ISEK 2016 Program

Tuesday, July 5

Pre-Conference Workshops

Details of the pre-conference workshops can be found on [here](#).

Opening of ISEK Congress 2016

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<th>Time</th>
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<td>18:00 – 20:00</td>
<td>Opening Reception</td>
<td>Rehabilitation Institute of Chicago (RIC)</td>
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<td>345 E Superior St, Chicago, IL 60611</td>
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Wednesday, July 6

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<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tr>
<td>08:00 – 09:30</td>
<td>Keynote presentation</td>
<td>John Rogers, University of Illinois, USA</td>
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<td><em>Epidermal Electronics for Electrophysiological Kinesiology (Regency Ballroom)</em></td>
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<td>09:30 – 10:00</td>
<td>Break</td>
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<td>10:00 – 11:30</td>
<td>Parallel Sessions</td>
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<td>S.1.</td>
<td><em>Neuromechanics of Human Locomotor Stability: Theoretical Insights and Clinical Applications</em></td>
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<td>Chairs:</td>
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<td>James Finley, University of Southern California, USA</td>
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<td>Keith Gordon, Northwestern University, USA</td>
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<td>Inter-limb cutaneous feedback in walking balance: Early responses at the ankle to rapid light touch displacement at the fingertip during walking</td>
<td>John Misiaszek¹, Tania Shiva¹</td>
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<td>¹University of Alberta</td>
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<td>Perturbation Based Gait Training May Improve the Tradeoff of Stability and Maneuverability in Patients with Lower Limb Injury</td>
<td>Riley Sheehan¹, Jason Wilken¹, Jonathan Dingwell²</td>
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<td>¹Military Performance Lab, Center for the Intrepid, ²University of Texas at Austin</td>
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<td>Post-stroke deficits in a mediolateral gait stabilization strategy (and a possible intervention)</td>
<td>Jesse Dean¹</td>
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<td>¹Medical University of South Carolina</td>
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<td>The effect of balance perturbations after myelopathy related sensory deficits on cortical oscillations during walking</td>
<td>Joseph Lee¹, Brian Schmit¹</td>
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<td>¹Marquette University</td>
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<td>Cortical Correlates of Locomotor Adaptation to Perturbations of Symmetry</td>
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S.2. **Motor Unit Control**

**Chairs:** Joshua Kline, Delsys Inc., USA
Patrick Crago, Case Western Reserve University, USA

Synchronization studies require accurate motor unit firings and robust statistical tests
Joshua Kline¹, Carlo De Luca¹
¹Delsys, Inc

Assessing Motor Unit Pool Control Properties in Aging using Surface Electromyography
Xiaogang Hu¹, William Rymer², Nina Suresh²
¹University of North Carolina-Chapel Hill, ²Rehabilitation Institute of Chicago

Motor unit coherence and synchronization in response to sustained isometric contraction of the first dorsal interosseous muscle
Lara McManus¹, Xiaogang Hu², William Rymer³, Nina Suresh⁴, Madeleine Lowery¹
¹University College Dublin, ²University of North Carolina-Chapel Hill and North Carolina State University, ³Northwestern University, ⁴Rehabilitation Institute of Chicago

Homogeneity of the Relationship between Motor Unit Recruitment Thresholds versus Derecruitment Thresholds across Force Levels and the Lifespan
Matt Stock¹, Jacob Mota¹
¹Texas Tech University

Transposed firing activation of motor units during oscillatory contractions
Paola Contessa¹, Joshua Kline¹, Carlo De Luca²
¹Delsys Inc, ²Boston University, Delsys Inc

Biomechanical Benefits of the Onion-Skin Scheme of Motor Unit Firing
Carlo De Luca¹, Paola Contessa²
¹Boston University/Delsys Inc, ²Delsys Inc

(Regency Ballroom B)

O.1. **Rehabilitation Technologies I**

**Chairs:** Paolo Bonato, Harvard University, USA
Deanne Gates, University of Michigan, USA

O.1.1 A new wearable exoskeleton device that controls knee motion in individuals after stroke
Shihomi Kawasaki¹, Koji Ohata¹, Tadao Tsuboyama¹, Yuichi Sawada², Yoshiyuki Higashi²
¹Graduate School of Medicine, Kyoto University, ²Kyoto Institute of Technology

O.1.2 A Novel Device for Functional Strength Training during Gait: Evidence from Healthy and Stroke Subjects
Edward Washabaugh¹, Edward Claflin¹, Richard Gillespie¹, Chandramouli Krishnan¹
O.1.3 Gait Rehabilitation in Paediatric Population through a Novel Robotic Platform: Pilot study
Cristina Baruón¹, Eduardo Rocon¹
¹CSIC

O.1.4 The kinematic change for inverted pendulum during stance phase with assist of hip movement in individuals after stroke.
Koji Ohata¹, Shihomi Kawasaki¹, Yasushi Ikeuchi², Yosuke Nagata², Toru Takenaka²
¹Graduate school of Medicine, Kyoto University, ²Honda R&D Co., Ltd.

O.1.5 Measuring balance control on a treadmill: no need for shear forces
Ingrid Schut¹, Jolanda Roelofs², Jantsje Pasma¹, Herman van der Kooij³, Vivian Weerdesteyn², Alfred Schouten¹
¹Delft University of Technology, ²Radboud university medical center

O.1.6 The Effect that Joint Mobilization has on Propriospinal Reflexes and Pain
James Agostinucci¹, John McLinden¹
¹University of Rhode Island

O.2. Neuromechanics I
Chairs: Daniel Ludvig, University of Montreal, Canada
Karl Zelik, Vanderbilt University, USA

O.2.1 Task dependancy in Sensorimotor Training: Influence of free bipedal and unipedal stance on variance of soleus H-reflex amplitudes
Gunnar Wahmkow¹, Tilman Engel¹, Steffen Müller¹, Eduardo Martinez-Valdez¹, Kaplick Hannes¹, Frank Mayer¹
¹Potsdam University

O.2.2 Trunk Muscle Reflexes Are Elicited by Small Continuous Perturbations
Daniel Ludvig¹, Christian Larivièle²
¹University of Montreal, ²Occupational Health and Safety Research Institute Robert-Sauvé (IRSST)

O.2.3 Heteronymous models are needed to describe shoulder stretch reflexes
M. Hongchul Sohn¹, Emma Baillargeon¹, David Lipps², Eric Perreault³
¹Northwestern University, ²University of Michigan, ³Northwestern University and Rehabilitation Institute of Chicago

O.2.4 Nonlinear connectivity in the human stretch reflex revealed by nonlinear phase coherence and multisine perturbations
Yuan Yang¹, Teodoro Solis-Escalante¹, Jun Yao², Frans van der Helm¹, Julius Dewald², Alfred Schouten¹
¹Delft University of Technology, ²Northwestern University

