

## State of the art of mobility medicine

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### State of art of mobility medicine: some more abstracts and evidence that the success of Pdm3 is based on extra-session relationships

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#### Abstract

Scientific conferences increasingly suffer from the need for short presentations in which speakers like to dwell on the details of their work. A mitigating factor is to encourage discussion and planning of collaborations by organizing small meetings in a hotel large enough to host all attendees. This extends discussions' opportunities during morning breakfasts, lunches, dinners and long evenings together. Even if the vast majority of participants will not stay for the entire duration of the Conference, the possibilities for specialists to interact with specialists who are even very distant in terms of knowledge increase enormously. In any case, the results in terms of new job opportunities for young participants outweigh the costs for the organizers. Thirty years of Padova Muscle Days offer many examples, but the authors of this report on the state of the art of Mobility Medicine testify that this also happened in the 2024 Five Days of Muscle and Mobility Medicine (2024Pdm3) hosted at the Hotel Petrarca, Thermae of Euganea Hills and Padua, Italy which is in fact a valid countermeasure to the inevitable tendencies towards hyperspecialization that the explosive increase in scientific progress brings with it.

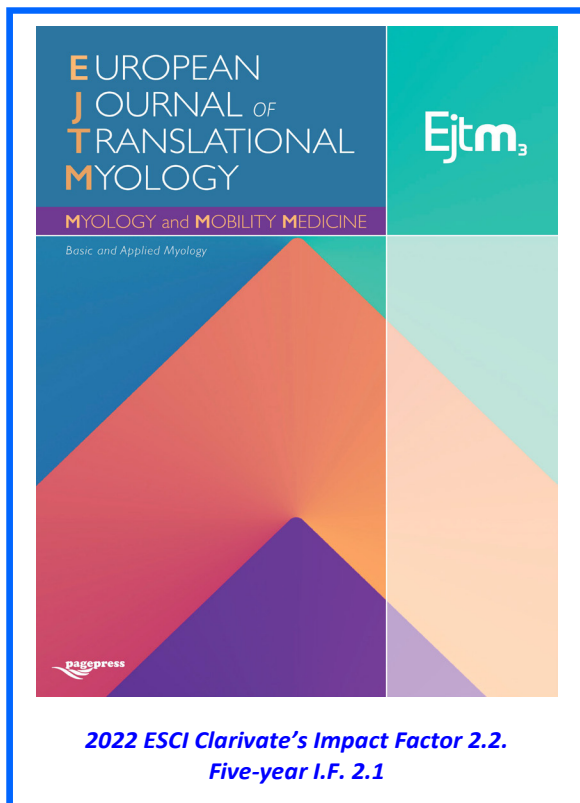
**Key Words:** Padua Days on Muscle and Mobility Medicine; 2024Pdm3 last-minute abstracts; European Journal of Translational Myology; PAGEpress; Italy.

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The Padua Muscle Days (PMDs), an international meeting on biology, anatomy, physiology, managements and rehabilitation of striated muscles, started in 1985 as the First Abano Terme Meeting on Rehabilitation (Padua, Italy), especially to provide advice on Translational Myology. Always the interest was on implementing basic research and clinical trials to prevent, manage and rehabilitate persons suffering from mobility disorders, which may be secondary, in addition to neuromuscular disorders, to diseases of the heart, lungs, liver, metabolism, endocrine tissues, life style and aging. During the 2023 Padua Days on Muscle and Mobility Medicine (Pdm3, the new nickname of the series) and then in summer and autumn of 2023 the 2024Pdm3 was planned to be held from February 27 to March 2, 2023, that is for five days, because 2024 include February 29. The success of the registrations and the maintenance of the traditional plan of oral presentations only (in person - the vast majority - or via Zoom), forced the organizers to extend the program to five days and to add parallel sessions. The five days included oral presentations of senior and junior scientists and clinicians from Argentina, Austria, Belgium, Brazil, Canada, Denmark, Egypt, France, Germany, Iceland, Ireland, Italy, Romania, Russia, Slovenia, Switzerland, UK, and USA. The almost full Collection of Abstracts (accepted up to January 31, 2024) is e-published in this Issue 34 (1) 2024 of the European Journal of Translational Myology (EJTM).<sup>1</sup>



Here a few Abstracts are reported that were accepted just before or even during the 2024Pdm3.

