines Bersch-Porada: *The effect of direct muscle stimulation on denervated gluteal muscles and tissue composition in people with chronic spinal cord injury*

4:10 - 4:30 PM Thordur Helgason, et al.: *Spinal cord stimulation review and recent progress*

4:30 - 4:50 PM Sara Kristinsdóttir, et al.: *Development of an experimental setup for exact measurement of time in event chain of patellar reflex test, transcutaneous spinal cord stimulation (tSCS) and H-reflex analysis in healthy, spinal cord injured and brain insulted individuals*

4:50 - 5:10 PM Serafina Pacilio et al.: *Skeletal muscle tissue restoration using functionalized biomaterials*

5:10 - 5:30 PM Janine Tomasch et al.: *Establishment of models for mechanical and oxidative stress based on tissue-engineered skeletal muscle*

5:30 Open Bar

### 5:30 PM - SESSION XV: Myo-rehabilitation in dentistry and beyond - Elena Ivanova, Riccardo Rosati, Chairs

5:30 - 5:50 PM Elena P. Ivanova, Riccardo Rosati: *Dental rehabilitation from a muscular point of view*

5:50 - 6:10 PM Claudia Dellavia et al.: *Head and neck functional analysis: the Functional Anatomy Research Center experience*

6:10 - 6:30 PM Giacomo Begnoni: *Masticatory muscles guided orthodontic treatments (Virtual presentation)*

6:30 - 6:50 PM Andrey Rachin: *Topical aspects of neuro-rehabilitation*

6:50 - 7:10 PM Ekaterina V Makarova et al.: *Back muscles training and balance therapy in rehabilitation of patients with osteoporotic vertebral fractures (Virtual presentation)*

### SUNDAY April 3, 2022

Hotel Petrarca, Montegrotto, Euganean Hills, (Padua), Italy

### 9:00 AM - SESSION XVI: Translational rehabilitation - Carla Stecco, Carmelo Chisari, Chairs

9:00 - 9:20 AM Carla Stecco et al.: *Fascia lata alterations in Hip Osteoarthritis*

9:20 - 9:40 AM Daniele Coraci et al.: *Rehabilitation of peripheral nerve disorders by physical agents. A multiperspective literature evaluation*

9:40 - 10:00 AM Lucrezia Tognolo: *Extracorporeal Shock Wave Therapy (ESWT) in muscular pathologies*

10:00 - 10:20 AM Maria Chiara Maccarone et al.: *Can home-based rehabilitation be effective to counteract skeletal muscle atrophy and to ameliorate physical functioning of elderly patients?*

10:20 - 10:35 PM Kirill V. Terentev et al.: *Early rehabilitation of ischaemic stroke with medicinal acupuncture: A clinical study (Virtual presentation)*

10:35 - 10:50 AM Irina A. Grischechkina et al.: *Can aqua exercises in fresh water improve the gait stereotype function in patients with a neurological disease? (Virtual presentation)*

### 10:50 AM - SESSION XVI: Translational rehabilitation, continue - Anatoly D. Fesyun, Giuseppe Messina, Chairs

10:50 - 11:10 AM Anatoly D. Fesyun, Maxim Yu. Yakovlev: *Sanatorium and spa resort treatment of patients who have recovered from COVID-19 (Virtual presentation)*

11:10 - 11:30 AM Valentina Azzollini et al.: *Focal Muscle Vibration and Action Observation: a novel approach for muscle strengthening*

11:30 - 11:50 AM Carmelo Chisari et al.: *A combined treatment protocol for postural instability in Pisa Syndrome*

11:50 - 12:10 AM Giuseppe Messina et al.: *Study of correlations between neuromuscular occlusion and posturographic parameters in the elderly for falls prevention: a pilot study*

12:10 - 12:35 AM Patrizia Proia et al.: *Improvement of the expression of upper limb muscle strength and balance in a group of patients with multiple sclerosis, through a proprioceptive rehabilitation protocol combined with the application of photon emission devices*

12:35 - 12:45 PM Igor Reverchuk et al.: *Mental health disorders of relatives of oncohematological patients (Virtual presentation)*

12:45 - 12:55 PM Anna Zavertyaeva et al.: *The state of helplessness in preschool children with mental retardation and its correction (Virtual presentation)*

01:00 PM *See you to the 2023 Padua Days of Muscle and Mobility Medicine (2023 PDM3)* Ugo Carraro

## 2022 PDM3 On-site, March 30 - April 3, PROGRAM

# FOR ALL ABSTRACTS LINK TO:

<https://www.pagepressjournals.org/index.php/bam/article/view/10440>

## LAST MINUTE ABSTRACTS

### 2022PDM3 On-site April 3 Abstract 121

#### Study of correlations between neuromuscular occlusion and posturegraphic parameters in the elderly for falls prevention: a pilot study

Giuseppe Messina 1,2,3, Alessandra Amato 1,2,4, Federica Rizzo 3, Giuseppe Alamia 1,2,4, Angelo Iovane 1,2, Ligia-Juliana Dominguez 5,6, Mario Barbagallo 5, Marianna Bellafiore 1,2

1 Department of Psychology, Educational Science and Human Movement, University of Palermo; 2 Sport and Exercise Sciences Research Unit, University of Palermo; 3 Posturalab Research Institute; 4 PhD Program in Health Promotion and Cognitive Sciences, University of Palermo; 5 Geriatric Unit, Department of Internal Medicine and Geriatrics, University of Palermo; 6 School of Medicine, Kore University of Enna, Italy.