O.2.5 Peri-patellar taps elicit regional stretch reflexes in the human vastus medialis
Alessio Gallina¹, Jean-Sébastien Blouin¹, Tanya Ivanova¹, S Jayne Garland²
¹University of British Columbia, ²University of Western Ontario

O.2.6 Evidence of Invariance in the Lower Leg Muscle's Response due to Stretch Reflex Excitation during Movement.
Diego Guarin¹, Robert Kearney¹
Parallel Sessions

11:30 – 13:00

O.3  EMG: modeling

Chairs: Madeleine Lowery, University College Dublin, Ireland
       Ted Clancy, Worcester Polytechnic Institute, USA

O.3.1  Comparison of EMG Feature Projection Techniques for Force Estimation
       Muhammad Asim Waris¹, Winnie Jensen¹, Kevin Englehart², Ernest Kamavuako¹
       ¹Aalborg University, ²University of New Brunswick

O.3.2  Periods of non-stationarity indicate motor unit recruitment in the tibialis anterior muscle of
       young healthy adults
       Shanette Go¹, William Litchy¹, Carlos Mantilla¹, Gary Sieck¹, Kenton Kaufman¹
       ¹Mayo Clinic

O.3.3  Two Degrees of Freedom EMG-Force at the Wrist in Able-Bodied Subjects Using a Minimum
       Number of Electrodes: Pilot Testing of Limb-Absent Subjects
       Edward Clancy¹, Carlos Martinez-Luna², Marek Wartenberg¹, Todd Farrell²
       ¹Worcester Polytechnic Institute, ²Liberating Technologies, Inc.

O.3.4  A comparison of Spike Shape Measures from Surface and Indwelling Electromyography during
       Elbow Flexion Isometric Ramp Contractions
       Lara Green¹, Anita Christie², J. Greig Inglis¹, David Gabriel¹
       ¹Brock University, ²University of Oregon

O.3.5  On the Usability of Rejection Capable Support Vector Machines in an Online Virtual Targeting
       Task
       Jason Robertson¹, Kevin Englehart¹, Erik Scheme¹
       ¹University of New Brunswick

O.3.6  Towards Improving the Training of Pattern Recognition Based Myoelectric Control
       Kadie Wright¹, Kevin Englehart¹, Erik Scheme¹
       ¹Institute of Biomedical Engineering

(Regency Ballroom A)

O.4  Rehabilitation Technologies II

Chairs: Patrick Crago, Case Western Reserve University
       Julius Dewald, Northwestern University

O.4.1  Cranial Nerve Non-Invasive Neuromodulation for Symptomatic Treatment of Mild and Moderate
       Traumatic Brain Injury - Effects on Muscle Coordination Patterns during Walking
       Samuel Acuña¹, Mitchell Tyler¹, Yuri Danilov¹, Darryl Thelen¹
       ¹University of Wisconsin-Madison

O.4.2  What does the CNS see during electrically stimulated muscle contractions?
       Patrick Crago¹
Does the distance between electrodes markedly affect the knee extension torque elicited in tetanic, stimulated contractions?
Taian Vieira¹, Laura Gastaldi¹, Alberto Botter¹
¹Politecnico di Torino

Sensory and Motor Thresholds for Surface Electrical Stimulation of Median and Ulnar Nerves at Elbow for Sensory Feedback
Marjolein Eiselina Thijssen¹, Petr Sipka¹, Søren Larsen¹, Mai Kristiane Thomsen¹, Eugen Romulus Lontis¹, Winnie Jensen¹
¹Aalborg University

The effect of rehabilitation with the neuromuscular electrical stimulation after femoral neck fracture surgery -Short term intervention reports-
Daisuke Bai¹, Mitsunori Tokuda¹, Yuki Fujimori¹, Yuki Kameguchi¹, Munehiro Ogawa², Yasuhito Tanaka²
¹Heisei Memorial Hospital, ²Nara Medical University

The cortical adaptation monitoring system for leg press machine with FES induced biofeedback
Misato Kasuya¹, Mai Nozakura¹, Soichiro Morishita¹, Yinlai Jiang¹, Masao Sugi¹, Hiroshi Yokoi¹
¹The University of Electro-Communications

O.5 Neuromechanics II
Chairs: Minoru “Shino” Shinohara, Georgia Tech
Karl Zelik, Vanderbilt University, USA

Effect of Lower Extremity Efforts on Involuntary Upper Extremity Activity in Chronic Hemiparetic Stroke: Preliminary Findings
Rachel Hawe¹, Jules Dewald¹
¹Northwestern University

Variability in neuromotor control of the musculoskeletal system dynamics: a stochastic modelling approach.
Bart van Veen¹, Saulo Martelli², Claudia Mazzà¹, Erkki Somersalo³, Daniela Calvetti³, Marco Viceconti³
¹University of Sheffield, ²Flinders University, ³Case Western Reserve University

From muscle-tendon to whole-body dynamics: towards a multi-scale empirical understanding of human movement biomechanics
Karl Zelik¹
¹Vanderbilt University

The same library of muscle synergies are shared across diverse locomotor tasks
Jessica Allen¹, Andrew Sawers², Lena Ting¹
¹Emory University, ²University of Illinois at Chicago

Decreasing the lumbar flexion moment induces earlier onset of flexion relaxation
Derek Zwambag¹, Diana De Carvalho², Stephen Brown¹
¹University of Guelph, ²Memorial University of Newfoundland

Estimation of Ankle Impedance During Walking on a Slippery Surface
O.6 Motor Units I
Chairs: Kevin Keenan, University of Wisconsin, USA
Paola Contessa, Boston University, USA

O.6.1 Motor units in the human medial gastrocnemius muscle are not spatially localized or functionally grouped
Martin Héroux¹, Harrison Brown², John Inglis², Gunther Siegmund³, Jean-Sébastien Blouin²
¹Neuroscience Research Australia, ²University of British Columbia, ³MEA Forensic Engineers & Scientists

O.6.2 Motor Unit Action Potential Clustering
Michael Asmussen¹, Vinzenz von Tscharner¹, Benno Nigg¹
¹University of Calgary

O.6.3 EMG envelope and tension oscillations during steady fine motor control
Claudio Orizio¹, Francesco Negro², Marta Cogliati¹, Anna Castronovo², Dario Farina²
¹University of Brescia, ²University Medical Center Göttingen

O.6.4 Using the Size Principle to Model Peripheral Muscle Fatigue
Jim Potvin¹, Andrew Fuglevand²
¹McMaster University, ²University of Arizona

O.6.5 Features for tracking spatial intra-cortical, electrophysiological changes in a rat model of ischemic stroke
Rasmus Nielsen¹, Winnie Jensen¹
¹Sensory-Motor Interaction

(Regency Ballroom D)