This Report is indeed dedicated to the examples of collaborations planned during the five days of the meeting and confirmed to date. Among the good examples are planned new sessions for the 2025Pdm3, e.g., the Sessions on emi-fasting approaches that will be organized by Stefen Anton and Ugo Carraro and the Session on physiology, physiopathology and therapy of Extreme Environments by Tiziana Pietrangelo and Gerardo Bosco. Preliminary results of a new collaboration among Padua, Rome, Genova and Palermo designed during discussions in Hotel Petrarca among Maria Chiara Maccarone, Giuseppe Messina and Ugo Carraro will be also reported during a "Practical Activities Session" in the next 2025Pdm3 on Home-Based Full-Body In-Bed Gym chaired by Maria Chiara and Giuseppe. Preliminary discussion on integrating efforts on Functional Electrical Stimulation by Marie Sophie Alberty, Ines Bersch, Ashraf S. Gorgey and Winfried Mayr for FES Of DDM will be hopefully supported also by Myriam Loyo, Michelle Cameron, Antonio Di Pietro, Johannes Krauss, Gerd Volk for electrical stimulation of facial muscles. If so, the Session on FES for denervated muscles will open the 2025Pdm3. Supported by Paolo Gargiulo, Daniele Coraci, Riccardo Forni, Marco Quadrelli with his Colleagues of SynLab and Ugo Carraro discussed and agreed on a collaborative program Padova (Italy) and Reykjavk (Iceland) on Digital Health and Muscle Imaging in Mobility Medicine. That also will be one of the key Sessions of the 2025Pdm3.

Elena Barbieri of Urbino University (Italy), Daniela Taviani of Milan University (Italy) and Paulo Gentil of the Federal University of Goias (Brasil) promised to support the long-term dream of Ugo Carraro to developing saliva tests for physical medicine and rehabilitation programs.

Finally, Philippe Perrin of the University of Nancy (France) is willing to support the efforts to find strong scientific evidence of the undisputable effects of the thermal waters and of the traditional warm muds of the Euganean Hills Thermae. This will be a joint program with the related 2025Pdm3 Session of FEMTEC, the World Hydrotherapy Federation, co-chaired by Philippe Perrin, Lucrezia Tognolo and Stefano Masiero.

**Ugo Carraro, 2024 and 2025Pdm3 Local organizer in name of all Authors**

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The Padua Days on Muscle and Mobility have been extended to five days in 2024, which have been filled with interesting talks ranging from highlights on the physiological processes at a cellular level to sharing clinical experiences within treating people with muscle-related diseases. The between-session discussions and networking that have resulted from the scientific talks are deemed highly beneficial for the development of new ideas, but they are also stimulating to have a more holistic approach in our daily professional activities. Engaging in the event with a talk oneself facilitates the exchange with other like-minded (or not like-minded) people since it increases visibility and helps to display personal expertise and opinions about specific topics. Hence, hearing about the role of satellite cells in muscular dystrophy resulted in a discussion about the usability of and the consequences for training with electrical stimulation (ES) via nerve or muscle (long pulse stimulation) in this population. Furthermore, sharing experiences involving ES stimulated discussions about the implementation of proprioceptive sensory rather than ES above motor threshold to enhance functions in people with Duchenne muscular dystrophy. Contributions about denervated muscle made the question arise about whether a fully denervated muscle can be validly guaranteed, especially in those with an incomplete spinal cord injury (SCI) where stimulation intensity cannot be increased due to sensation integrity. A complete denervation of the muscles of the lower extremity is more likely to be guaranteed in people with spina bifida and sensorimotor complete SCI with a neurological level of injury below L1 and a *conus cauda* lesion. In the former case, the underlying cause is the structural damage of spinal nerves since birth. An additional positive aspect of the meeting was the networking fostering in-person exchange about previous work performed by the researchers in the field. One-to-one communication is often more straightforward and brings fast results, contributing to a faster development and implementation of expertise in this domain. Looking back at the congress, one can state that a lot of knowledge regarding muscle physiology has been won, leading to discussions about their translation into clinics while carefully selecting an appropriate study design when conducting the necessary investigations.

