

**Roberto Merletti, Ph.D.**  
**Curriculum Vitae**  
**April 2024**



**Personal data**

Name	Roberto Merletti
Place and date of birth	Torino, March 6 1945
Citizenship :	Italian
Home Address	Via Artisti 26, 10124, Torino, Italy
Office Address	Dip.to di Elettronica e Telecom., Politecnico di Torino Corso Duca degli Abruzzi 24 Torino, 10129 Institutional e-mail: roberto.merletti@formerfaculty.polito.it Personal e-mail: roberto@robertomerletti.it URL: www.robertomerletti.it
Last position	Full Professor of Biomedical Engineering at the Dept of Electronics, Politecnico di Torino, Italy (retired Nov. 2015) Director of the Lab. for Engineering of the Neuromuscular System (LISiN), Politecnico di Torino, Italy (retired Nov. 2015)

**University Education**

1968 Politecnico di Torino “Laurea” in Electronic Engineering  
 1970 The Ohio State University, Columbus, Ohio, U.S.A. MS in Biomed. Eng.  
 1972 The Ohio State University, Columbus, Ohio, U.S.A., PhD in Biomed. Eng.

**Main Teaching activities**

- 1997 - 2015 Director of the Laboratory for Engineering of the Neuromuscular System.  
Teaching of doctoral courses.
- 2005 -2015 Full Professor of Biomedical Engineering at the Dept of Electronics,  
Politecnico di Torino, Italy. Teaching of “Biomedical Instrumentation”,  
“Engineering of the Neuromuscular System”, “Rehabilitation Engineering”.
- 1984 - 2005 Associate Professor of Biomedical Engineering at the Dept of Electronics,  
Politechnic of Torino, Italy

Prof. Roberto Merletti, Politecnico di Torino, Dip.to di Elettronica e Telecomunicazioni,  
 Corso Duca degli Abruzzi 24, 10129 Torino, Italy  
 e-mail: roberto@robertomerletti.it

- 1989 - 1994 Associate Professor of “Biomedical Instrumentation” and of “Biomedical Signal Processing” Department of Biomedical Eng., Boston University, Boston, USA
- 1979 - 1984 Assistant Professor of "Biomedical Instrumentation" at Polit. di Torino

### **Main Research activities**

- 1997 - 2015 Director of the Laboratory for Engineering of the Neuromuscular System.
- 2009-2012 Coordinator of the Project “Technologies for Anal Sphincter analysis and Incontinence” (TASI), Compagnia di San Paolo, Torino
- 2005 - 2008
- a) Coordinator of the Marie Curie Project “Decomposition of multichannel surface electromyograms” (DEMUSE)
  - b) Partner of the European project “Cybernetic Manufacturing Systems” (CyberManS),
  - c) Coordinator of the ESA Project “Microgravity Effects on Skeletal Muscles”
  - d) Partner of the ASI Project “Osteoporosis and Muscle atrophy” (OSMA)
- 2005 - 2007 Coordinator of National Project (PRIN) “Study of Muscular and Adrenocortical Responses to Training”
- 2001 - 2004
- a) Coordinator of the European project “Neuromuscular Assessment of the Elderly worker” (NEW, 2001-2004)
  - b) Partner of the European project “On Asymmetry In Sphincters” (OASIS)
- 1997 - 2000 Partner and Member of the Management Committee of the European Concerted action “Surface Electromyography for Non Invasive EMG” (SENIAM).
- 1998 - 2001 Partner and Member of the Management Committee of the European Concerted action PROCID
- 1989 - 1994 Research activity at the Neuromuscular Research Center of Boston University (USA)
- 1973 - 1979 Research activity at the company "Sorin Biomedica" in the fields of cardiac and neuromuscular stimulation

### **Services to the Scientific Community**

Member of the Editorial Board of Journal of Electromyography and Kinesiology.

Member of the Editorial Board of Biomedical signal processing and control

Former member of the Editorial Board of IEEE Transactions on Biomedical Engineering.

Former member of the Editorial Board of European J. of Applied Physiology

Former member of the Editorial Board of Physiological Measurement

Guest Editor of a Special Issue of Medical Engineering and Physics (July 1999)

Guest Editor of a Special Issue of Journal of Electromyography and Kinesiology (October 2000)

Guest Editor of a Special Issue of Physiological Measurement (2009)

Prof. Roberto Merletti, Politecnico di Torino, Dip.to di Elettronica e Telecomunicazioni,  
Corso Duca degli Abruzzi 24, 10129 Torino, Italy  
e-mail: roberto@robertomerletti.it

President of the Congress of Biomedical Engineering in Exercise and Sport (Totino, 2006)  
 President of the Congress of the International Society for Electrophysiology and Kinesiology (June 2006)

### **Recognitions and Honors:**

Senior Member of The Institute of Electrical and Electronic Engineers (IEEE)  
 Fellow of the International Society for electromyography and kinesiology (ISEK)  
 Corresponding Member of the Slovenian Academy of Sciences and Arts (SASA)