13:00 – 14:00 Lunch & Posters

14:00 – 15:00 Keynote Presentation

Birgit Juul-Kristensen, University of Southern Denmark, Denmark
Why is it important to use EMG in Clinical research of musculoskeletal disorders
(Regency Ballroom)

15:00 – 15:30 Break

15:30 – 17:00 Parallel Sessions

S.3. Muscle mechanics and neural control determining fine hand-motor tasks
Chairs: Dick F. Stegeman, Radboud University Medical Centre, Netherlands
Huub Maas, VU University, Netherlands

Mechanical factors limiting finger independence
Huub Maas¹, Nathalie van Beek¹, Josien van den Noort², Dick Stegeman³
The Effect of the Subsynovial Connective Tissue in the Carpal Tunnel On Finger Motion In Health And Disease
Peter Amadio¹
¹Mayo Clinic

Neuromuscular control of extrinsic flexors and extensors during single finger movements
Nathalie van Beek¹, Dick Stegeman², Josien van den Noort³, DirkJan Veeger¹, Huub Maas¹
¹Vrije universiteit Amsterdam, ²Radboud University Medical Centre, ³VU University medical center

Base vectors in complex finger movements
Sigrid Dupan¹, Naveed Ejaz², Dick Stegeman¹, Joern Diedrichsen²
¹Donders Institute for Brain, Cognition, and Behaviour, ²The Brain and Mind Institute

Correlated deficits in bi-lateral hand function following unilateral stroke
Naveed Ejaz¹, Jing Xu², Benjamin Hertler³, Meret Branscheidt², Mario Widmer³, Nathan Kim², Michelle Harran⁴, Juan Cortes⁴, Andreia Faria², Pablo Celnik², Tomoko Kitago⁴, Andreas Luft⁵, John Krakauer², Jörn Diedrichsen⁵
¹University College London, ²Johns Hopkins University, ³University of Zürich, ⁴Columbia University, ⁵University of Western Ontario

Wrist posture and force effects on finger control
Peter Keir¹, Stephen May¹
¹McMaster University

(Regency Ballroom A)

S.4. Neuromodulatory Strategies for Improving Motor Control after CNS Damage

Chairs: Aiko K. Thompson, University of South Carolina, USA
Jonathan R. Wolpaw, New York State Dept Health, USA

Novel neuromodulation strategies for Parkinson's disease
Robert Chen¹
¹Toronto Western Hospital, University of Toronto

Plasticity in the Corticospinal Pathway after Human Spinal Cord Injury
Monica Perez¹
¹University of Miami

Acute Intermittent Hypoxia Enhances Neuroplasticity In Incomplete Sci
William Rymer¹, Milap Sandhu¹, Arun Jayaraman¹
¹Rehabilitation Institute of Chicago

Changing a reflex to improve walking: operant conditioning of the soleus h-reflex in people with chronic incomplete spinal cord injury
Aiko Thompson¹
¹Medical University of South Carolina
Stimulation-induced plasticity in corticospinal transmission to motoneurones
Janet Taylor¹, Siobhan Donges¹, Jessica D’Amico¹
¹Neuroscience Research Australia

Using targeted neuroplasticity for rehabilitation
Jonathan Wolpaw¹
¹Wadsworth Center (NY State Dept. of Health) and SUNY Albany

(Regency Ballroom B)

S.5. Joint ISEK-ISB symposium

Chairs: Karen Søgaard, University of Southern Denmark, Denmark
Glen Lichtwark, University of Queensland, Australia

Introduction:
Catherine Disselhorst-Klug, RWTH Aachen University, Germany

Forearm muscle activity differs during gripping in people with tennis elbow compared to healthy individuals.
Nagarajan Manickaraj¹, Leanne M Bisset², Justin J Kavanagh²
¹PhD Student, Griffith University, ²Griffith University

An electromyographic evaluation of elastic band exercises targeting neck and shoulder pain
Thomas Grøndberg¹, Lars Kristensen¹, Ying Gao ², Mike Murray¹, Gisela Sjøgaard¹, Karen Søgaard¹
¹University of Southern Denmark, ²University of Jyväskylä

Neck pain: Do head movement qualities change during an intensive treatment period?
Marit Thielemann¹, Nina Vøllestad¹
¹University of Oslo

The additional value of electromyography in system identification and parameter estimation to assess the contribution of underlying systems in standing balance
Jantsje Pasma¹, Joost van Kordelaar², Digna de Kam³, Vivian Weerdesteyn³, Alfred Schouten¹, Herman van der Kooij²
¹Delft University of Technology, ²University of Twente, ³Radboud University Medical Center

Intrinsic foot muscle activity in response to different loading conditions
Andrew Cresswell¹, Glen Lichtwark¹, Luke Kelly¹
¹The University of Queensland

(Regency Ballroom C)

S.6. Stepping out of the lab: EMG in daily life

Chairs: Kat M. Steele, University of Washington, USA
Andrew Sawers, University of Illinois, USA

Fully-Integrated Stretchable Epidermal Electronics and Biosensors
Roozbeh Ghaffari¹
¹MC10 Inc.

A Wireless Surface EMG System for Daily Activity Measurement
Yi Su¹, Sudhamayee Routhu¹, Kee Moon¹, Yusuf Ozturk¹
¹San Diego State University

Tattoo-like, long-term electromyography sensors for quantifying muscle fatigue and recovery
Nanshu Lu¹, Luke Nicolini¹, Dragan Djurdjanovic¹
¹University of Texas at Austin

EMG-based Online Intent Recognition for a Powered Lower Limb Prosthesis
John Spanias¹, Eric Perreault¹, Levi Hargrove²
¹Northwestern University, Rehabilitation Institute of Chicago, ²Rehabilitation Institute of Chicago, Northwestern University

NeuroGame Therapy for the Improvement of Ankle Control in Children with Cerebral Palsy
Torey Gilbertson¹, Sarah McCoy¹, Kristie Bjornson², Robert Price³, Chet Moritz¹
¹University of Washington, ²Seattle Children's Research Institute, University of Washington

Backyard Brains: Using EMGs as an entry into neuroscience education
Gregory Gage⁴
⁴Backyard Brains

(Regency Ballroom D)

17:00 – 18:30  **Poster Session I (Crystal Ballroom)**

End of Day 1
Thursday July 7th

08:00 – 09:00 **Keynote Presentation**

Irene Davis, Harvard Medical School, USA
*The Foot Core: A new paradigm*
(Regency Ballroom)

09:00 – 09:30 **Break** (Crystal Ballroom)

09:30 – 11:00 **Parallel Sessions**

**S.7. Synchrony and frequency in neuromuscular control**

**Chairs:** Francisco Valero-Cuevas, University of Southern California, USA
Christopher Laine, University of Southern California, USA

Synchrony and frequency in neuromuscular control
Christopher Laine¹
¹Univ of Southern California

Motor control of upper airway dilator muscles
John Trinder¹
¹University of Melbourne

