

## Elisa Kallioniemi, Ph.D.

Postdoctoral Research Fellow

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Visa status: US Permanent Resident

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### ACADEMIC TRAINING AND EDUCATION

- 2018–current **Postdoctoral Research Fellow, Department of Psychiatry, UT Southwestern Medical Center, Dallas, USA.** Mentors: Carol Tamminga, M.D., and Jeff Daskalakis, M.D., Ph.D. (UC San Diego). *Research on neurobiological effects and markers of response for magnetic seizure therapy and repetitive transcranial magnetic stimulation (rTMS) in depression and schizophrenia.*
- 2017–2018 **Postdoctoral Researcher, Department of Psychiatry and Behavioral Science, Stanford Medicine, Stanford, USA.** Mentors: Laura Roberts, M.D., M.A., and Nolan Williams, M.D. *Research on neurobiological effects of high dose rTMS in depression.*
- 2012–2017 **Medical Physicist Trainee, Diagnostic Imaging Center, Kuopio University Hospital, Kuopio, Finland.** *Clinical training in radiotherapy, nuclear medicine, clinical physiology, diagnostic radiology, clinical neurophysiology.*
- 2012–2016 **Ph.D. in Medical Physics, Departments of Applied Physics and Clinical Neurophysiology, University of Eastern Finland/Kuopio University Hospital, Kuopio, Finland.** Mentors: Petro Julkunen, Ph.D., Laura Säisänen, Ph.D., Pasi Karjalainen, Ph.D.; and Ari Pääkkönen, Ph.D. *Developed novel TMS methods to study cortical function. Published six first-author journal articles and graduated with distinction (top 5% of all Ph.D. theses).*
- 2004–2012 **MSc.(Tech.) and BSc.(Tech.) in Biomedical Engineering, School of Electrical Engineering, Aalto University, Espoo, Finland**
- 2010 **Exchange Student in Biomedical Engineering, La Trobe University, Melbourne, Australia**

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### RELATED PROFESSIONAL EXPERIENCE

- 2012 Research Assistant, Brain Research Unit, Aalto University, Finland
- 2011–2012 Research Assistant, Cognitive Science, University of Helsinki, Finland
- 2011 R&D Trainee, Nexstim Plc. (a manufacturer of (r)TMS devices), Finland
- 2010 Trainee Biomedical Engineer, The Alfred Hospital, Australia
- 2010 Assistant Engineer, Syndome Electronics Industry Co., Ltd., Thailand
- 2008 Trainee in Research, Electronics and Telecommunications Research Institute, South Korea

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### RESEARCH AND CAREER OBJECTIVES

My long-term career plans are to become an independent investigator and to establish a research program developing novel electromagnetic brain stimulation applications. My interest in electromagnetism and how it can be used to modulate neural activity synthesizes my multi-disciplinary training in biomedical engineering, medical physics, and neuroscience, which provides me with a unique perspective on brain stimulation. As I further my research career, I wish to focus these efforts to alleviate the suffering caused by severe psychiatric disorders.