### **Summary of publications**

Books	4
Chapters in international books	5
Chapters in national books	7
Publications in peer-reviewed international journals	200
Publications on national Journals	30
Publications in proceedings of Intern. Congresses	>150
Publications in proceedings of national. Congresses	10
Editorials. letters to journals	5

### **Patents**

Four patents registered by Politecnico di Torino

### **Supervision of Doctoral Dissertations (2001-2016)**

1. **Dario Farina (2001)**  
 Detection, analysis and interpretation of surface electromyographic signals for the study of motor control
2. **Corrado Cescon (2004)**  
 Development of advanced techniques for the detection and processing of mechanomyographic (MMG) signals
3. **Ales Holobar (2004)**  
 Blind decomposition of convolutive mixtures of close-to-orthogonal pulse sources applied to surface electromyograms.
4. **Marco Gazzoni (2005)**  
 Surface electromyography for the investigation of single motor units: methods and applications.
5. **Alberto Botter (2011)**  
 Investigation of the neuromuscular system during involuntary muscle contractions:

Prof. Roberto Merletti, Politecnico di Torino, Dip.to di Elettronica e Telecomunicazioni,  
 Corso Duca degli Abruzzi 24, 10129 Torino, Italy  
 e-mail: roberto@robertomerletti.it

Methodological issues and clinical applications.

6. **Hamid Reza Marateb (2011)**  
Extraction of information from the human neuro-muscular system using intra-muscular and high-density surface electromyography in voluntary contractions.
7. **Taian De Mello Martins Vieira (2011)**  
Insights gained into the control of human quiet standing posture from electromyography.
8. **Umberto Barone (2013)**  
A new portable High Density Surface EMG Multichannel Acquisition System.
9. **Babak Afsharipour (2014)**  
Estimation of load sharing among muscles acting on the same joint and applications of surface electromyography.
10. **Khalil Ullah (2016)**  
Extraction of muscle anatomical and physiological information from multi-channel surface EMG: algorithms and their analysis
11. **Subaryani D H Soedirdjo (2016)**  
A High Density Surface EMG study of the Biceps Brachii: sampling, filtering and interpretation of the signals in time and space.

#### **PUBLICATIONS CONCERNING sEMG: BOOKS and CHAPTERS OF BOOKS**

1. Hermens H., Freriks B, Merletti R., Stegeman D., Blok J., Rau G., Disselhorst-Klug C., Hagg G., European Recommendations for Surface Electromyography, RRD publish. ISBN 90-75452-15-2, 1999.
2. Hermens H., Freriks B, Merletti R., Stegeman D., Blok J., Rau G., Disselhorst-Klug C., Hagg G., Raccomandazioni Europee per l'Elettromiografia di Superficie, Edizione italiana a cura di R. Merletti, Coop. Lib. Univ. Torinese (CLUT), ISBN 88-7992-1525, 2000
3. Merletti (editor) , Elementi di elettromiografia di superficie, Coop. Lib. Univ. Torinese (CLUT), ISBN 88-7922-153-3, 2000
4. Pozzo M., Farina D., Merletti R., Electromyography: detection, processing and applications, in: Handbook of biomedical technology and devices, J. E. Moore (ed.), CRC Press, 2003
5. Farina D., Filligoi G.C., Merletti R., Analisi di segnali EMG di superficie per lo studio del controllo motorio. In "Bioingegneria della postura e del movimento" Cappello A., Cappelozzo A., di Prampero P.E. (Eds.), Patron Editore (Pub.), pp. 281-306, 2003
6. Merletti R., Medicina del lavoro: valutazioni tramite EMG di superficie. In "Bioingegneria della postura e del movimento" Cappello A., Cappelozzo A., di Prampero P.E. (Eds.), Patron Editore (Pub.), pp. 495-510, 2003

7. Merletti R., Marchetti M., Contardo V., Veronica M., Applicazioni dell'EMG di superficie in riabilitazione sportiva, cap. 4.7 del testo "La Spalla e lo Sport", Masson,
8. Merletti R., Parker P.A. (eds.), Electromyography: Physiology, engineering and non invasive applications, IEEE Press / J Wiley, USA, 2004
9. Rainoldi A., Minetto M., Merletti R. (edtrs), Biomedical Engineering in exercise and sports. Edizioni Minerva Medica, Torino 2006, Italy
10. Barbero R., Rainoldi A, Merletti R. Atlas of muscle innervation zones: understanding surface EMG and its applications, Springer, Italy 2012
11. Merletti R, Farina D. (eds) Surface Electromyography: physiology, engineering and applications, IEEE Press / J Wiley, USA, May 2016.
12. Merletti R., Pelvic floor EMG: principles, technique and applications, Ch 7 of “ Childbirth related pelvic floor dysfunctions”, Springer 2016.
13. Merletti R., Campanini I., Rymer W.Z., Disselhorst-Klug C., (editors), Surface electromyography: barriers limiting widespread use of sEMG in clinical assessment and neurorehabilitation. Open Access E-book. Frontiers in Neurology/Neurorehabilitation, doi: 10.3389/978-2-88966-616-4