Investigating neural strategies for muscle coordination
Christopher Laine¹, Francisco Valero-Cuevas¹
¹University of Southern California

Investigating the neural substrate of motor coordination using muscle networks
Tjeerd Boonstra¹
¹University of New South Wales

Motor unit synchronization revisited: Estimating the proportion of common synaptic inputs to population of motor neurons in humans
Francesco Negro¹, Utku Şükru Yavuz¹, Dario Farina¹
¹Universitätsmedizin Göttingen

Sensitivity of intermuscular coherence to identify common oscillatory synaptic inputs to motor neurons
Kevin Keenan¹, Francesco Negro², Dario Farina², Roger Enoka³
¹University of Wisconsin-Milwaukee, ²Georg-August University, ³University of Colorado

(Regency Ballroom A)

**S.8. Neuromuscular Electrical Stimulation: Time to Turn the Page**

**Chairs:** Nicola Maffiuletti, Schulthess Clinic, Switzerland
Marco Minetto, University of Turin, Italy

Maximising the central contribution to electrically-evoked contractions
David Collins¹, Matheus Wiest¹, Austin Bergquist²
¹University of Alberta, ²University of Toronto
Introduction and Conclusion to the symposium "Neuromuscular Electrical Stimulation: Time to Turn the Page"
Nicola Maffiuletti¹, Marco Minetto²
¹Schulthess Clinic, ²University of Turin

Predictors of response to neuromuscular electrical stimulation training
Marco Alessandro Minetto¹, Isabelle Vivodtzev², Giuseppe Massazza¹, Nicola Maffiuletti³
¹University of Turin, ²Univ Grenoble Alpes and Inserm U 1042, ³Schulthess Clinic

Spatially Distributed Sequential Stimulation: Method to Reduce Muscle Fatigue During Transcutaneous Functional Electrical Stimulation
Kei Masani¹, Dmitry Sayenko², Robert Nguyen³, Vishvek Babbar⁴, Tomoyo Hirabayashi⁵, Austin Berquist⁴, Milos Popovic⁴
¹Toronto Rehab and University of Toronto, ²University of California, ³ETH Zurich, ⁴University of Toronto and Toronto Rehab, ⁵Toronto Rehab

An Algorithm for NMES Therapy after Knee Surgery: A Novel Structured Approach
Jennifer Stevens-Lapsley¹, Andrew Kittelson¹, Yocheved Laufer², Michal Elboim-Gabyzon², Nicola Maffiuletti³
¹University of Colorado, Anschutz Medical Campus, ²University of Haifa, ³Shulthess Clinic

Low-frequency pulsed currents vs. kHz-frequency alternating currents
Marco Vaz¹
¹Federal University Of Rio Grande Do Sul

(Regency Ballroom B)

O.7 EMG: signal processing
Chairs: Lucas J. McKay, Emory University, USA
Winnie Jensen, Aalborg University, Denmark

O.7.1 Optimum threshold for slope sign changes and zero crossing features.
Asim Waris¹, Rosa Hugosdottir¹, Julie Gade¹, Kevin Englehart², Erik Scheme², Ernest Nlandu Kamavuako¹
¹Aalborg University, ²University of New Brunswick

O.7.2 Variability of Features Extracted from sEMG Signal
Yiyang Shi¹, Dawn MacIsaac¹, Philip Parker¹
¹University of New Brunswick

O.7.3 Wavelet-based functional ANOVA to reveal statistically-significant contrasts between EMG waveforms recorded in different experimental conditions
J. Lucas McKay¹, Torrence Welch¹, Brani Vidakovic¹, Lena Ting¹
¹Emory University and Georgia Tech

O.7.4 Nonnegative matrix factorization to assess spatiotemporal muscle activation
Didier Staudenmann¹, Andreas Dafertshofer², Dick Stegeman³, Jaap van Dieen²
¹University of Fribourg, Movement and Sport Science, ²Vrije Universiteit Amsterdam, ³Radboud University Medical Centre

O.7.5 Analysis of amplitude estimation of non-stationary myoelectric signals
David Hofmann¹
¹Emory University
Kate Bibbings¹, Peter Harding¹, Nick Combes², Ian Loram¹, Emma Hodson-Tole¹
¹Manchester Metropolitan University, ²Preston Royal Hospital

Motor performance and Ergonomics

Chairs: Peter Keir, McMaster University, Canada
Usha Kuruganti, University of New Brunswick, Canada

The surgeon’s workload; traditional laparoscopic (TLS) versus robot-assisted (RAS) surgery
Bente Rona Jensen¹, Morten Dedenroth¹, Dorte Hartwell¹, Berit Mosgaard¹, Annemette Jørgensen², Torur Dalsgaard¹
¹University of Copenhagen, ²Aalborg University Hospital

Characterizing changes in neuromuscular control in response to different locomotor tasks using electromyographic wavelet analysis
Linard Filli¹, Martina Waser¹, Christopher Easthope², Tim Killeen², Christian Meyer¹, Lilla Loerincz¹, Armin Curt², Marc Bolliger², Bjoern Zoerner¹
¹University Hospital Zurich, ²Balgrist University Hospital

Temporal trunk muscle patterns are altered ipsilateral to back injury side despite perception of recovery
D Adam Quirk¹, Cheryl Hubley-Kozey¹
¹Dalhousie University

Computer mouse design and ergonomic mouse pads influence wrist angle, forearm extensor and upper trapezius muscle activity
David MacDonald¹, Sharika Udipi¹, Kylie Tucker¹, Sharika Udipi¹, Hweekoon Yeo¹, Torbjorn Selas¹, Michel Coppieters¹
¹The University of Queensland, ²Vrije Universiteit Amsterdam

Surface electromyographic inter-individual variability and pattern recognition in front crawl swimming
Jonas Martens¹, Daniel Daly¹, Kevin Deschamps¹, Filip Staes¹, Ricardo Fernandes²
¹KU Leuven, ²University of Porto

Posture variation and maximal acceptable work pace during repetitive work
Tessy Luger¹, Svend Erik Mathiassen², Tim Bosch³, Marco Hoozemans¹, Marjolein Douwes³, DirkJan Veeger¹, Michel de Looze¹
¹Vrije Universiteit Amsterdam, ²University of Gävle, ³TNO

EMG: novel applications

Chairs: Joshua Kline, Delsys Inc., USA
Jon Shemmel, University of Otago, New Zealand
O.9.1 Changes in the surface electromyographic signal during high intensity fatiguing dynamic exercise
Clare Davidson¹, Giuseppe De Vito¹, Madeleine Lowery¹
¹University College Dublin

O.9.2 Feasibility of uterine electromyography outside pregnancy
Chiara Rabotti¹, Federica Sammali¹, Nienke Kuijsters², Benedictus Schoot³, Massimo Mischi¹
¹Eindhoven University of Technology, ²Catharina Hospital, ³University Hospital Gent