Giuseppe Messina, Email: [giuseppe.messina17@unipa.it](mailto:giuseppe.messina17@unipa.it)

Previous researches have investigated the influence of occlusion on body posture for falls prevention reporting conflicting results. However, a few studies have explored the impact of the occlusion considering the neuromuscular component. Hence, the aim of this study was to investigate any correlations between EMG parameters of masseter and temporal muscles and posturegraphic parameters in elderly. We enrolled a number of 68 elderly people (16 female and 52 male) without fall history from the geriatric ambulatory clinic of the Department of Internal Medicine and Geriatrics of the University Hospital of Palermo (Italy). All participants were administered a surface EMG assessment of masseter and temporal muscles during a maximum natural intercuspation through a wireless device capable of measure the balancing of dental occlusion (Teethan, Garbagnate Milanese, Milano, Italia) and a baropodometric evaluation to assess plantar pressure in orthostatic position using a baropodometric platform (FreeStep, Sensor Medica, Guidonia Montecelio, Roma, Italia). Our results showed a positive correlation between the percentage of muscle activation of the right temporal muscle and the percentage of pressure on the right forefoot in male participants ( $r=0.57$ ,  $p<0.05$ ) and a

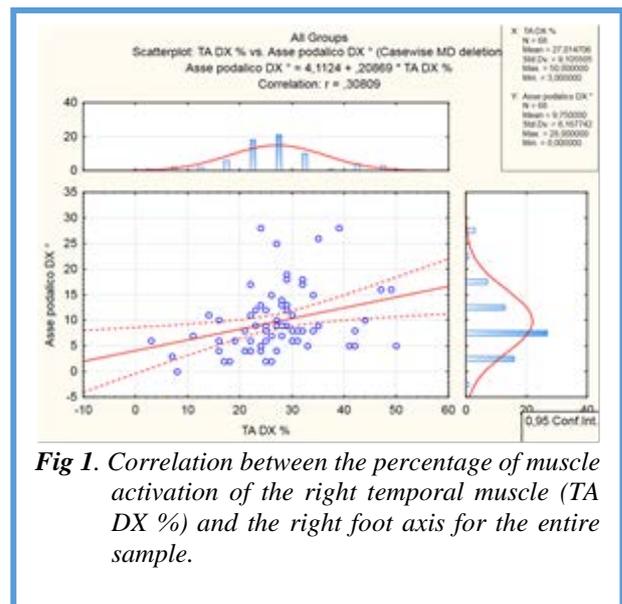


Fig 1. Correlation between the percentage of muscle activation of the right temporal muscle (TA DX %) and the right foot axis for the entire sample.

positive correlation between the percentage of muscle activation of the right temporal muscle and the percentage of pressure on the right rearfoot in female participants ( $r=0.29$ ,  $p<0.05$ ). Moreover, for the entire sample, we found a positive correlation between the percentage of muscle activation of the right temporal muscle and the right foot axis ( $r=0.31$ ,  $p<0.05$ ). Although further studies are needed, our findings suggest a relationship between plantar pressure and neuromuscular occlusion in elderly without fall history and these may have an implication on falls.

Key Words: Neuromuscular occlusion; temporal muscle; masseter muscle; body posture; plantar pressure.

#### References

- Baldini A, Nota A, Tripodi D, Longoni S, Cozza P. Evaluation of the correlation between dental occlusion and posture using a force platform. Clinics (Sao Paulo). 2013;68(1):45-9. doi: 10.6061/clinics/2013(01)oa07.
- Perinetti G, Marsi L, Castaldo A, Contardo L. Is postural platform suited to study correlations between the masticatory system and body posture? A study of repeatability and a meta-analysis of

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reported variations. *Prog Orthod.* 2012;13(3):273-80. doi: 10.1016/j.pio.2011.12.003.

- Bergamini M, Pierleoni F, Gizdulich A, Bergamini C. Dental occlusion and body posture: a surface EMG study. *Cranio.* 2008 Jan;26(1):25-32. doi: 10.1179/crn.2008.041.