### **Publications in peer-reviewed Journals (2004-2024)**

1. Casale R., Farina D., Merletti R., Rainoldi A., Myoelectric manifestations of fatigue during a twelve day exposure to hypobaric hypoxia, Muscle Nerve, 30: 618-625, 2004
2. Cescon C., Farina D., Gobbo M., Merletti R., Orizio C., Effect of accelerometer location on mechanomyogram variables during voluntary, constant force contractions in three human muscles, Med. Biol. Eng. Comput., 42: 121-128, 2004
3. Enck P., Franz H., Azpiroz F., Fernandez Fraga X., Hinninghofen H., Kaske-Bretag K., Bottin A., Martina S., Merletti R., Innervation Zones of the External Anal Sphincter in Healthy Male and Female Subjects (Preliminary Results), Digestion, 69:123-130, 2004
4. Falla D., Jull G., Rainoldi A., Merletti R., Neck flexor muscle fatigue is side specific in patients with unilateral neck pain, Eur. J. Pain, 8(1):71-77, 2004
5. Farina D., Arendt-Nielsen L., Merletti R., Graven-Nielsen T., The effect of experimental muscle pain on motor unit firing rate and conduction velocity, J. Neurophysiol., 91: 1250-9, 2004
6. Farina D., Blanchietti A., Pozzo M., Merletti R., M-wave properties during progressive motor unit activation by transcutaneous stimulation, J. Appl. Physiol., 97, (2):545-555, 2004
7. Farina D., Févotte C., Doncarli C., Merletti R., Blind separation of linear instantaneous mixtures of non-stationary surface myoelectric signals, IEEE Trans. Biomed. Eng., 51, 9: 1555-1567, 2004
8. Farina D., Merletti R., Enoka R.M., The extraction of neural strategies from the surface EMG, J. Appl. Physiol., 96: 1486-1495, 2004
9. Farina D., Merletti R., Estimation of average muscle fiber conduction velocity from two-dimensional surface EMG recordings, J. Neurosci. Meth., 134: 199-208, 2004

Prof. Roberto Merletti, Politecnico di Torino, Dip.to di Elettronica e Telecomunicazioni,  
 Corso Duca degli Abruzzi 24, 10129 Torino, Italy  
 e-mail: roberto@robertomerletti.it

10. Farina D., Merletti R., Indino B., Graven-Nielsen T., Surface EMG crosstalk evaluated from experimental recordings and simulated signals. Reflections on crosstalk interpretation, quantification and reduction, *Methods of Information in Medicine*, 43: 30-35, 2004
11. Farina D., Mesin L., Martina S., Merletti R., A surface EMG generation model with multi-layer cylindrical description of the volume conductor, *IEEE Trans. Biomed. Eng.*, 51: 415-426, 2004
12. Farina D., Mesin L., Martina S., Merletti R., Comparison of spatial filter selectivity in surface myoelectric signal detection – Influence of the volume conductor model, *Med. Biol. Eng. Comput.*, 42: 114-120, 2004
13. Farina D., Pozzo M., Merlo E., Bottin A., Merletti R., Assessment of muscle fiber conduction velocity from surface EMG signals during fatiguing dynamic contractions, *IEEE Trans. Biomed. Eng.*, 51, (8):1383-1393, 2004
14. Farina D., Zagari D., Gazzoni M., Merletti R., Repeatability of muscle fiber conduction velocity estimates using multi-channel surface EMG techniques, *Muscle Nerve*, 29: 282-291, 2004
15. Gazzoni M., Farina D., Merletti R., A new method for the extraction and classification of single motor unit action potentials from surface EMG signals, *J. Neurosci. Meth.*, 136: 165-177, 2004
16. Merletti R., Benvenuti F., Doncarli C., Disselhorst-Klug C., Ferrabone R., Hermens J.H., Kadefors R., Laübli T., Orizio C., Sjøgaard G., Zazula D., The European Project “Neuromuscular assessment in the elderly worker” (NEW): achievements in electromyogram in signal acquisition, modelling, and processing, *Med. Biol. Eng. Comput.*, 42: 429-431, 2004
17. Merletti R., Bottin A., Cescon C., Farina D., Gazzoni M., Martina S., Mesin L., Pozzo M., Rainoldi A., Enck P., Multi-channel surface EMG for the non-invasive assessment of the anal sphincter muscle, *Digestion*, 69:112-122, 2004
18. Pozzo M., Bottin A., Ferrabone R., Merletti R., Sixty-four channel wearable acquisition system for long term surface EMG recording with electrode arrays, *Med. Biol. Eng. Comput.*, 42, (4):455-466, 2004
19. Pozzo M., Merlo E., Farina D., Antonutto G., Merletti R., di Prampero P.E., Muscle fiber conduction velocity estimated from surface EMG signals during explosive dynamic contractions, *Muscle Nerve*, 29: 823-833, 2004
20. R. Merletti, P. Parker (Eds), “Electromyography. Physiology, engineering and non invasive applications”, J. Wiley/IEEE Press Publication, 133-168, USA, ISBN 0-471-67580-6, 2004
21. Clancy EA, Farina D, Merletti R. , Cross-comparison of time- and frequency-domain methods for monitoring the myoelectric signal during a cyclic, force-varying, fatiguing hand-grip task, *J Electromyogr Kinesiol.* 2005; 15(3):256-65
22. Castroflorio T, Farina D, Bottin A, Piancino MG, Bracco P, Merletti R., Surface EMG of jaw elevator muscles: effect of electrode location and inter-electrode distance, *J Oral Rehabil.* 2005; 32(6):411-7
23. Azpiroz F, Fernandez-Fraga X, Merletti R, Enck P., The puborectalis muscle, *Neurogastroenterol Motil.* 2005; 17 Suppl 1:68-72.
24. Enck P, Hinninghofen H, Merletti R, Azpiroz F., The external anal sphincter and the role of surface electromyography, *Neurogastroenterol Motil.* 2005; 17 Suppl 1:60-7.
25. Merlo E, Pozzo M, Antonutto G, di Prampero PE, Merletti R, Farina D., Time-frequency analysis and estimation of muscle fiber conduction velocity from surface EMG signals during explosive dynamic contractions, *J Neurosci Methods.* 2005, 30;142(2):267-74.
26. Lanzetta M, Pozzo M, Bottin A, Merletti R, Farina D., Reinnervation of motor units in intrinsic muscles of a transplanted hand, *Neurosci Lett.* 2005, 10;373(2):138-43.
27. Keenan KG, Farina D, Maluf KS, Merletti R, Enoka RM., Influence of amplitude cancellation on the simulated surface electromyogram, *J Appl Physiol.* 2005;98(1):120-31.