O.9.3 Nonlinear Analysis of Electromyography in Parkinson's Disease During Isometric Leg Extension
Matthew Flood¹, Bente Jensen², Anne Malling³, Martin Rose³, Madeleine Lowery¹
¹University College Dublin, ²University of Copenhagen, ³University of Copenhagen

O.9.4 Chronic EMG activity reveals early changes in muscle activation in treadmill running SOD1 mice
Katharina Quinlan¹, CJ Heckman¹, Matthew Tresch¹, Vicki Tysseling¹
¹Northwestern University Feinberg School of Medicine

O.9.5 The gluteus medius, gluteus minimus and tensor fascia latae are more active during gait in post-menopausal women with greater trochanteric pain syndrome
Charlotte Ganderton¹, Tania Pizzari¹, Adam Semciw²
¹La Trobe University, ²University of Queensland

O.9.6 Quadratus femoris is minimally active in common rehabilitation exercises
Adam Semciw¹, Jodie McClelland², Damien Moore², Tania Pizzari²
¹The University of Queensland, ²La Trobe University

(Regency Ballroom A)

O.10 Sensorimotor control and learning
Chairs: Keith Gordon, Northwestern University, USA
José Luis Pons, Cajal Institute CSIC, Spain

O.10.1 Locomotor Adaptation to Stable and Unstable Environments
Keith Gordon¹, Mengnan Wu¹, Geoffery Brown¹
¹Northwestern University

O.10.2 Hybrid Robotic System for Reaching Rehabilitation after Stroke
Francisco Resquin¹, Jose Gonzalez-Vargas¹, Jaime Ibañez¹, Fernando Brunetti², Iris Dimbwadyo³, Susana Alves⁴, Laura Carrasco³, Laura Torres³, José Luis Pons¹
¹Spanish National Research Council, ²Catholic University Nuestra Señora de la Asunción, ³La Salle, ⁴Centro de Referencia Estatal de Atención al Daño Cerebral

O.10.3 Size of kinematic error affects retention of locomotor adaptation in children with cerebral palsy
Rongnian Tang¹, Janis Kim¹, Deborah J Gaebler-Spira¹, Ming Wu¹
¹Rehabilitation Institute Of Chicago

O.10.4 Motor learning with pain results in long-lasting changes in motor strategies
Sauro Salomoni¹, Welber Marinovic¹, Timothy Carroll¹, Paul Hodges¹
¹The University of Queensland

O.10.5 Factors affecting smoothness of head movements
Marit Thielemann¹, Nina Vøllestad¹
O.10.6 Multichannel SEMG activity and force variability during isometric contractions at low level forces in diabetic individuals
Eneida Y Suda¹, Isabel CN Sacco¹, Thiago T Kawamura¹, Rogerio P Hirata², Afshin Samani², Pascal Madeleine³
¹University of São Paulo, ²Aalborg University

O.11 Novel measurement techniques
Chairs: Oliver Kannape, University of Central Lancashire, UK
Chris Thompson, Temple University

O.11.1 High density multi-channel needle electromyography: towards electrical cross-sectional imaging of human skeletal muscle
Bashar Sheikh Hasan¹, Enrique Escobedo-Cousin³, Hock Soon Low³, Anthony O'Neill³, Stuart Baker¹, Roger Whittaker¹
¹Newcastle University

O.11.2 Spatiotemporal muscle activation of a sustained contraction until task failure assessed with nonnegative matrix factorization
Didier Staudenmann¹, Andreas Daffertshofer², Dick Stegeman³, Roger Enoka⁴
¹University of Fribourg, Movement and Sport Science, ²Move Research Institute / Vrije Universiteit Amsterdam, ³Donders Institute / Radboud University Medical Centre, ⁴Department of Integrative Physiology / University of Colorado

O.11.3 Monitoring changes in motor unit behavior following short-term high intensity interval training with high-density surface electromyography motor unit tracking
Eduardo Martinez-Valdes¹, Deborah Falla², Francesco Negro², Frank Mayer¹, Dario Farina²
¹University of Potsdam, Potsdam, Germany, ²University Medical Center Göttingen, Georg-August University, Göttingen, Germany

O.11.4 Neuromuscular control adaptations in strength trained athletes: a high-density EMG study
Alessandro Del Vecchio¹, Federico Quinzi¹, Ilenia Bazzucchi¹, Luigi DI Luigi¹, Francesco Felici¹
¹University of Rome "Foro Italico"

O.11.5 Assessing somatosensory evoked potentials using high density surface electromyography grids
Tessy Luger¹, Andreas Daffertshofer¹
¹Vrije Universiteit Amsterdam

O.11.6 Design of New Multi-channel Electrodes for the Collection of Surface Electromyography
Monopolar Signals for the Software Generation Signals for Linear Array and Laplacian Configurations for Digital Signal Processing
Jeff Kilby¹, Krishnamachar Prasad³, Grant Mawston¹
¹Auckland University of Technology

O.12 Motor Units II
Chairs: Nina Suresh, Northwestern University, USA
Kevin McGill, VA Palo Alto Health Care System, USA
O.12.1 Comparison of Five Methods for Estimating Motor Unit Firing Rates from Firing Times
Lukai Liu¹, Paolo Bonato², Edward Clancy¹
¹Worcester Polytechnic Institute, ²Spaulding Rehabilitation Hospital & Harvard Medical School

O.12.2 The common synaptic input signal underlying the common drive
Kevin McGill¹, Zoia Lateva¹, M. Elise Johanson¹
¹VA Palo Alto Health Care System

O.12.3 Assessment of single motor unit activation in central and peripheral neuronal disorders
Kathrin Koch¹, Catherine Desselhorst-Klug¹
¹RWTH Aachen University

O.12.4 Modulation of motor units serving different VM fibers during knee extension
Hélio Cabral¹, Leonardo de Souza¹, Roger Mello², Liliam Oliveira¹, Taian Vieira¹
¹Universidade Federal do Rio de Janeiro, ²Escola Naval/Marinha do Brasil

O.12.5 Initial estimates of motoneuron after-hyperpolarization through the tonic discharge of motor unit populations
Iva Stojkovska¹, Michael Johnson¹, Francesco Negro², Matthieu Chardon¹, Dario Farina², Charles Heckman¹, Chris Thompson³
¹Northwestern University, ²University Medical Center, Georg-August University, ³Temple University

O.12.6 The Temporal Structure of Intermuscular Motor Unit Synchronization: Application of Wavelet Coherence
Maurice Mohr¹, Vinzenz von Tscharner¹, Benno Nigg¹
¹University of Calgary

(Regency Ballroom D)

12:30 – 13:30  Lunch & Posters  (Crystal Ballroom)