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### 2022PDM3 On-site March 30 Abstract 122

#### The p97/Nploc4 ATPase complex plays a role in muscle atrophy during cancer and amyotrophic lateral sclerosis

Andrea David Re Cecconi 1, Mara Barone 1, Simona Gaspari 1, Massimo Tortarolo 1, Caterina Bendotti 1, Luca Porcu 2, Giulia Terribile 1, Rosanna Piccirillo 1

1 Department of Neurosciences, Mario Negri Research Institute for Pharmacological Research IRCCS, Milan, Italy; 2 Department of Oncology, Mario Negri Research Institute for Pharmacological Research IRCCS, Milan, Italy

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The p97 complex participates in the degradation of muscle proteins during atrophy upon fasting or denervation interacting with different adaptors.<sup>1</sup> We investigated whether and how it might also be involved in muscle wasting in cancer, where loss of appetite occurs, or amyotrophic lateral sclerosis (ALS), where motoneuron death causes muscle denervation and fatal paralysis.<sup>2</sup> The mRNA levels of p97 were induced in tibialis anterior (TA) of three distinct cancer cachectic mouse models but not in the non-cachectic 4T1 tumor. Similarly, p97 was high both in mRNA and protein in muscles from SOD1G93A mice. Electroporation of a shRNA for murine p97 into muscle reduced the fiber atrophy caused by colon adenocarcinoma C26 and ALS. When we interrogated a microarray we had previously generated for the expression of p97 adaptors, we found few of them induced in cachectic TA from C26-mice. By qPCR, we validated their inductions in TA of cachectic and ALS models and selected Nploc4 as the one most induced. Electroporation of a Crispr/Cas9 vector against Nploc4 into muscle reduced the fiber atrophy caused by C26 and ALS. Since Disulfiram (DSF) uncouples p97 from Nploc4,<sup>3</sup> we treated atrophying myotubes with DSF, and found accumulated polyubiquitinated proteins and reduced degradation of long-lived proteins. DSF halves Nploc4 in the soluble muscle fraction and given to C26-mice limited the body and muscle weight loss, with no effect on tumor. The p97/Nploc4 complex plays a crucial

role in muscle atrophy during these disorders and disrupting this complex might serve as a novel drug strategy.

Key Words: Muscle wasting; cancer cachexia; Amyotrophic Lateral Sclerosis; Nploc4; protein degradation.

#### References

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- Oskarsson B, Gendron TF, Staff NP. Amyotrophic Lateral Sclerosis: An Update for 2018. *Mayo Clin Proc* 2018;93:1617–1628.

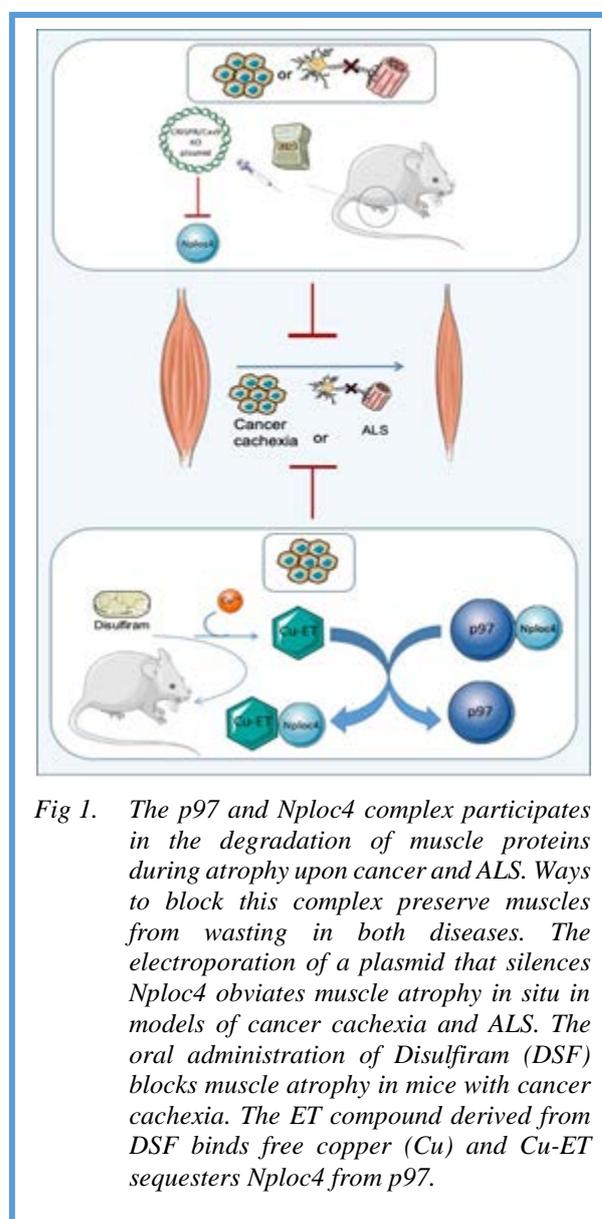


Fig 1. The p97 and Nploc4 complex participates in the degradation of muscle proteins during atrophy upon cancer and ALS. Ways to block this complex preserve muscles from wasting in both diseases. The electroporation of a plasmid that silences Nploc4 obviates muscle atrophy in situ in models of cancer cachexia and ALS. The oral administration of Disulfiram (DSF) blocks muscle atrophy in mice with cancer cachexia. The ET compound derived from DSF binds free copper (Cu) and Cu-ET sequesters Nploc4 from p97.