Prof. Roberto Merletti, Politecnico di Torino, Dip.to di Elettronica e Telecomunicazioni,  
 Corso Duca degli Abruzzi 24, 10129 Torino, Italy  
 e-mail: roberto@robertomerletti.it

28. Cescon C, Sguazzi E, Merletti R, Farina D. Non-invasive characterization of single motor unit EMG and MMG activities in the biceps brachii muscle. *J. Electromyogr. Kinesiol.* 2006; 16:17-24.
29. Farina D, Zennaro D, Pozzo M, Merletti R, Laubli T. Single motor unit and spectral surface EMG analysis during low-force, sustained contractions of the upper trapezius muscle. *Eur. J. Appl. Physiol.* 2006; 96:157-64.
30. Franz H, Hinninghofen H, Kowalski A, Merletti R, Enck P. Mode of delivery affects anal sphincter innervation. *Gastroenterology*, 2006;130(Suppl 2):S724.
31. Keenan KG, Farina D, Merletti R, Enoka RM. Influence of motor unit properties on the size of the simulated evoked surface EMG potential. *Exp. Brain Res.* 2006;169:37-49.
32. Keenan KG, Farina D, Merletti R, Enoka RM. Amplitude cancellation reduces the size of motor unit potentials averaged from the surface EMG. *J. Appl. Physiol.* 2006; 100:1928-37.
33. Mesin L, Joubert M, Hanekom T, Merletti R, Farina D. A finite element model for describing the effect of muscle shortening on surface EMG, *IEEE Trans. Biomed. Eng.* 2006; 53:593-600.
34. Campanini, Merlo A, Degola P, Merletti R, Vezzosi G, Farina D. Effect of electrode location on EMG signal envelope in leg muscles during gait. *J. Electromyogr. Kinesiol.* 2007; 17:515-26.
35. Carotti E, De Martin JC, Merletti R, Farina D. Compression of surface EMG signals with algebraic code excited linear prediction. *Med. Eng. Phys.* 2007; 29:253-258.
36. Cescon C, Madeleine P, Graven-Nielsen T, Merletti R, Farina D. Two-dimensional spatial distribution of surface mechanomyographical response to single motor unit activity. *J. Neurosci. Methods* 2007; 159:19-25.
37. Keenan KG, Farina D, Meyer FG, Merletti R, Enoka RM. Sensitivity of the cross-correlation between simulated surface EMGs for two muscles to detect motor unit synchronization. *J Appl. Physiol.* 2007; 102:1193-201.
38. Botter A, Merletti R, Minetto MA. Pulse charge and not waveform affects M-wave properties during progressive motor unit activation. *J. Electromyogr. Kinesiol.* 2008 Apr 30 [Epub ahead of print]
39. Cescon C, Bottin A, Fernandez Fraga XL, Azpiroz F, Merletti R. Detection of individual motor units of the puborectalis muscle by non-invasive EMG electrode arrays. *J. Electromyogr. Kinesiol.* 2008; 18:382-389.
40. Cescon C, Rebecchi P, Merletti R. Effect of electrode array position and subcutaneous tissue thickness on conduction velocity estimation in upper trapezius muscle. *J. Electromyogr. Kinesiol.* 2008; 18:628-636.
41. Clancy EA, Bertolina MV, Merletti R, Farina D. Time- and frequency-domain monitoring of the myoelectric signal during a long-duration, cyclic, force-varying, fatiguing hand-grip task. *J. Electromyogr. Kinesiol.* 2008; 18:789-797.
42. Merletti R. Motor units in cranial and caudal regions of the upper trapezius muscle have different discharge rates during brief static contractions. *Acta Physiol. (Oxf)* 2008; 192:453. (invited editorial)
43. Mesin L, Merletti R. Distribution of electrical stimulation current in a planar multilayer anisotropic tissue. *IEEE Trans. Biomed. Eng.* 2008; 55:660-670.
44. Mesin L, Merletti R, Rainoldi A. Surface EMG: The issue of electrode location. *J. Electromyogr. Kinesiol.* 2009;19:719-726.
45. Minetto MA, Botter A, Ravenni R, Merletti R, De Grandis D. Reliability of a novel neurostimulation method to study involuntary muscle phenomena. *Muscle Nerve* 2008; 37:90-100.