13:30 – 14:30  Keynote Presentation – The Basmajian Lecture

W. Zev Rymer, Rehabilitation Institute of Chicago (RIC), USA
Clinical Applications for advanced electromyographic techniques: A field in transition
(Regency Ballroom)

14:30 – 15:00  Break  (Crystal Ballroom)

15:00 – 16:30  Parallel Sessions

S.9. Implementation of Impairment Based Neuro-Rehabilitation Devices and Technologies following Brain Injury
Chairs: Julius Dewald, Northwestern University, USA
Michael Ellis, Northwestern University, USA

The use of haptic robots to study neural mechanisms underlying the expression of sensorimotor impairments in stroke.
Julius Dewald¹, Albert Chen², Jun Yao¹
¹Northwestern University Feinberg School of Medicine, ²Athenahealth
Robotic assessment of the "good arm" following stroke
Sean Dukelow¹, Jennifer Semrau¹, Troy Herter², Stephen Scott³
¹Hotchkiss Brain Institute/University of Calgary, ²University of South Carolina, ³Queen's University

Robotic Measurement and Intervention for Synergy-Related Reaching Dysfunction Following Stroke
Michael Ellis¹, Julius Dewald¹
¹Northwestern University

Using Robotic Systems to Assess Proprioceptive Deficits in Individuals with Hemiparetic Stroke
Netta Gurari¹
¹Northwestern University

Training modalities in robot-mediated upper limb rehabilitation in stroke
Arno Stienen¹
¹University of Twente

4D EEG: Assessing the role of the sensorimotor cortex in reflex modulation during motor control.
Frans van der Helm¹, Yuan Yang¹, T Solis-Escalante¹, M Vlaar¹, Jun Yao², Jules Dewald², Alfred Schouten¹
¹Delft University of Technology, ²Northwestern University

(S.10. Neural mechanisms underlying falls and impaired balance: an introspective from animal to patient)

Chairs: Claire Honeycutt, Arizona State University, USA
Jacques Duysens, Katholieke Universiteit Leuven, Belgium

Are hypermetric stretch reflexes significant contributors to falls in stroke survivors?
Claire Honeycutt¹, Mark Grabiner²
¹Arizona State University, ²University of Illinois at Chicago

Strategies to maintain static and dynamic lateral stability during locomotion in the cat
Boris Prilutsky¹, Hangue Park¹, Ricky Mehta¹, Joshua Jarrell¹, Stephen DeWeerth¹, Bradley Farrell²
¹Georgia Institute of Technology, ²Georgia State University

New rehabilitation tools and technologies to improve balance and mobility
Joyce Fung¹
¹McGill University

Balance reactions following perturbations to touch are more pronounced when standing on an unstable surface
John Misiaszek¹, Jesse Vander Meulen¹
¹University of Alberta

Basic insights in tripping responses can assist in designing appropriate fall prevention programs.
Jacques Duysens¹, Zrinka Potocanac²
¹Katholieke Universiteit Leuven, ²Jozef Stefan Institute

Altered sensorimotor transformations for balance in Parkinson's disease
J. Lucas McKay¹, Madeleine Hackney², Lena Ting¹
¹Emory University and Georgia Tech, ²Emory University and Atlanta VAMC

(Regency Ballroom B)
EMG Signal Analysis in Clinical Applications

**Chairs:** Madeleine Lowery, University College Dublin, Ireland
Edward (Ted) Clancy, Worcester Polytechnic Institute, USA

The use of EMG in neuromuscular diagnosis: an overview
Dick Stegeman¹
¹Radboud University Medical Centre

A novel method for analysis of pathological tremor in electroencephalograms
Ales Holobar¹, Juan Gallego², Rok Istenic¹, Eduardo Rocon², Juan Romero³, Julian Benito-Leon⁴, José Pons⁵, Vojko Glaser¹
¹University of Maribor, ²Spanish National Research Council, ³School of Biomedical Sciences, Universidad Francisco de Vitoria, ⁴University Hospital "12 de Octubre", Madrid, Spain, ⁵Cajal Institute, Spanish National Research Council

High Density Surface EMG Examination of Motor Unit Firing Behavior in Amyotrophic Lateral Sclerosis
Faezeh Jahanmiri-Nezhad¹, Ales Holobar², William Rymer³, Ping Zhou⁴
¹University of Northern Iowa, ²University of Maribor, ³Rehabilitation Institute of Chicago, ⁴University of Texas Health Science Center at Houston

A novel device for assessing pelvic floor muscle function in women
Stéphanie Madill¹, Angelica Lang¹, Gordon Sarty¹
¹University of Saskatchewan

Alterations in motor unit firing rate and action potential properties during isometric fatigue in stroke survivors
Lara McManus¹, Xiaogang Hu², William Rymer³, Madeleine Lowery¹, Nina Suresh⁴
¹University College Dublin, ²University of North Carolina-Chapel Hill and North Carolina State University, ³Rehabilitation Institute of Chicago and Northwestern University, ⁴Rehabilitation Institute of Chicago

Contribution of deep and superficial motor units to the surface EMG of the masseter muscle.
Johannes van Dijk¹, Ulrike Eiglsperger¹, Johanna Radeke¹, Hans Schindler², Bernd Lapatki¹
¹University of Ulm, ²University of Heidelberg

Spastic muscle and its treatment using botulinum toxin: new viewpoints with major implications

**Chairs:** Can A. Yucesoy, Boğaziçi University, Turkey
Richard Lieber, Rehabilitation Institute of Chicago, USA

Experimental and Modeling Assessments Specific to Treatment Aims Indicate New Viewpoints and an Understanding of Mechanisms of Effects of Botulinum Toxin Type A
Can Yucesoy¹, Filiz Ates²
¹Bogazici University, ²Waseda University

Structural and Functional Consequences of Neurotoxin injection in a Rat Model System
Richard Lieber¹, Samuel Ward²
¹Northwestern University, ²University of California, San Diego
The effect of botulinum toxin injections on gastrocnemius muscle volume in children with spastic cerebral palsy
Adam Shortland¹
¹Guy's & St Thomas' Foundation Trust

Muscle material properties in children with hemiplegic cerebral palsy
Sabrina Lee¹, Deborah Gaebler-Spira¹, Li-Qun Zhang¹, William Rymer², Katherine Steele³
¹Northwestern University, ²Rehabilitation Institute of Chicago, ³University of Washington

Persistent muscle weakness and contractile material loss in a clinically relevant botulinum toxin type-a (btx-a) injection protocol
Rafael Fortuna¹, Andrew Sawatsky¹, Walter Herzog¹
¹University of Calgary

Intraoperative Testing of Individual Spastic Knee Flexor Muscles’ Capacity to Affect Impeded Knee Joint Function in Cerebral Palsy Patients
Filiz Ates¹, Yener Temelli², Can Yucesoy³
¹Waseda University, ²Istanbul University, ³Bogazici University