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### 2022PDM3 On-site April 2 Abstract 123

#### Muscle atrophy and denervation in a mouse model of disuse

Barbara Ravara 1, Elena Monti 1Barbara Girolami 2, Feliciano Protasi 2, Antonio Musarò 3, Sandra Zampieri 1,4,5

1 Department of Biomedical Sciences, University of Padova, Padova, Italy; 2 CAST, Center for Advanced Studies and Technology; University G D'Annunzio of Chieti-Pescara, Chieti, Italy; 3 Sapienza University of Rome, Italy; 4 Department of Surgery, Oncology and Gastroenterology, University of Padova, Padova, Italy; 5 CIR-Myo Myology Centre, University of Padova, Padova, Italy

Sandra Zampieri Email: [sanzamp@unipd.it](mailto:sanzamp@unipd.it)

Skeletal muscle deconditioning can occur as a consequence of immobilization, disuse or hypoactivity, that are common conditions in patients undergo post-surgery rehabilitation. In response to deconditioning, numerous changes can be detected in the skeletal muscle including atrophy, fiber type shift with metabolic reprogramming and neuromuscular junction (NMJ) destabilization.<sup>1</sup> In the main studies on animal models and human experiments of muscle deconditioning and unloading, the decrease in strength production is more significant than the reduction in muscle mass. This discrepancy is due to either changes in muscle quality (increases of fat) or in pennation angle, and to E-C uncoupling and denervation.<sup>2,3</sup> Several proteins are sound markers of NMJ destabilization and myofiber denervation, such as the C-terminal fragment of Agrin (CAF)<sup>4</sup> and the neural cell adhesion molecule (NCAM).<sup>5</sup> It has been shown that during disuse or inactivity, circulating levels of CAF are increased and NCAM is relocalized in synaptic and extrasynaptic sites within the myofiber, while rehabilitation protocol of physical exercise recovering skeletal muscle mass and function normalized their expression and distribution.<sup>3,4</sup> To increase knowledge in this context, we run a study developing a mouse model of muscle atrophy using a short period of cast immobilization of the lower hindlimb muscles followed by a period of rehabilitation by treadmill running. We will present findings of muscle morphometry, structure and phenotype, either related to

denervation and NMJ stability. The results of an AbTrial (Abcam) for the serological assessment of CAF using an ELISA assay untested in murine species will also be discussed.

Key words: Muscle disuse; denervation; C-terminal fragment of Agrin; NCAM

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4. Hettwer S, Dahinden P, Kucsera S, Farina C, Ahmed S, Fariello R, Drey M, Sieber CC, Vrijbloed JW. Elevated levels of a C-terminal agrin fragment identifies a new subset of sarcopenia patients. *Exp Gerontol*. 2013 Jan;48(1):69-75. doi: 10.1016/j.exger.2012.03.002. Epub 2012 Mar 11.
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### 2022PDM3 On-site April 2 Abstract 124

#### A new CT analysis of abdominal wall after DIEP flap harvesting

Tito Brambullo 1, Eva Kohlscheen 1, Diego Faccio 1, Francesco Messina 1, Roberto Vezzano 2, Giulia Pranovi 3, Stefano Masiero 3, Sandra Zampieri 4,5,6, Barbara Ravara 4,5,6, Franco Bassetto 1, Vincenzo Vindigni 1

1 Plastic and Reconstructive Surgery Unit, Department of Neurosciences, University of Padua, Padua, Italy; 2 Radiology Unit, Civil Hospital of Pescara, Pescara, Italy; 3 Rehabilitation Unit, Department of Neurosciences, University of Padua, 35128 Padua, Italy; 4 Department of Biomedical Sciences, University of Padova, Padua, Italy; 5 Department of Surgery, Oncology, Gastroenterology, 3rd Surgical Clinic, University of Padova, Padua, Italy; 6 Myology Center, University of Padova, Padua, Italy

Tito Brambullo, Email: [tito.brambullo@aopd.veneto.it](mailto:tito.brambullo@aopd.veneto.it)

The abdominal microsurgical flap based on the deep inferior epigastric artery perforator (DIEP) flap has become the most popular option worldwide for autologous breast reconstruction. Several authors have investigated the results of reconstructed breasts, but the literature lacks systematic reviews exploring the donor site of the abdominal wall.<sup>1-4</sup> To fulfil our aims, a new diagnostic muscle imaging analysis was designed and implemented. This study focused on rectus abdominal muscle morphology and function in a single series of 12 consecutive patients analysed before and after breast reconstruction with a microsurgical DIEP flap. Patients were divided into two groups, namely, “ipsilateral reconstruction” and “contralateral reconstruction”, depending on the side of the flap harvest and breast reconstruction, then evaluated by computed tomography (CT) scans scheduled for tumor staging, and clinically examined by a physiatrist. Numerous alterations in muscle physiology were observed due to surgical dissection of perforator vessels, and rectus muscle distress without functional impairment was a common result. Postoperatively, patients undergoing “contralateral reconstruction” appeared to exhibit fewer rectus muscle alterations. Overall, only three patients were impacted by a long-term deterioration in their quality of life. On the basis of the newly developed and implemented diagnostic approach, we concluded that DIEP microsurgical breast reconstruction is a safe procedure without major complications at the donor site, even if long-term alterations of the rectus muscle are a common finding.