46. Rainoldi A, Gazzoni M, Merletti R, Minetto MA. Mechanical, electromyographical and biochemical variables after a fatiguing task in endurance and power-trained athletes. *J. Sports Sci.* 2008; 26:321-331.
47. Troiano A, Naddeo F, Sosso E, Camarota G, Merletti R, Mesin L. Assessment of force and fatigue in isometric contractions of the upper trapezius muscle by surface EMG signal and perceived exertion scale. *Gait Posture* 2008; 28:179-186
48. Merletti R, Holobar A, Farina D. Analysis of motor units with high-density surface electromyography. *J. Electromyogr. Kinesiol.* 2008; 18, 879-890.
49. Farina D, Holobar A, Gazzoni M, Zazula D, Merletti R, Enoka RM. Adjustments differ among low-threshold motor units during intermittent, isometric contractions. *J. Neurophysiol.* 2009;101:350-359
50. Holobar A, Gazzoni M, Farina D, Merletti R, Zazula D. Estimating motor unit discharge pattern from the surface electromyogram. *Clin. Neurophysiol.* 2009;120:551-562.
51. Merletti R, Botter A, Troiano A, Merlo E, Minetto MA. Technology and instrumentation for detection and conditioning of the surface electromyographic signal: state of the art. *Clin Biomech.* 2009;24:122-134
52. Merletti R, Farina D. Analysis of intramuscular electromyogram signals. *Philosoph Trans. of the Royal Soc. . Philos. Transact. A Math. Phys. Eng. Sci.* 2009;367:357-368.
53. Minetto MA, Botter A, De Grandis D, Merletti R. Time and frequency domain analysis of surface myoelectric signals during electrically-elicited cramps. *Neurophysiol. Clin.* 2009; 39:15-25
54. Alexe-Ionescu A, Barbero G., Merletti R., Electrode potential and selective ionic absorption, *Physics Letters* 2009; 37: 1791-1795
55. Mesin L, Cescon C, Gazzoni M, Merletti R, Rainoldi A. A bi-dimensional index for the selective assessment of myoelectric manifestations of peripheral and central muscle fatigue. *J. Electromyogr. Kinesiol.* 2009;19:851-863
56. Botter A, Lanfranco F, Merletti R, Minetto MA. Myoelectric fatigue profiles of three knee extensor muscles. *Int. J. Sports Med.* 2009;30:408-417.
57. Botter A, Merletti R, Minetto MA. Pulse charge and not waveform affects M-wave properties during progressive motor unit activation. *J. Electromyogr. Kinesiol.* 2009;19:564-573.
58. Mesin L., Gazzoni M., Merletti R., Automatic localization of innervation zones: a simulation study of the external anal sphincter, *J. Electromyogr. Kinesiol.* 2009;19(6):413-421.
59. Vieira T., Windhorst U., Merletti R., Is the stabilization of quiet upright stance in humans driven by synchronized and similar modulations of the activity of medial and lateral gastrocnemius muscles? *J. Appl. Physiol.* 2010; 108: 85-97
60. Enck P, Franz H, Davico E, Mastrangelo F, Mesin L, Merletti R., Repeatability of Innervation Zone Identification in the External Anal Sphincter Muscle, *Neurourology and Urodynamics*, 2010; 29: 449-457.
61. Mesin L., Merlo E., Merletti R., Orizio C., Investigation of motor unit recruitment during stimulated contractions of tibialis anterior muscle, *J. Electromyogr. Kinesiol.* 2010;20:580-589.
62. Vieira TMM, Merletti R, Mesin L. Automatic segmentation of surface EMG images: Improving the estimation of neuromuscular activity. *J. Biomech.* 2010;43:2149-2158.
63. Farina D., Holobar A., Merletti R., Enoka R., Decoding the neural drive to muscles from the surface electromyogram, *Clinical neurophysiology*, 2010 , (doi: 10.1016. 2009.10040, ahead of print).