(Regency Ballroom D)

16:30 – 18:30  Poster Session II  (Crystal Ballroom)

19:30 – 23:00  Conference Banquet
The Mid America Club
200 East Randolph Drive, 80th Floor, Aon Center, Chicago, IL 60601

Friday July 8th

08:00 – 09:30  Parallel Sessions

S.13.  Prosthetics to Orthotics: Transferable Expertise
Chairs: Kostas Nizamis, University of Twente, Netherlands
Arno Stienen, University of Twente, Netherlands

The state-of-the-art EMG control in dynamic orthoses
Derek Kamper¹
¹Illinois Institute of Technology

Unassisted FES is all you need to regain hand function
Thierry Keller¹
¹Tecnalia Research and Innovation

Direct mechanical control outperforms EMG control
Dick Plettenburg¹
¹Delft University of Technology

Surface EMG control in neurorehabilitation: experiences from EMG-driven modelling and robotic for upper and lower limb post-stroke rehabilitation
Dario Farina¹, Massimo Sartori¹, Andrea Turolla²
¹University Medical Center Goettingen, ²IRCCS San Camillo Hospital Foundation
The case for impedance control in wearable robotics
Elliott Rouse¹
¹RIC / Northwestern University

Structured panel discussion on prosthetics to orthotics: transferrable expertise
Arno Stienen¹
¹University of Twente

(Regency Ballroom A)

S.14. Clinical applications of muscle synergies
Chairs: Kat M. Steele, University of Washington, USA
Jessica Allen, Georgia Tech, USA

Function and dysfunction in brain connectivity coordinating muscle synergies in humans
Jason Kutch¹
¹University of Southern California

Does modularity in post-stroke motor coordination differ in dynamic and static tasks?
Jinsook Roh¹, Kevin Wilger¹, William Rymer², Randall Beer³
¹Temple University, ²Northwestern University, ³Rehabilitation Institute of Chicago

Neuromotor modules as markers of diseased states and progress of motor recovery
Vincent C. K. Cheung¹, Giacomo Severini², Paolo Bonato³, Andrea Turolla⁴, Roy T. H. Cheung⁵
¹The Chinese University of Hong Kong, ²University College Dublin, ³Harvard Medical School, ⁴IRCCS San Camillo Hospital, ⁵The Hong Kong Polytechnic University

Synergistic changes in muscle coordination post-stroke in a locomotor learning task
Gelsy Torres-Oviedo¹, Pablo Iturralde¹
¹University of Pittsburgh

Do muscle synergies change after treatments in cerebral palsy?
Benjamin Shuman¹, Marije Goudriaan², Kaat Desloovere³, Michael Schwartz³, Katherine Steele¹
¹University of Washington, ²KU Leuven, ³Gillette Children's Specialty Healthcare

Long-term training modifies the modular structure and organization of walking balance control
Andrew Sawers¹, Jessica Allen², Lena Ting²
¹University of Illinois at Chicago, ²Emory University

(Regency Ballroom B)

O.13 Muscle Physiology
Chairs: Rick Leiber, Rehabilitation Institute of Chicago, USA
Tom Sandercock, Northwestern University, USA

O.13.1 Passive stiffness of lumbar multifidus and erector spinae muscle fibres is decreased in ENT1 deficient mice
Kelsey Gsell¹, Derek Zwambag¹, Cheryle Séguin², Stephen Brown¹
¹University of Guelph, ²Western University
O.13.2 High-resolution in vivo measurement of changes in architecture of the human medial gastrocnemius muscle during passive lengthening
Bart Bolsterlee¹, Arkiev D'Souza¹, Simon Gandevia¹, Robert Herbert¹
¹Neuroscience Research Australia (NeuRA)

O.13.3 Inhomogeneity of electromyography- and ultrasound-detect ed onset of voluntary muscle activation explains their inconsistent relationship
Angela Dieterich¹, Alberto Botter², Taian Vieira², Anneli Peolsson³, Frank Petzke¹, Paul Davey⁴, Deborah Falla¹
¹University Medical Center Goettingen, ²Politecnico di Torino, ³Linköping University, ⁴Curtin University

O.13.4 Feasibility of quantitative uterine motion analysis by ultrasound speckle tracking outside pregnancy
Federica Sammali¹, Nienke Kuijsters², Chiara Rabotti¹, Benedictus Schoot³, Massimo Mischi¹
¹Eindhoven University of Technology, ²Catharina Hospital, ³University Hospital Ghent

O.13.5 Three different cell types produce collagen during skeletal muscle fibrosis
Richard Lieber¹ Mark Chapman²
¹Northwestern University, ²University of California, San Diego

O.13.6 Functional Relevance of Epimuscular Interactions at Forearm: In vivo Assessments with Ultrasound Elastography
Filiz Ates¹, Yasuo Kawakami¹
¹Waseda University

(Regency Ballroom C)

O.14 Movement Disorders
Chairs: Monica Perez, University of Miami, USA
Winfred Mugge, Delft University of Technology, USA

O.14.1 A startling acoustic stimulus influences initial and late phases of postural responses differently in people after stroke
Jolanda Roelofs¹, Milou Coppens¹, Nicole Donkers¹, Jorik Nonnekes¹, Vivian Weerdesteyn¹, Alexander Geurts¹
¹Radboud university medical center

O.14.2 Evaluations of wrist spasticity post stroke
Sang Hoon Kang¹, Song Joo Lee², Li-Qun Zhang³
¹Northwestern University; Rehab. Inst. of Chicago; UNIST, ²Northwestern University; Rehab. Inst. of Chicago; KIST, ³Northwestern University; Rehab. Inst. of Chicago; Northshore University HealthSystem

O.14.3 Coordination of deep hip muscle activity is altered in symptomatic femoroacetabular impingement
Laura Diamond¹, Wolbert Van den Hoorn², Kim Bennell¹, Tim Wrigley¹, Rana Hinman¹, John O'Donnell³, Paul Hodges²
¹The University of Melbourne, ²The University of Queensland, ³St Vincent's Hospital

O.14.4 Trunk neuromuscular patterns in recovered low back injury individuals differs between those who do and do not reinjure at one-year follow up
Cheryl Hubley-Kozey¹, D Adam Quirk¹, Daniel Trudel²
¹Dalhousie University, ²Canadian Armed Forces
O.14.5 Extrinsic finger muscle stiffness contributes substantially to increased passive stiffness of the wrist and finger joints in chronic hemiparetic stroke individuals: A Pilot Study
Benjamin Binder-Markey¹, Julius Dewald¹, Wendy Murray¹
¹Northwestern University

O.14.6 Humeral rotational capabilities of stroke survivors and pattern recognition of intent during shoulder tasks
Joseph Kopke², Levi Hargrove², Michael Ellis¹
¹Northwestern University, ²Northwestern University; Rehabilitation Institute of Chicago