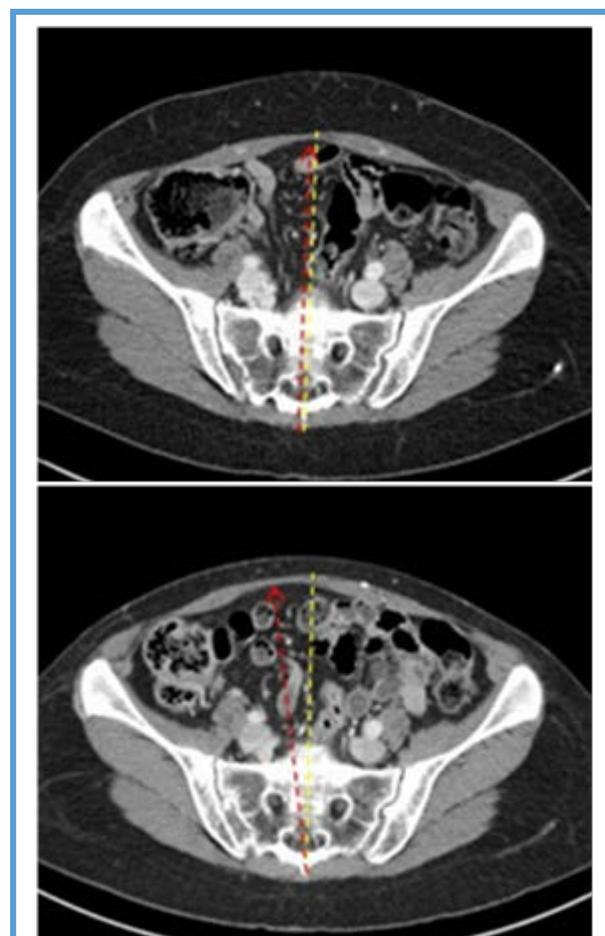
Keywords: abdominal wall; breast reconstruction; CT; DIEP flap; donor site morbidity; rectus muscle

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**Fig 1.** (Upper panel) Pt n#12, preoperative transverse CT scan at sub-umbilical level; (Lower panel) Pt n#12, postoperative transverse CT scan at same level. Yellow dot-ted lines indicate the midline, red dotted arrows indicate the linea alba between the recti muscles.



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4. Stecco C, Azzena GP, Macchi V, Porzionato A, Behr A, Rambaldo A, Tiengo C, De Caro R. Rectus abdominis muscle innervation: an anatomical study with surgical implications in diep flap harvesting. *Surg Ra-diol Anat.* 2018 Aug;40(8):865-872. doi: 10.1007/s00276-017-1944-6.

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### 2022PDM3 On-site April 2 Abstract 125

#### New paradigms for 3D modelling and surgical planning

Paolo Gargiulo

1 Institute of Biomedical and Neural Engineering, Reykjavik University, Reykjavik, Iceland; 2 Landspítali University Hospital, Reykjavik, Iceland Department of Medicine, Orthopedics, University of Iceland, Reykjavik, Iceland

Paolo Gargiulo, Email: [paologar@landspitali.is](mailto:paologar@landspitali.is)

The presentation will give an insight from the ongoing development of 3D modelling, 3D printing and Digital Anatomy (DA). The DA process describe the mechanism of how human body structures are converted, first into a computer-accessible format and then into a physical model with mimicking not only the geometry but also the structure.<sup>1,2</sup> The applications of such technology are not only employed surgical planning, surgeon training, patient communication but also the study of structural and mechanical proprieties on bones, muscles, blood vessels and cartilages. In this way, patient specific conditions such as degeneration, pathologies and tissue mechanical and elastic conditions can be studied like never before.<sup>3,4</sup> Reykjavik University will be the 1st place in north Europe operating with this new technology having as aim to develop towards new paradigms for modelling and surgical planning.

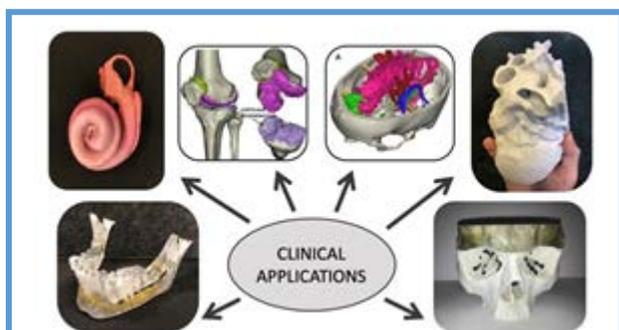


Fig 1. Application of 3D Printing at Medical Technology Center, Reykjavik University, Iceland

Keywords: 3d model, digital anatomy, 3d printing, medical imaging.