64. Merletti R. The electrode-skin interface and optimal detection of bioelectric signals. *Physiol. Meas.* 2010;31:3.
65. Merletti R, Avenaggiato M, Botter A, Holobar A, Marateb HR, Vieira TMM. Advances in surface EMG: recent progress in detection and processing techniques. *Crit. Rev. Biomed. Eng.* 2010;38:305-345.
66. Merletti R, Botter A, Cescon C, Minetto MA, Vieira TMM. Advances in surface EMG: recent progress in clinical research applications. *Crit. Rev. Biomed. Eng.* 2010;38:347-379.
67. Barbero M, Gatti R, Lo Conte L, Macmillan F, Coutts F, Merletti R. Reliability of surface EMG matrix in locating the innervation zone of upper trapezius muscle. *J. Electromyogr. Kinesiol.* 2011;21:827-833.
68. Cescon C, Mesin L, Nowakowski M, Merletti R. Geometry assessment of anal sphincter muscle based on monopolar multichannel surface EMG signals. *J. Electromyogr. Kinesiol.* 2011;21:394-401.
69. Gallina A, Merletti R, Vieira TMM. Are the myoelectric manifestations of fatigue distributed regionally in the human medial gastrocnemius muscle? *J. Electromyogr. Kinesiol.* 2011;21:929-938.
70. Marateb HR, McGill KC, Holobar A, Lateva ZC, Mansourian M, Merletti R. Accuracy assessment of CKC high-density surface EMG decomposition in biceps femoris muscle. *J. Neural Eng.* 2011;8:066002.
71. Marateb HR, Muceli S, McGill KC, Merletti R, Farina D. Robust decomposition of single-channel intramuscular EMG signals at low force levels. *J. Neural Eng.* 2011;8:066015.
72. Merletti R, Botter A, Lanfranco F, Minetto MA. Spinal involvement and muscle cramps in electrically elicited muscle contractions. *Artif. Organs.* 2011;35:221-225.
73. Mesin L, Merletti R, Vieira TMM. Insights gained into the interpretation of surface electromyograms from the gastrocnemius muscles: A simulation study. *J. Biomech.* 2011;44:1096-1103.
74. Vieira TMM, Loram ID, Muceli S, Merletti R, Farina D. Postural activation of the human medial gastrocnemius muscle: are the muscle units spatially localised? *J. Physiol.* 2011;589:431-443.
75. Piitulainen H, Botter A, Merletti R, Avela J. Muscle fiber conduction velocity is more affected after eccentric than concentric exercise. *Eur. J. Appl. Physiol.* 2011;111:261-273.
76. Vieira TMM, Loram ID, Muceli S, Merletti R, Farina D. Recruitment of motor units in the medial gastrocnemius muscle during human quiet standing: is recruitment intermittent? What triggers recruitment? *J. Neurophysiol.* 2012;107:666-76.
77. Marateb HR, Rojas-Martínez M, Mansourian M, Merletti R, Villanueva MA. Outlier detection in high-density surface electromyographic signals. *Med. Biol. Eng. Comput.* 2012;50:79-89.
78. Watanabe K, Kouzaki M, Merletti R, Fujibayashi M, Moritani T. Spatial EMG potential distribution pattern of vastus lateralis muscle during isometric knee extension in young and elderly men. *J. Electromyogr. Kinesiol.* 2012;22:74-9.
79. Bonfiglioli R, Botter A, Calabrese M, Mussoni P, Violante FS, Merletti R. Surface electromyography features in manual workers affected by carpal tunnel syndrome. *Muscle Nerve.* 2012;45:873-82.
80. Barone U, Merletti R. Design of a portable, intrinsically safe multichannel acquisition system for high-resolution, real-time processing HD-sEMG. *IEEE Trans Biomed Eng.* 2013;60:2242-52.
81. Baudry S, Lanfranco F, Merletti R, Duchateau J, Minetto MA. Effects of Short-Term Dexamethasone Administration on Corticospinal Excitability. *Med Sci Sports Exerc.* 2013 Sep 18. [Epub ahead of print]

Prof. Roberto Merletti, Politecnico di Torino, Dip.to di Elettronica e Telecomunicazioni,  
 Corso Duca degli Abruzzi 24, 10129 Torino, Italy  
 e-mail: roberto@robertomerletti.it