**32 publications in total, 11 first-authored**

- [1.] Reijonen J, Pitkänen M, **Kallioniemi E**, Mohammadi A, Ilmoniemi RJ, Julkunen P. *Spatial extent of cortical motor hotspot in navigated transcranial magnetic stimulation*. Journal of Neuroscience Methods, 2020;346:108893.
- [2.] Pruitt T, Wang X, Wu A, **Kallioniemi E**, Husain MM, Liu H. *Transcranial Photobiomodulation (tPBM) With 1,064-nm Laser to Improve Cerebral Metabolism of the Human Brain In Vivo*. Lasers in Surgery and Medicine, 2020;52(9):807-813.
- [3.] Sirkka J, Säisänen L, Julkunen P, Könönen M, **Kallioniemi E**, Leinonen V, Danner N. *Corticospinal excitability in idiopathic normal pressure hydrocephalus: a transcranial magnetic stimulation study*. Fluids Barriers CNS, 2020;17(1):6.
- [4.] McClintock SM, **Kallioniemi E**, Martin DM, Kim JU, Weisenbach SL, Abbott CC. *A critical review and synthesis of clinical and neurocognitive effects of non-invasive neuromodulation antidepressant therapies*. Focus (American Psychiatric Association Publishing), 2019;17(1):18-29.
- [5.] **Kallioniemi E**, McClintock SM, Deng Z-D, Husain MM, Lisanby SH. *Magnetic Seizure Therapy: Towards Personalized Seizure Therapy for Major Depression*. Personalized Medicine in Psychiatry, 2019;17-18:37-42.
- [6.] Nguyen DTA, Rissanen SM, Julkunen P, **Kallioniemi E**, Karjalainen PA. *Principal Component Regression on Motor Evoked Potential in Single-Pulse Transcranial Magnetic Stimulation*. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2019;27(8):1521-1528.
- [7.] Wang X, Dmochowski JP, Zeng L, **Kallioniemi E**, Husain M, Gonzalez-Lima F, Liu H. *Transcranial photobiomodulation with 1064-nm laser modulates brain electroencephalogram rhythms*. Neurophotonics, 2019;6(2):025013.
- [8.] Määttä S, Säisänen L, **Kallioniemi E**, Lakka TA, Lintu N, Haapala EA, Koskenkorva P, Niskanen E, Ferreri F, Könönen M. *Maturation changes the excitability and effective connectivity of the frontal lobe: A developmental TMS-EEG study*. Human Brain Mapping, 2019;40(8):2320-2335.
- [9.] Weiss Lucas C, **Kallioniemi E\***, Neuschmelting V, Nettekoven C, Pieczewski J, Jonas K, Goldbrunner R, Karhu J, Grefkes C, Julkunen P. *Cortical Inhibition of Face and Jaw Muscle Activity and Discomfort Induced by Repetitive and Paired-Pulse TMS During an Overt Object Naming Task*. Brain Topography. 2019;32(3):418-434.  
\*shared first authors
- [10.] **Kallioniemi E\***, Kärkkäinen O\*, Määttä S, Könönen M, Kivimäki P, Kaarre O, Velagapudi V, Kekkonen V, Lehto SM, Laukkanen E, Tolmunen T. *Repeated Transcranial Magnetic Stimulation-Induced Motor Evoked Potentials Correlate with the Subject-Specific Serum Metabolic Profile of Creatine*. Journal of Clinical Neurophysiology, 2019;36(3):229-235. \*shared first authors
- [11.] Säisänen L, Määttä S, Julkunen P, Niskanen E, **Kallioniemi E**, Gröhn H, Kemppainen S, Lakka TA, Lintu N, Eloranta AM, Vanninen R, Makkonen I, Könönen M. *Functional and structural asymmetry in primary motor cortex in Asperger syndrome: a navigated TMS and imaging study*. Brain Topography. 2019;32(3):504-518.
- [12.] Pitkänen M, **Kallioniemi E**, Järnefelt G, Karhu J, Julkunen P. *Efficient Mapping of the Motor Cortex with Navigated Biphasic Paired-Pulse Transcranial Magnetic Stimulation*. Brain Topography. 2018;31(6):963-971.