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### 2022PDM3 On-site April 1 Abstract 126

#### Mosole's evidence of transforming muscle fibers coexpressing fast and slow myosin heavy chains in slow type muscle-groupings of life-long active seniors

Dario Coletti 1,2,3 Ugo Carraro 3,4,5

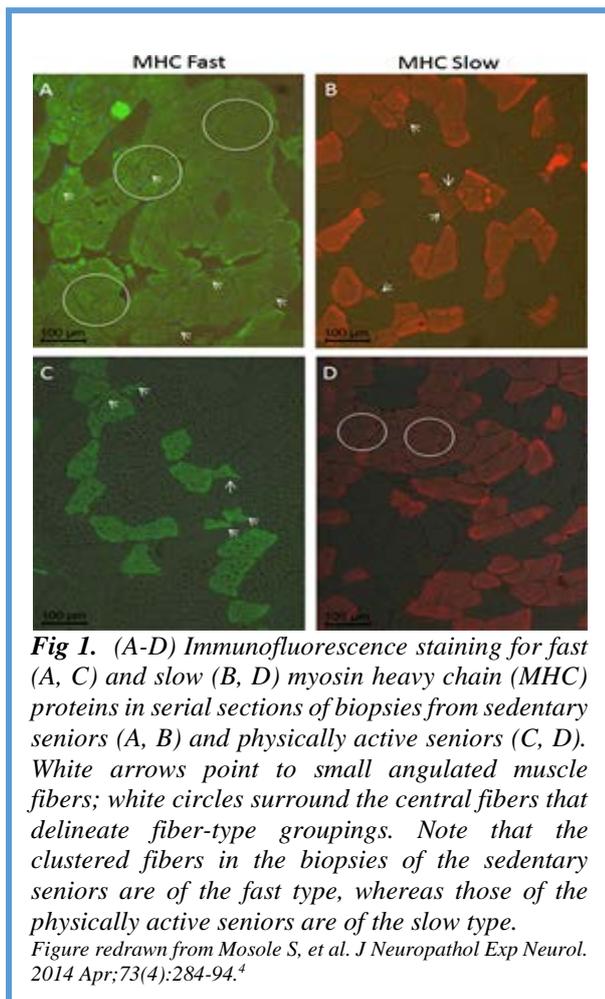
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We like to use the words of the first of us, taken from a review published in this Issue of EJTM 32 (1), 2022.<sup>1</sup> "With aging, type 2 fast fibers preferentially undergo denervation and are reinnervated by slow-twitch motor neurons. They spread forming new neuro-muscular junctions with the denervated fibers: the result is an increased proportion of slow fibers that group together since they are associated in the same motor unit.



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Grouping and fiber type shifting are indeed major histological features of aging skeletal muscle. Exercise has been proposed as an intervention for age-related sarcopenia due to its numerous beneficial effects on muscle mechanical and biochemical features. In 2013, a precursor study in humans was published in the *European Journal of Translation Myology* (formerly known as *Basic and Applied Myology*), highlighting the occurrence of reinnervation in the musculature of aged, exercise-trained individuals as compared to matching control. This paper, entitled *Reinnervation of Vastus lateralis is increased significantly in seniors (70-years old) with a lifelong history of high-level exercise*, is now being reprinted as an «Ejtm Seminal Paper».<sup>2,3</sup> In this short review we discuss those results in the light of the most recent advances confirming the occurrence of exercise-mediated reinnervation, ultimately preserving muscle structure and function in elderly people who exercise.<sup>1</sup> The figure is taken from the 2014 Mosole's paper: Mosole S, et al. *J Neuropathol Exp Neurol.* 2014 Apr;73(4):284-94.<sup>4</sup>

**Key Words:** Aging; coexpression of fast and slow myosin heavy chains; denervation and reinnervation; fiber-type

grouping; human skeletal muscle; recreational sport activity.

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### 2022PDM3 On-site April 1 Abstract 127

#### Multi-scale Bone Remodeling Prediction in Patients Undergoing Total Hip Arthroplasty

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Total hip arthroplasty (THA) is the most widely used surgery in case of severe damage of hip joints. However, the implant produces significant variations of stress distribution in the operated femur, determining the host bone remodeling, which, in turn, influences the bone quality of THA patient. The aim of the study is to create a prediction model, which allows determining significant parameters for THA femur quality during the remodeling, starting from patient clinical data, diagnostic x-ray computed tomography (XCT) and 3D high resolution imaging. Patient clinical data as age, gender, body mass index, type of operation (unilateral or bilateral), prosthesis (cemented or uncemented) and diagnosed pathologies connected to bone tissue, are correlated to multi-scale parameters of femur. Information at macro level is obtained by the analysis of diagnostic X-ray computed tomography (d-XCT) scans of patient femurs. Data are segmented to collect the densitometry of regions of orthopedic interest (gruen zones). The densitometry of rectus femoris muscle is also considered, due to the fact

that remains roughly recognizable also when it is degenerated. Micro and nano femur morphometric parameters are obtained by high resolution 3D imaging on femur biopsies, achieving information on bone microarchitecture and ultrastructure. After a learning, based on above-mentioned THA patients' data at 24 hours, 1 years and 6 years after the implant, the prediction model can predict the bone quality and the better-regenerated zones. The prediction model of THA femur quality works also as support of further clinical decisions on post-surgery treatments and rehabilitation, by providing a projection on patient mobility.

