

HIGHLIGHTS FROM THE IFESS 2021 CONFERENCES

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Introduction

The International Functional Electrical Stimulation Society (IFESS) is a not-for-profit association dedicated to creating a future in which electrical stimulation technologies enhance the quality of life.

IFESS was founded in 1995 and, since its foundation, it aimed at promoting the awareness, knowledge, and understanding of electrical stimulation technologies and their application.

In 2021, IFESS organized two parallel events between the 23rd and the 25th of September. One event was held in person in Rovinj Croatia (<https://3eventrovinj.com/>) and one was fully virtual and integrated in the Rehabweek 2021 (<https://2021.rehabweek.org/>).

IFESS2021 virtual event @Rehabweek

The International Consortium for Rehabilitation Technology (ICRT) is the Rehabweek hosting umbrella society funded in 2015. It includes four participating societies:

- International Consortium on Rehabilitation Robotics (ICORR)
- International Functional Electrical Stimulation Society (IFESS)
- International Industry Society in Advanced Rehabilitation Technology (IISART)
- International Society for Virtual Rehabilitation (ISVR)

Due to the pandemic and to the correlated severe travel restrictions, the ICRT decided to postpone the in person Rehabweek event to 2022 in Rotterdam and organized, with the full support of the Kenes Group, the RehabWeek Virtual '21.

The virtual meeting offered top-level keynotes, interactive sessions, round tables, small-group discussions among participants, and live virtual visits to clinical facilities, presenting real-time hands-on applications of advanced rehabilitation technologies.

The scientific program was based on two main blocks of 5 hours in which the 4 participating societies offered

common keynotes and industry sessions and 4 parallel scientific sessions, one per each participating society.

The keynote of IFESS was presented by Prof. Vivian Mushawar who gave a great talk on the novel approaches for restoring mobility after neural injury or disease.

All the contributions submitted for the conference were presented in 2 fast-forward sessions in which short pre-recorded videos were shown. Then the authors were shared in breakout rooms where a moderator facilitated discussions and interactions on the presented topics. This modality was really appreciated by students and authors because it was possible to interact with experts in the field exchanging ideas for further developments of their works.

In 2021 Artificial Organs became the IFESS official journal. Thus, the editor in chief of the Journal, Dr. Vakhtang Tchanchaleishvili, presented all the tips, tricks, and caveats about publishing in the Journal and offered an interactive Q&A session.

During the Rehabweek virtual event, IFESS organized several invited Scientific Sessions covering different topics of interest in the field and trying to always maximize the interaction with the audience.

The first session was dedicated to FES, Critical Care and COVID 19. Indeed, we have all witnessed the enormous pressure on critical care units caused by the C19 pandemic. Mechanical ventilation causes atrophy of the diaphragm, which in turn delays return to unassisted breathing. Diaphragmatic stimulation has been used for many years to assist breathing in persons with damage to their cervical spinal cord. In this session we heard from four research teams working on new methods to reduce the burden on critical care provision by means of stimulation to activate the diaphragm.

An invited session on neuroscience, rehabilitation and human-machine interfaces was organized by Thierry Keller and Paul Verschure and was a great success in terms of audience. In addition, a joint session between IFESS and ICORR was organized by Prof. Jules Dewald on the common topic of hybrid systems based on robotics and FES.

Two live events in clinics were organized. The first was organized by Dr. Naaz Desai from the Toronto Rehabilitation Institute and dealt mainly with applications of FES on upper limbs involving video of clinical practice and a very interactive Q&A session moderated by experts in the field.

The other live clinical event was organized by Ines Bersch and her clinical group from the Swiss Paraplegic Centre in Nottwil and was offered jointly to the audience of IFESS and INRS. This live event focused on the effectiveness of technologies in clinical practice and showed the whole path from the clinical idea to the implementation and the application to patients. The session offered the possibility for the audience to interact with the patients themselves so as to experience their perceptions, feedback and satisfaction.

During the last year IFESS tried to boost the connection with other societies and indeed an invited session was offered to the Association of Chartered Physiotherapists in Neurology (ACPIN) on the very actual topic of the development of clinical guidelines specifically in the context of mobility and particularly giving the example of the use of ankle-foot orthoses and Functional Electrical Stimulation post stroke. Also this session was enriched by interactive breakout rooms to discuss key challenges in the development and implementation of guidelines and educational programs worldwide.

Other topics covered by the event were: i) transdisciplinary training for a full deployment of technologies in rehabilitation organized by Prof. Alessandra Pedrocchi, ii) a minisymposium presenting the results of the H2020 Rehyb Project, iii) a workshop on the role of electrodes and stimulation parameters in the recruitment of nerves and muscle fibers for people interested in the basics but crucial fundamentals in the field of FES iv) three webinars on the restoration of bladder and bowel function following spinal cord injury (organized by Sean Doherty), the functionally relevant brain stimulation (organized by Luka Milosevic), and the feasibility and efficacy of FES for the upper limb in young children with unilateral cerebral palsy (organized by Kristin Musselman).

During all the breaks we tried to scale the virtual event with multiple floors and rooms created in the interactive platform, REMO (<https://remo.co/>), in order to allow easy networking opportunities between participants.

IFESS2021 in person event @Rovinj

The conference was held in Rovinj, Croatia at the Orthopaedic and Rehabilitation Hospital “Martin Horvat”. The event was organized by Prof. Dejan Popovic and Prof. Marinko Rade. In parallel, this conference hosted the XI External Control of Human Extremities (ECHE)

meeting, and the Summer School: Wearable robotics for rehabilitation for a total of 3 full days of science.