82. Botter A, Vieira TM, Loram ID, Merletti R, Hodson-Tole EF. A novel system of electrodes transparent to ultrasound for simultaneous detection of myoelectric activity and B-mode ultrasound images of skeletal muscles. *J Appl Physiol.* 2013;115:1203-14.
83. Gallina A, Merletti R, Gazzoni M. Uneven spatial distribution of surface EMG: what does it mean? *Eur J Appl Physiol.* 2013;113:887-94.
84. Gallina A, Ritzel CH, Merletti R, Vieira TM. Do surface electromyograms provide physiological estimates of conduction velocity from the medial gastrocnemius muscle? *J Electromyogr Kinesiol.* 2013;23:319-25.
85. Piitulainen H, Botter A, Merletti R, Avela J. Multi-channel electromyography during maximal isometric and dynamic contractions. *J Electromyogr Kinesiol.* 2013;23:302-10.
86. Rojas-Martínez M, Mañanas MA, Alonso JF, Merletti R. Identification of isometric contractions based on High Density EMG maps. *J Electromyogr Kinesiol.* 2013 ;23:33-42.
87. Watanabe K, Gazzoni M, Holobar A, Miyamoto T, Fukuda K, Merletti R, Moritani T. Motor unit firing pattern of vastus lateralis muscle in type 2 diabetes mellitus patients. *Muscle Nerve.* 2013;48:806-13.
88. Cescon C, Raimondi EE, Zacesta V, Drusany-Staric K, Martsidis K, Merletti R. Characterization of the motor units of the external anal sphincter in pregnant women with multichannel surface EMG. *Int Urogynecol J.* 2014 Aug;25(8):1097-103.
89. Cescon C, Riva D, Zacesta V, Drusany-Staric K, Martsidis K, Protsepko O, Baessler K, Merletti R. Effect of vaginal delivery on the external anal sphincter muscle innervation pattern evaluated by multichannel surface EMG: results of the multicentre study TASI-2. *Int Urogynecol J.* 2014 Nov;25(11):1491-9.
90. Farina D, Merletti R, Enoka RM. The extraction of neural strategies from the surface EMG: an update. *J Appl Physiol* (1985). 2014 Dec 1;117(11):1215-1230.
91. Piervirgili G, Petracca F, Merletti R. A new method to assess skin treatments for lowering the impedance and noise of individual gelled Ag-AgCl electrodes. *Physiol. Meas.* 2014;35:2101-18.
92. Ullah K, Cescon C, Afsharipour B, Merletti R. Automatic detection of motor unit innervation zones of the external anal sphincter by multichannel surface EMG. *J Electromyogr Kinesiol.* 2014;6:860-867.
93. Li X, Holobar A, Gazzoni M, Merletti R, Rymer W, Zhou P. Examination of Post-stroke Alteration in Motor Unit Firing Behavior Using High Density Surface EMG Decomposition. *IEEE Trans Biomed Eng.* 2015;62:1242-1252.
94. Afsharipour B., Ullah K., Merletti R. Amplitude indicators and spatial aliasing in high density surface electromyography recordings, *Biomed. Signal Proc. and Control*, 2015; 22: 170-179.
95. Afsharipour B, Petracca F, Gasparini M, Merletti R. Spatial distribution of surface EMG on trapezius and lumbar muscles of violin and cello players in single note playing. *J. Electromyogr Kinesiol.* 2016; 31: 144-153.
96. Cattarello P., Merletti R., Petracca F., Analysis of High Density Surface EMG and finger pressure in the left forearm of violin players. *Medical Problems of Performing Artists*, September 2017, pg 139-151, <https://doi.org/10.21091/mppa.2017.3023>
97. Cattarello P., Vinelli S., D'Emanuele S., Gazzoni M., Merletti R., Comparison of chairs based on HDsEMG of back muscles, biomechanical and comfort indices, for violin and viola players: A short term study. *J Electromyogr Kinesiol.* 2018; 42: 92-103.
98. Afsharipour B., Soedirdjo S., R. Merletti, Two-dimensional surface EMG: The effects of electrode size, interelectrode distance and image truncation. *Biomedical Signal Processing and Control* (2019) 49, 298–307

99. Besomi M., Hodges A., Van Dieën J., Carson RG., Clancy E., Disselhorst-Klug C., Holobar A., Hug F., Kiernan M., Lowery M., McGill K., Merletti R., Perreault E., Sogaard K., Tucker K., Besier T., Enoka R., Falla D., Farina D., Gandevia S., Rothwell JC., Vicenzino B., Wrigley T. Consensus for experimental design in electromyography (CEDE) project: electrode selection matrix. *Journal of Electromyography and Kinesiology*, 2019; 48: 128–144.  
<https://doi.org/10.1016/j.jelekin.2019.07.008>
100. Merletti R., Muceli S., Tutorial. Surface EMG detection in space and time: best practices. *Journ. of Electromyography and Kinesiology*, 2019; 49: (free download)  
[doi.org/10.1016/j.jelekin.2019.102363](https://doi.org/10.1016/j.jelekin.2019.102363)
101. Russo A., Aranceta-Garza A., D'Emanuele S., Serafino F., Merletti R., HDsEMG activity of the lumbar erector spinae in violin players: comparison of two chairs. *Medical Probl. of Perform. Artists*, 2019; 34(4): 205-214, doi: 10.21091/mppa.2019.4034
102. Besomi M., Hodges P., Clancy E., Van Dieën J., Hug F., Lowery M., Merletti R., Sogaard K., Wrigley T., Besier T., Carson R., Disselhorst-Klug C., Enoka R., Falla D., Farina D., Gandevia S., Holobar A., Kiernan M., McGill K., Perreault E., Rothwell J. Tucker K., Consensus for experimental design in electromyography (CEDE) project: Amplitude normalization matrix. *J. Electromyogr. Kinesiol.* 2020;53:102438.  
doi: 10.1016/j.jelekin.2020.102438.
103. Rojas-Martínez M, Serna LY, Jordanic M, Marateb HR, Merletti R, Mañanas MÁ. High-density surface electromyography signals during isometric contractions of elbow muscles of healthy humans. *Sci Data*. 2020 Nov 16;7(1):397, doi: 10.1038/s41597-020-00717-6.
104. Merletti R., Cerone G.L., Tutorial. Surface EMG detection, conditioning and pre-processing: best practices, *Journ. of Electromyogr. and Kinesiol.*, 2020; 54 102440,  
doi:10.1016/j.jelekin.2020.102440
105. Campanini I., Disselhorst-Klug C., Rymer W.Z., Merletti R., Neurorehabilitation: Barriers Limiting Its Use., *Frontiers in Neurology/Neurorehab.* 2020; doi.org/10.3389/fneur.2020.00934
106. McManus L., Lowery M., Merletti R. , Sogaard K, Besomi M, Clancy EA, van Dieën JH, Hug F, Wrigley T, Besier T, Carson RG, Disselhorst-Klug C, Enoka RM, Falla D, Farina D, Gandevia S, Holobar A, Kiernan MC, McGill K, Perreault E, Rothwell JC, Tucker K, Hodges P., Consensus for experimental design in electromyography (CEDE) project: Terminology matrix. *J. Electromyogr Kinesiol.* 2021; 59, 102565, doi:10.1016/j.jelekin.2021.102565.
107. Korrami Chokami A., Gasparini M. Merletti R., Identification of periodic bursts in surface EMG: application to the erector spinae muscles of sitting violin players. *Biomed. Signal Process. and Control*, 2021; 65, 102369, doi.org/10.1016/j.bspc.2020.102369.
108. Aranceta-Garza A., Russo A., D'Emanuele S., Serafino F., Merletti R., High density surface electromyographic activity of the lumbar erector spinae muscles and comfort/discomfort assessment in piano players: comparison of two chairs. *Frontiers in Physiology*, 2021;12:743730,  
doi: 10.3389/fphys.2021.743730
109. Merletti R., Campanini I., Rymer W.Z., Disselhorst-Klug C., Editorial: Surface Electromyography: Barriers Limiting Widespread Use of sEMG in Clinical Assessment and Neurorehabilitation, *Front. Neurology/Neurorehab.* 2021, <https://doi.org/10.3389/fneur.2021.642257>
110. Merlo A., Montecchi M.G., Lombardi F., Vata, X., Musi A., Lusuardi M., Merletti R., Campanini I. Monitoring involuntary muscle activity in acute patients with upper motor neuron lesion by wearable sensors. A feasibility study. *Sensors*, 2021; 9: 3120, doi: 10.3390/s21093120.