(Regency Ballroom D)

09:30 – 10:00 Break (Crystal ballroom)
10:00 – 11:00 Keynote Presentation
Doug Weber, University of Pittsburgh, USA
Feeling the force: DARPA’s HAPTIX program to create prosthetic hands that restore touch sensations and proprioception (Regency Ballroom)
11:00 – 12:00 General Assembly (Regency Ballroom)
12:00 – 13:30 Lunch & Poster Session III (Crystal Ballroom)
13:30 – 15:00 Parallel Sessions

S.15. Multichannel EMG: decomposition and other applications
Chairs: Dario Farina, University Medical Center Göttingen, Germany
Ales Holobar, University of Maribor, Slovenia

Convolutional source deflation significantly improves convergence of blind motor unit identification from surface electromyograms
Uros Manacinski¹, Ales Holobar¹
¹University of Maribor, Faculty of Electrical Engineering and Computer Science

High-density surface electromyograms: do they sample representative muscle active?
Taian Vieira¹
¹Politecnico di Torino

Topographical characteristics of motor units of the complete facial musculature determined by means of high-density surface EMG.
Bernd Lapatki¹, Alisa Barth¹, Johannes Neubert¹, Johanna Radeke¹, Dick Stegeman², Ales Holobar³, Johannes van Dijk¹
¹University of Ulm, ²Radboud University Medical Centre, ³University of Maribor

Longitudinal tracking of individual motor units using high-density surface electromyography
Francesco Negro¹, Eduardo Martinez-Valdes², Christopher Thompson³, Michael Johnson⁴, Deborah Falla¹, Charles Heckman⁴, Dario Farina¹
¹Universitätsmedizin Göttingen, ²University of Potsdam, ³Temple University, ⁴Northwestern University
Differences in motor unit discharge characteristics among proximal and distal muscles of the upper limb in individuals with chronic hemiparetic stroke
Laura Miller McPherson¹, Francesco Negro², Chris Thompson³, CJ Heckman⁴, Dario Farina², Jules Dewald⁴
¹Florida International University, ²University of Gottingen, ³Temple University, ⁴Northwestern University

How synaptic organization shapes the motoneuron to EMG transform
CJ Heckman¹, Randy Powers²
¹Northwestern University, ²University of Washington

(Regency Ballroom A)

S.16.  **Mobilizing Data: Research at the Intersection of Data Science and Biomechanics**

**Chairs:** Jennifer Hicks, Stanford University, USA
Scott Delp, Stanford University, USA

The Mobilize Center: accelerating movement science with big data
Jennifer L. Hicks¹, Joy P. Ku¹, Scott L. Delp¹,²
Departments of Bioengineering¹ and Mechanical Engineering², Stanford University

Stepping forward? Patient-specific measures of altered control to improve treatment outcomes in cerebral palsy
Katherine Steele¹, Michael Schwartz²
¹University of Washington, ²Gillette Children's Specialty Healthcare

Detecting foot strike from kinematics, a case study in the debate between hypothesis-first and data-first methods
Sean Osis¹, Reed Ferber¹
¹University of Calgary

Characterizing Clinically Meaningful Phenotypes of Osteoarthritis Progression: Eight-Year Data from the Osteoarthritis Initiative
Eni Halilaj¹, Jason Fries³, Jennifer Hicks¹, Scott Delp¹
¹Stanford University

Data and data management for finite element analysis in joint biomechanics
Ahmet Erdemir¹
¹Cleveland Clinic

Moving Forward: From Physical Activity Monitoring to Physical Performance Monitoring
Matthew Smuck¹
¹Stanford University

(Regency Ballroom B)

S.17.  **Practical Application of Electrophysiology and Kinesiology**

**Chair:** Tohru Kiryu, Niigata University, Japan
Masaki Yoshida, Osaka Electro-Communication University, Japan

Application of multi-channel surface EMG technique to researches of aging and lifestyle-related diseases
Kohei Watanabe¹
¹Chukyo University
Rehabilitation robot using muscle activity and neural decoding
Toshihiro Kawase¹, Duk Shin¹, Hiroyuki Kambara¹, Natsue Yoshimura¹, Yasuharu Koike³
¹Tokyo Institute of Technology

Ubiquitous approach for health and sport
Masaki Yoshida¹, Zunyi Tang¹, Masaki Sekine¹, Toshiyo Tamura¹
¹Osaka Electro-Communication University

A Remote and Non-Contact Monitoring System of Physiological Indices to Cope with Visually Induced Motion Sickness
Makoto Yoshizawa¹, Norihiro Sugita¹, Makoto Abe², Akira Tanaka³, Noriyasu Homma¹, Tomoyuki Yambe¹
¹Tohoku University, ²Shinshu University, ³Fukushima University

Brain-muscle-machine interface: controlling a prosthetic hand
Ryu Kato¹
¹Yokohama National University

(Regency Ballroom C)

S.18. **Intermittent control**
**Chairs:** Ian Loram, Manchester Metropolitan University, UK
Scott Beardsley, Marquette University, USA

Intermittent Control provides a deterministic explanation of linear and remnant components of human stance control without injection of random noise.
Cornelis van de Kamp¹, Henrik Gollee², Peter J Gawthrop³, Ian D Loram⁴
¹Delft University of Technology, ²University of Glasgow, ³University of Melbourne, ⁴Manchester Metropolitan University

Intermittent control: a general paradigm for understanding sensorimotor control
Ian Loram¹, Peter Gawthrop², Henrik Gollee³
¹Manchester Metropolitan University, ²The University of Melbourne, , ³University of Glasgow,

A machine learning model of intermittent control
Ryan Cunningham¹, Ian Loram¹
¹Manchester Metropolitan University

Remnant response in visual-manual tasks and intermittent control
Henrik Gollee¹, Ian Loram³, Peter Gawthrop³
¹University of Glasgow, ²Manchester Metropolitan University, ³University of Melbourne

Sensorimotor dynamics in the brain during intermittent control of goal-directed movements
Scott Beardsley³, Robert Scheidt¹
¹Marquette University

A dual Kalman filter approach to adaptation in intermittent control
Jose Alvarez Martin¹, Henrik Gollee¹, Ian Loram², Peter Gawthrop³
¹University of Glasgow, ²Manchester Metropolitan University, ³University of Melbourne

Intermittency using boundary control
James Patton¹, Amit Shah¹
¹University of Illinois at Chicago (UIC), and the Rehabilitation Institute of Chicago (RIC)

(Regency Ballroom D)

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<td>Regency Ballroom Foyer</td>
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<td>15:30 – 16:30</td>
<td>Keynote Presentation, Sponsored by ISB</td>
<td>Scott Delp, Stanford University, USA&lt;br&gt;(Regency Ballroom)</td>
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<td>Closing Reception, Sponsored by ISB</td>
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