The opening session of IFESS 2021 included opening remarks from Professor Simona Ferrante, the president of IFESS, the welcome speech of Prof Marinko Rade, the welcome speech by the Croatian Ministry of Health, Prof Vili Beroš, by the Secretary of State of the Ministry of Health, prim.dr. Željko Plazonić and the director of the Croatian National Health Service dr. Lucian Vukelić who applauded the remarkable scientific level of the meeting and strongly advocated for follow up events.

The live event in Rovinj offered scientific presentations and from 25 countries, interactive sessions between FES specialists and surgical and non-surgical clinician, along with top-level keynotes given by ECHE academicians, and with hands-on applications as part of the Summer school - Wearable robotics for rehabilitation. Organizing a live event in a clinical setting as the Orthopaedic and Rehabilitation Hospital “Martin Horvat” allowed for specific clinical sessions on real life cases on Deep Brain Stimulation and Spinal Cord Stimulation. In the keynote sections, Prof. Vance Bergeron from Lyon, held an inspiring lecture on how Functional Electrical Stimulation has stimulated his life after the cervical trauma, and Prof. Miloš Popović from Toronto elucidated the use of Functional Electrical Stimulation to treat major depressive disorders.

The event was accompanied by face-to-face meetings and mingling in the beautiful and renowned summer destination Rovinj, which culminated in the surprise barbecue party at the hospital’s beach. The relaxed atmosphere allowed for organic interactions and exchange of information, intuitive scientific thinking and the creation of astonishing memories linked to IFESS

As said, in parallel with IFESS, the conference in Rovinj hosted also the XI External Control of Human Extremities (ECHE). The ECHE conference series started as “International Symposium on the Application of Automatic Control in Prosthetics Design” in 1963 in Opatija, at a time of societal separation between East and West in Europe and strict political borders, a more than remarkable achievement. The group Rajko Tomović, Prof. at Belgrade University, brought together was most impressive, with 42 leading scientists and influential leaders in rehabilitation medicine and innovative technology from former Yugoslavia and Hungary and 16 from Israel, Italy, Netherlands, Sweden, United Kingdom and USA, among them Norbert Wiener, founder of Cybernetics, just 6 months before his passing away. The first edition was entirely dedicated to upper and lower extremity prostheses and advanced control strategies, and the planning for continuation of this meeting format. After, a triannual series of conferences was established in Dubrovnik under the modified title “External Control of Human Extremities” (ECHE), in 1966, and later “Advances in External Control of Human Extremities”, with 9 editions till 1990. Already in 1966, the topical

spectrum was expanded to Functional Electrical Stimulation, numerous renown pioneers in the field participating and contributing over the years. In the art of FES, the meeting series doubtlessly played a key role in developing joint international activities like the Vienna International Workshop on FES and the foundation of IFESS. 58 years after the initiation of ECHE I-X in Opatija, Prof. Dejan Popovic brought the movement rehabilitation community back to the region at the Croatian coast, historic Rovinj with its 140 years tradition in hosting medical rehabilitation, and brought a group of time witnesses together to look back on main trendsetting achievement of ECHE in a dedicated special session, as one of the highlights of IFESS 2021.

Vodovnik Student Award

The full library of the abstracts of the parallel meeting can be found in this issue in the online format.

As every year IFESS run a student paper competition and assigns an award in honor to Dr. Lojze Vodovnik.

This year, IFESS awarded the three best student contributions presented in either of the two parallel conferences.

The Vodovnik Award Announcement session was held on Saturday the 25th of September at 12:00 on the terrace of the Hospital in Rovinj and was broadcasted in the Rehabweek virtual platform.

Dr. Matija Milosevic, the chair of the evaluation commission, presented the award ceremony. Prof Simona Ferrante, the IFESS President thanked all participants and organizers of the two events and opened the session. We were honoured to have an introduction to the memory of Dr Vodovnik by his friend and colleague Prof. Alojz Kralj, Professor Emeritus from the University of Ljubljana, Faculty of Electrical Engineering and Slovenian Academy of Sciences and Arts.

Roberto M. de Freitas, from Osaka University, Japan, was awarded First Place for the contribution titled “Development of an anatomically realistic cervical transcutaneous spinal cord stimulation model”.

Conor Keogh, from the University of Oxford, UK, was placed Second for the work titled “Non-invasive phrenic nerve stimulation to avoid ventilator induced diaphragm deconditioning in critical care: Parameters and optimization”. The Third Prize was given to Varshini Nandakumar from Bournemouth University, UK, for the contribution titled “Machine learning controlled adaptive functional electrical stimulation to assist walking”.

Conclusions

For IFESS 2021 was both a difficult but also very fruitful year. The COVID-19 pandemic posed a huge challenge to the society, but also rewarded IFESS with an increase of the membership base thanks to more activity and innovative approaches with more online events, webinars, virtual site visits, and the parallel IFESS 2021 conference

event. The hybrid approach allowed us to offer both worlds, socialising and celebrating a conference at the historic site and birth region of the IFESS, and at the same time offer to the travel restricted member base an interactive format with live site visits and a rich conference program for high level scientific dissemination. Joining Rehabweek 2021 also facilitated higher visibility outside the member base and the generous offer from AO to publish all conference abstracts helps us to leave a footprint of both great events for the current and future FES community. IFESS is very grateful for this and thanks to all authors for their quality contributions. Finally IFESS wishes to all readers interesting new readings and findings from the IFESS 2021 abstracts and contributions.