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The 2024 Padua Five Days on Muscle and Mobility Medicine provided a unique opportunity to present the latest advances in clinical translation research related to applications of electrical stimulation in persons with spinal cord injury (SCI). One of the interesting applications is the capacity to stimulate denervated muscles in SCI persons with *caudua equina* syndrome or

lower motor neuron injury. This is an extension to the RISE project that previously suggested the use of long pulse width stimulation (LPWS; 120-150 ms) to exercise the denervated muscles. Gorgey et al. proposed the use of LPWS with testosterone treatment to reciprocate the determinantal changes in muscle size and composition in this population with SCI. However, the study protocol was limited to only twice weekly using a lab-based approach to train the denervated muscles for 12 months. The training program results in modest changes in muscle size with difficulty in recruiting and retaining reasonable sample to complete the program (n=5). Based on these limitations, the study team proposed a study to address the above limitations via using a telehealth home-based approach to train the denervated muscles 4x weekly for 9 months to increase sample size and to retain participants over the course of the study. The proposed study has yet to be executed upon funding and regulatory approvals.

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Attending the 2024 Padua Five Days on Muscle & Mobility Medicine (2024Pdm3) was an enriching experience that offered a unique mix of scientific knowledge and personal connections. Following the presentations by various eminent professionals, several researchers with shared interests reached out, eager to delve deeper into the topics discussed. Moreover, presentations by PhD students also generated significant discussions, which continued in the corridors of the conference. Professors in both pre-clinical and clinical fields shared their experiences with young PhD students, noting many points of convergence. These encounters often extended beyond the confines of the conference rooms, spilling over into informal discussions during lunch and dinner. Over plates of authentic Italian cuisine, ideas were brainstormed, perspectives were exchanged, and potential avenues for collaboration were explored. These unplanned meetings not only deepened understanding of the topics but also forged new connections with researchers from diverse backgrounds. As experiences were shared, it became clear that expertise could be utilized to address complex research questions and drive innovation in respective fields. This discussion sparked a desire to collaborate, establishing bridges between universities geographically distant through potential shared research projects. Some young researchers even received intriguing job offers, both national and international, aiding in their academic career progression. These interactions underscored the invaluable role of the 2024Pdm3 not just as a platform for knowledge dissemination but also as an incubator for

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interdisciplinary collaboration. By fostering a culture of open dialogue and networking, events like the Padua Muscle Days could serve as fertile ground for cultivating partnerships that go beyond geographical boundaries. Such collaborative moments are essential in an era marked by rapid scientific advancement. By centralizing meetings in one location, encouraging shared accommodations, and extending the duration of events, organizers can create an environment favorable to collaboration and advancement in research.

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All together we reassure the traditional Key Organizers of Pdm3 Sessions, in particular H. Lee Sweeney, Christiaan Leewenburgh, Piera Smeriglio, Massimo Ganassi, Marco Narici and Riccardo Rosati that there will be always room for their sessions in the Programs of the Padua Days on Muscle and Mobility Medicine starting from the one of 2025.

In any case we are sure that the 2025Pdm3 will be even more successful than the recent successful events.<sup>1-8</sup>

**List of acronyms**

EJTM - European Journal of Translational Myology  
Pdm3 - Padua Days on Muscle and Mobility Medicine  
PMD – Padua Muscle Days

**Acknowledgments**

The end figure depicts the Patrons and the Sponsors, but we must highlight the three most generous.

The Myology Institute at the University of Florida, Gainesville, FL, USA, directed by H. Lee Sweeney, whose generous donation allowed all lecturers and speakers who had to cover costs of transatlantic flights to be exempt from registration fees.

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**Conflict of Interest**

The authors disclose no conflicts of research interest.

**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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# ***LAST MINUTE ABSTRACTS***

## ***of the 2024Pdm3***

***TUESDAY February 27, 2024***

### **2024Pdm3 February 27 - Abstract 124**

**Effect of Neuromuscular Electric Stimulaton on Gait Speed and Lower-Extremity Function of Patients With Stroke after botulin toxin injection: A Randomized Controlled Trial**

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Neuromuscular electric stimulation (NMES) is routinely used in rehabilitation of hemiplegic patients post stroke. Its efficacy in restore function has been demonstrated in several metanalysis. However, to date there is a lack of evidence on its application on gluteal muscles. To evaluate the effects of neuromuscular electric stimulation (NMES) of the gluteus maximus muscle on gait speed and lower extremity function of hemiplegic patients with recovering from stroke. The study was designed as a randomized controlled assessor blinded trial. Consecutive inpatient (N=25) with diagnosis of hemiplegia were recruited in a neuromuscular rehabilitation ward. Both groups joined a conventional stroke rehabilitation program. The program involved two 35 minutes sessions daily, 6 days a week for 3 weeks, for a total of 36 sessions. As adjunct, The NMES group received NMES of the gluteus maximus muscle. Settings involved a symmetric rectangular biphasic wave,