111. Gallina A, Disselhorst-Klug C, Farina D, Merletti R, Besomi M, Holobar A, Enoka RM, Hug F, Falla D, Søgaard K, McGill K, Clancy EA, Carson RG, van Dieën JH, Gandevia S, Lowery M, Besier T, Kiernan MC, Rothwell JC, Tucker K, Hodges P., Consensus for experimental design in electromyography (CEDE) project: High-density surface electromyography matrix. *J. Electromyogr. Kinesiol.* 2022; 64:102656. doi: 10.1016/j.jelekin.2022.102656.
112. Barbero G., Evangelista L. R., Merletti R. Half-cell and noise voltages at a metal-electrode and dilute solution interface, *Journ. Statistical Mechanics:Theory and Experiment*, 2022; doi.org/10.1088/1742-5468/ac827e
113. Campanini I., Merlo A., Disselhorst-Klug C., Mesin L., Muceli S., Merletti R., Fundamental Concepts of Bipolar and High-Density Surface EMG Understanding and Teaching for Clinical, Occupational, and Sport Applications: Origin, Detection, and Main Errors. *Sensors* 2022; 22: 4150. doi.org/10.3390/s22114150
114. Merletti R. ,Temporiti F., Gatti R., Gupta S., Sandrini G., Serrao M., Translation of surface electromyography (sEMG) to clinical and motor rehabilitation applications: the need for new clinical figures. *Translational Neuroscience*, 2023;14(1):20220279, doi.org/10.1515/tnsci-2022-0279
115. Martinez-Valdes E, Enoka RM, Holobar A, McGill K, Farina D, Besomi M, Hug F, Falla D, Carson RG, Clancy EA, Disselhorst-Klug C, van Dieën JH, Tucker K, Gandevia S, Lowery M, Søgaard K, Besier T, Merletti R, Kiernan MC, Rothwell JC, Perreault E, Hodges P., Consensus for experimental design in electromyography (CEDE) project: Single motor unit matrix. *J. Electromyogr. Kinesiol.*, 2023; 68:102726. doi:10.1016/j.jelekin.2022.102726.
116. Clancy E., Morin E., Hajian G., Merletti R., Tutorial. Surface electromyogram (sEMG) amplitude estimation: Best practices. *J. Electromyogr Kinesiol.*, 2023;72:102807. doi: 10.1016/j.jelekin.2023.102807.
117. Merletti R., Metrology in sEMG and movement analysis: the need for training new figures in clinical rehabilitation. *Front. Rehabil. Sci.* 2024, 5:1353374. doi: 10.3389/fresc.2024.1353374
118. Khorrami Chokami A., Merletti R., Right-Left sEMG Burst Synchronization of the Lumbar Erector Spinae Muscles of Seated Violin Players. *Sci. Rep.* 2024;14(1):22992. doi: 10.1038/s41598-024-69531-z.
119. Muceli S., Merletti R., Tutorial. Frequency analysis of the surface EMG signal: Best practices. *J. Electromyogr Kinesiol.* 2024. In press.
120. Farina D., Merletti R., Enoka R., The extraction of neural strategies from the surface EMG: 2024. *J. of Appl. Physiol.* In Press.