Key Words: THA; Artificial Intelligence; bone remodeling.

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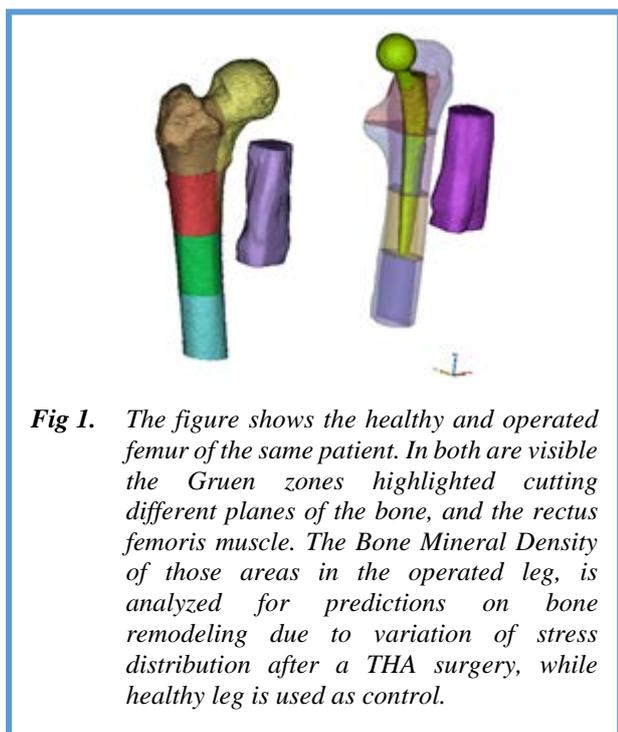
### 2022PDM3 On-site April 3 Abstract 128

#### Centre of Active Ageing (Austria): current status

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Physical inactivity is a global pandemic that not only causes morbidity and mortality, but also represents a major economic burden worldwide. As a longer-term goal, we must strive to integrate physical activity into our everyday lives. Increased physical activity, among other things, has an influence on chronic pain of the locomotor system, minimizes the risk of cardiovascular disease,



**Fig 1.** The figure shows the healthy and operated femur of the same patient. In both are visible the Gruen zones highlighted cutting different planes of the bone, and the rectus femoris muscle. The Bone Mineral Density of those areas in the operated leg, is analyzed for predictions on bone remodeling due to variation of stress distribution after a THA surgery, while healthy leg is used as control.



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increases self-esteem and cognitive abilities, maintains mobility and autonomy, and thus has direct effects on healthy life years and direct and indirect health expenditure. The Centre of Active Ageing (CAA) project, funded by the EU cross border cooperation program INTERREG, is intended to be in line with the Austrian health targets (R-GZ) for Austria,<sup>2</sup> the National Health Program of Slovakia,<sup>3</sup> the recommendations of the Lancet Physical Activity Series Executive Committee, and of the WHO.<sup>5</sup> Encouraging policymakers to take physical activity seriously, to motivate people, and to create the opportunities to do so on a regular basis. Preliminary results after 100 subjects finished a 12 week training and education program including 50min strength training and gymnastic sessions twice a week show a consistent improvement in functional performance. Before and after the intervention subjects were tested for upper body strength with handgrip and 30s arm curl test, lower extremity strength/function with isometric knee extension torque and 30s chair stand test and general functional abilities with 2min step test, sit and reach, back scratch, up-and-go test, 10m walking test and questionnaires for general health EQ-5D-5L and physical activity GPAQ. Moreover results of a subgroup which performed a follow-up after six months show a significant improvement which was maintained (Figure). In conclusion, the preliminary results indicate the efficacy of the exercise program within the Centre of Active Aging in St. Pölten for improving physical fitness of elderly.

Funding: European cross border cooperation program INTERREG Slovakia-Austria (project CAA B205; 305041X157)

Key Words: Aging, Physical Activity, Centre of Active Ageing, Elderly.

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### 2022PDM3 On-site April 1 Abstract 129

#### Exercise intervention in elderly: a novel system within the Centre of Active Aging in Bratislava

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Aging is a complex process generally defined as gradual changes in biological, psychological, sociological domains of life as people grow older. One of the most efficient methods to counteract age-related changes in muscle mass and function is physical exercise. Regular physical activity is known to improve both, motor functions and overall physical fitness. The Center of active aging in Bratislava as a part of the Slovak – Austrian cross-border project “Center of active aging” provides Physical activity and health promotion program; a comprehensive training and education program with the main goal to enhance the overall physical fitness of elderly people and support their health status. The exercise system applied in Centre of active aging is defined as a supervised multimodal training containing functional resistance training mainly in closed kinetic chain and combination of endurance and coordination in water and/or land based. One hundred sixty three participants (n = 163, 74,1 ± 2,97 years) underwent a 10-week (2 times per week) period of multimodal training. Before and after the intervention subjects were tested for lower body strength by 30 s chair-rising test, for maximal walking speed over 10 m and aerobic capacity by the 6-min. bicycle test. After the intervention, in 30 s chair-rising test the number of sit-to-stand repetitions increased from 14,9 ± 3,7 to 19,5 ± 3,8 (p<0,001). The maximal walking speed test increased by 12,5 % (p<0,001) after