frequency 100 Hz, amplitude 150 mS, ratio on:off 5:10. Patients undertook two 30 minutes sessions daily, 6 days a week, for 3 weeks. Gait speed and lower extremity function were measured via 10 meters walk test (10MWT) at comfortable and maximal speed and the Lower Extremity Functional Scale (LEFS). Outcome measures were recorded pre and post intervention. NMES of the gluteus maximus muscle combined with a conventional stroke rehabilitation program was superior to a conventional stroke rehabilitation program alone, in terms of gait speed and lower-extremity function.

**Key words:** Spasticity; botulin toxine; electrical stimulation.

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**2024Pdm3 February 27 - March 2, 2024**

**FRIDAY March 1, 2024**

**Conference Hall Paradise, Hotel Petrarca, Thermae of Euganean Hills (Padua) Italy**

## 2024Pdm3 March 1 - **Abstract 125**

**Peripheral foot drop syndrome: neurophysiological and ultrasound approach in the evaluation of clinical deficit in Rehabilitation, a narrative review.**

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Peripheral foot drop syndrome (PFDS) is commonly found in our clinical practice, it is determined by different etiologies. Thus, since the underlying causes of PFDS are different from each other, a tailored approach to the diagnosis of this condition could allow to prevent it and to set up an effective rehabilitation program. It was also imperative to identify a diagnostic path that could lead to an accurate definition of the patient's prognosis, applying both neurophysiological and ultrasound studies. We carried out a narrative review of the literature to identify the most useful methods, to create a diagnostic pathway that could be easily applicable in any ambulatory care setting. We then identified the following exams: electromyography (EMG), electroneurography (ENG),

direct muscle stimulation (DMS) and muscular tissue ultrasound to identify the degree and extension of fibrosis (1,2,3). These methods are largely applied in clinical practice as single exams, less frequently in combination. The data collected with each method can be used to obtain various information on the neural conduction and the muscular tissue itself. Combining these diagnostic exams, that only require little resources and time, could provide enough information to ameliorate the allocations of the patient in a rehabilitation setting, creating a tailored program for each patient based on its pathological characteristics (3).

**Key words:** Foot drop syndrome; peroneal nerve deficit; direct muscle stimulation; ultrasound; electrical stimulation.

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**FRIDAY March 1, 2024**

**CONFERENCE HALL GRAZIA, Hotel Petrarca, Thermae of Euganean Hills (Padua) Italy**

## 2024Pdm3 March 1 – Abstract 126

### How to correctly diagnose temporomandibular disorder

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Temporomandibular disorders (TMD) refer to a wide range of conditions that affect the temporomandibular joint, surrounding muscles, and bones. These disorders are musculoskeletal and neuromuscular in nature. TMD affects approximately 15% of adults, with a higher incidence rate between 20 to 40 years of age. TMD can be divided into intra-articular and extra-articular disorders. Patients with TMD may experience several symptoms, including jaw pain or dysfunction, earache, headache, and facial pain. The factors that cause TMD are multifactorial, including biological, environmental, social, emotional, and cognitive triggers. Diagnosis of TMD is usually based on the patient's medical history and physical examination. Diagnostic imaging may be helpful when malocclusion or intra-articular abnormalities are suspected. Most patients can improve with noninvasive treatments such as patient education, self-care, cognitive-behavioral therapy, pharmacotherapy, physical therapy, and occlusal devices. Initial treatment usually involves nonsteroidal anti-inflammatory drugs and muscle relaxants, while benzodiazepines or antidepressants may be added for chronic cases. The advancements in medical and dental diagnosis technology have been remarkable in recent years. However, these tools, procedures and instruments can be misused and misinterpreted, despite their ability to produce improved clinical diagnoses or even identify new disorders. In the field of TMDs, the conditions are similar to common orthopedic problems found in other parts of the body. In addition to imaging the affected areas, few important new technological approaches have augmented the traditional history and examination for an adequate diagnosis of such problems. The Diagnostic Criteria for Temporomandibular Disorders exemplify the traditional approach. Unfortunately, the TMD field is filled with a variety of diagnostic instruments and procedures that have not been tested for diagnostic

validity. Misuse of these techniques can complicate the true diagnosis of patients presenting with symptoms, while also creating new patients by identifying so-called abnormalities in healthy subjects. These strategies often magnify the issues and lead to a treatment protocol that results in irreversible changes to the dental occlusion, mandibular position, or both, as part of the treatment strategy to "correct" the so-called abnormality. Moreover, the same variety of technologies and measurements are used on asymptomatic individuals, creating non-existing diseases and treatment needs. Thus, there is a possibility of either magnifying or creating a serious iatrogenic disease when the patient might have a simple condition or no disease at all. Thirdly, appropriate technologies and measurements can also be misused due to inadequate training in relevant information integration. The purpose of this report is to identify the 10 key points in the diagnosis and management of TMDs. Furthermore, it aims to eliminate those misleading concepts that lead to incorrect patient management.

Key words: temporomandibular disorders, diagnosis, pain, biopsychosocial management

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**How and when joint surgical therapy is necessary**

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Temporomandibular Disorders (TMD) refer to a group of different conditions that affect the temporomandibular joint (TMJ) or the muscles of the jaw, or both. TMD is characterized by several symptoms such as pain in the TMJ and/or jaw muscles, sounds in the TMJ, and restriction, deviation or deflection of the mouth opening path. TMD is the most common orofacial pain condition of non-dental origin. However, the assessment of TMD prevalence can be complex due to the frequent presence of other symptoms such as earache, headache, neuralgia, and tooth pain, which might be related to TMD or present as ancillary findings to be assessed in the differential diagnosis process. The prevalence of TMD (Temporomandibular Disorders) at the population level is still a topic of debate because the diagnostic criteria used in different studies are not homogeneous. However, there is evidence that the prevalence of signs and symptoms of TMD may be high in the general population. Early research suggested that between 1% to 75% of the general population showed at least one objective TMD sign, and between 5% to 33% reported subjective symptoms. TMD symptoms are commonly seen in people within the age range of 20 to 40 years, with a lower prevalence in younger and older individuals. Distinct peaks have been recently identified in patient populations with specific TMD conditions. One peak is observed around the age of 30 for subjects with disc displacements while another is observed over the age of 50 for inflammatory-degenerative joint disorders. Degenerative disorders of the temporomandibular joint (TMJ) are becoming an increasingly frequent cause of orofacial pain and are diagnosed in about one-third (30.1%) of subjects belonging to patient populations. Over the years, various approaches have been suggested to manage symptoms associated with such disorders and to enhance joint function. TMDs that originate outside the joint are typically managed non-surgically. There are various ways to manage TMJ disorders including physical therapy, pharmacotherapy, and occlusal appliance therapy. Non-surgical treatments are usually

preferred for internal derangements, and if they do not work, surgery may be considered. There are different types of surgical procedures available to treat TMJ disorders such as minimally invasive procedures like arthrocentesis and arthroscopy, as well as open joint surgery like disc plication and repositioning, and osseous surgery such as condylotomy and eminoplasty. In cases where all other surgical and nonsurgical treatments have been unsuccessful, a prosthetic total joint replacement (TJR) is often the last resort. The purpose of this report is to provide a review of different surgical methods, so that healthcare providers such as general dentists, oral and maxillofacial surgeons, and orofacial pain specialists can collaborate to provide patient-centered care and achieve the best possible outcomes.

**Key words:** temporomandibular disorders, arthrocentesis, discectomy, TMJ ankylosis, TMJ surgery  
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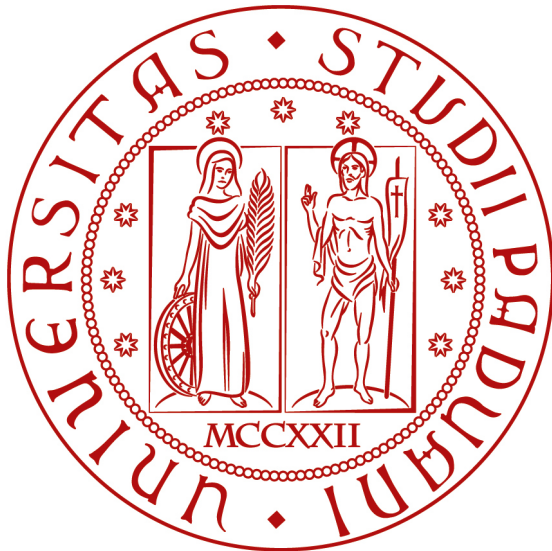


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