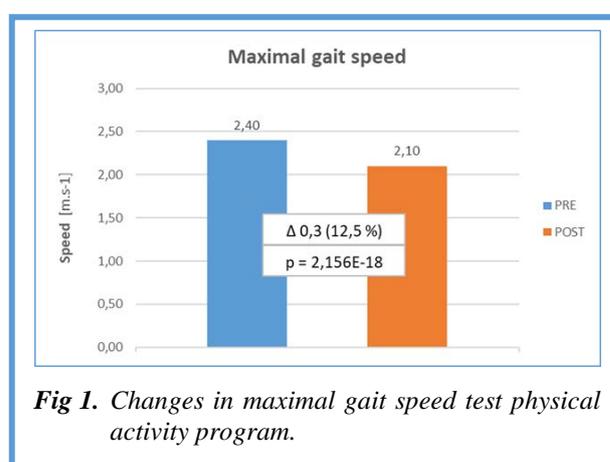


Fig 1. Changes in maximal gait speed test physical activity program.



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the intervention. After the training the aerobic capacity in 6-min. bicycle test increased by 5,63 % ( $p < 0,001$ ). In conclusion, the preliminary results indicate the efficacy of the novel exercise system within the Centre of Active Aging in Bratislava for improving physical fitness of elderly.

The project Centre of Active Aging (registration number 305041X157) is funded and supported by European development fund, cross-border cooperation program Interreg Slovakia – Austria.

**Key Words:** Aging performance decline; Centre of Active Aging; Elderly.

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### 2022PDM3 On-site April 1 Abstract 130

#### Early Onset of Therapy after Knee or Hip Replacement: AMB-REMOB a new concept in outpatient rehabilitation

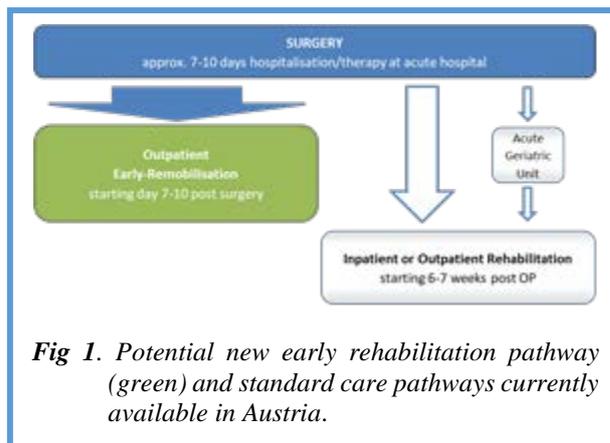
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Total knee or hip replacements are on the top lists of the major operations in the European Union. Especially in Austria, the incidence of hip and knee replacement is high (299 and 230 per 100 000 inhabitants) in comparison to other European countries. In the recent years, there have been advances in surgical technique as well as in rehabilitation and a few studies within the last years show that after orthopedic surgery aquatic physical therapy can



**Fig 1.** Potential new early rehabilitation pathway (green) and standard care pathways currently available in Austria.

improve function and does not increase the risk of wound-related adverse events and is as effective as land-based therapy in terms of pain, edema, strength, and range of motion in the early postoperative period. The aim of this study is to investigate an alternative and favorable treatment scheme; early outpatient remobilization. The rehabilitation measures include underwater therapy (gymnastics and pressure jet massage and electrotherapy and are applied in the usual time and method. The underwater therapy, about 50 min, is meant to improve joint mobility and decongestive measures. Electrotherapy is used to treat pain, performed with standardized forms of electrical currents. The study will include patients undergoing total knee or hip arthroplasty due to chronic cartilage damage. They will be randomly divided into two groups: a control group in which the conventional time schedule of rehabilitation will be applied, and a study group which will start rehabilitation immediately after discharge from the hospital. Another advantage of this early remobilization close to the patient's home is that patients remain in their familiar social environment and therefore are better supported back into the rapid re-integration of their everyday life. The results of this clinical study will help to optimize the rehabilitation process and program for patients after knee and hip arthroplasty surgery, so that they can return to their daily activities and normal life faster afterwards.

Clinical Trial Registration: German Clinical Trial Register DRKS00028152 and Universal Clinical Trial Number UTN U1111-1275-5181

Funding: European cross border cooperation program INTERREG Slovakia-Austria (project AMB-REMOB 305011AXY3)

**Key Words:** Outpatient rehabilitation, knee replacement, hip replacement, early remobilization, surgery.

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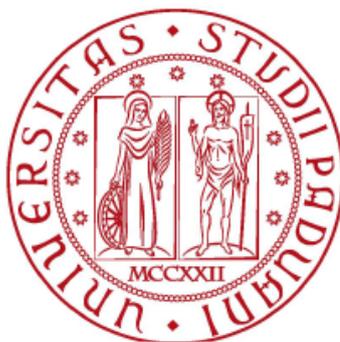
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