- [13.] Löfberg O, Julkunen P, **Kallioniemi E**, Pääkkönen A, Karhu J. *Modulation of motor cortical excitability with auditory stimulation*. Journal of Neurophysiology, 2018;120(3):920-925.
- [14.] Julkunen P, Löfberg O, **Kallioniemi E**, Hyppönen J, Kälviäinen R, Mervaala E. *Abnormal motor cortical adaptation to external stimulus in Unverricht-Lundborg disease (progressive myoclonus type 1, EPM1)*. Journal of Neurophysiology. 2018;120(2):617-623.
- [15.] Kaarre O, Äikiä M, **Kallioniemi E**, Könönen M, Kekkonen V, Heikkinen N, Kivimäki P, Tolmunen T, Määttä S, Laukkanen E. *Association of the N100 TMS-evoked potential with attentional processes: a motor cortex TMS-EEG study*. Brain and Cognition, 2018;122:9-16.
- [16.] **Kallioniemi E**, Savolainen P, Järnefelt G, Koskenkorva P, Karhu J, Julkunen P. *Transcranial magnetic stimulation modulation of corticospinal excitability by targeting cortical I-waves with biphasic paired-pulses*. Brain Stimulation, 2018;11(2):322-326.
- [17.] Saari J, **Kallioniemi E**, Tarvainen M, Julkunen P. *Oscillatory TMS-EEG-Responses as a Measure of the Cortical Excitability Threshold*. IEEE Transactions on Neural Systems and Rehabilitation Engineering, 2018;26(2):383-391.
- [18.] Kaarre O, **Kallioniemi E**, Könönen M, Tolmunen T, Kekkonen V, Kivimäki P, Heikkinen N, Ferreri F, Laukkanen E, Määttä S. *Heavy alcohol use in adolescence is associated with altered cortical activity: a combined TMS-EEG study*. Addiction Biology, 2018;23:268-280.
- [19.] Pitkänen M, **Kallioniemi E**, Julkunen P, Nazarova M, Nieminen JO, Ilmoniemi RJ. *Minimum-Norm Estimation of Motor Representations in Navigated TMS Mappings*. Brain Topography. 2017;30(6):711-722.
- [20.] Pitkänen M, **Kallioniemi E**, Julkunen P. *Effect of inter-train interval on the induction of repetition suppression of motor-evoked potentials using transcranial magnetic stimulation*. PLoS One, 2017;12(7):e0181663.
- [21.] Määttä S, Könönen M, **Kallioniemi E**, Lakka T, Lintu N, Lindi V, Ferreri F, Ponzo D, Säisänen L. *Development of cortical motor circuits between childhood and adulthood: a navigated TMS-HdEEG study*. Human Brain Mapping, 2017;38(5):2599-2615.
- [22.] **Kallioniemi E**, Pitkänen M, Könönen M, Vanninen R, Julkunen P. *Localization of cortical primary motor area of the hand using navigated transcranial magnetic stimulation, BOLD and arterial spin labeling fMRI*. Journal of Neuroscience Methods. 2016;273:138-148.
- [23.] Julkunen P, Määttä S, Säisänen L, **Kallioniemi E**, Könönen M, Jäkälä P, Vanninen R, Vaalto S. *Functional and structural cortical characteristics after restricted focal motor cortical infarction evaluated at chronic stage - Indications from a preliminary study*. Clinical Neurophysiology. 2016;127(8):2775-2784.
- [24.] **Kallioniemi E**, Julkunen P. *Alternative stimulation intensities for mapping cortical motor area with navigated TMS*. Brain Topography, 2016;29(3):395-404.
- [25.] **Kallioniemi E**, Könönen M, Säisänen L, Gröhn H, Julkunen P. *Functional neuronal anisotropy assessed with neuronavigated transcranial magnetic stimulation*. Journal of Neuroscience Methods, 2015;256:82-90.
- [26.] **Kallioniemi E**, Pääkkönen A, Julkunen P. *Repetition suppression in transcranial magnetic stimulation-induced motor-evoked potentials is modulated by cortical inhibition*. Neuroscience, 2015;310:504-511.

[27.] Pitkänen M, **Kallioniemi E**, Julkunen P. *Extent and Location of the Excitatory and Inhibitory Cortical Hand Representation Maps: A Navigated Transcranial Magnetic Stimulation Study*. Brain Topography. 2015;28(5):657-665.

[28.] **Kallioniemi E**, Säisänen L, Pitkänen M, Könönen M, Karhu J, Julkunen P. *Input-output characteristics of late corticospinal silent period induced by transcranial magnetic stimulation*. Journal of Clinical Neurophysiology, 2015;32(4):346-351.

[29.] **Kallioniemi E**, Pitkänen M, Säisänen L, Julkunen P. *Onset latency of motor evoked potentials in motor cortical mapping with neuronavigated transcranial magnetic stimulation*. The Open Neurology Journal, 2015;9:62-69.

[30.] **Kallioniemi E**, Könönen M, Julkunen P. *Repeatability of functional anisotropy in navigated transcranial magnetic stimulation – coil-orientation versus response*. NeuroReport, 2015;26(9):515-521. Cover image.



[31.] **Kallioniemi E**, Säisänen L, Könönen M, Awiszus F, Julkunen P. *On the estimation of silent period thresholds in transcranial magnetic stimulation*. Clinical Neurophysiology, 2014;125(11):2247-2252.

[32.] Julkunen P, **Kallioniemi E**, Könönen M, Säisänen L. *Feasibility of automated analysis and inter-examiner variability of cortical silent period induced by transcranial magnetic stimulation*. Journal of Neuroscience Methods, 2013;217(1-2):75-81.

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## SELECTED PRESENTATIONS

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### **41 presentations in total, 24 first-authored**

**Kallioniemi E**. *Using electromagnetic brain stimulation to tackle unmet clinical needs in psychiatry*. Rising Stars in Engineering in Health workshop, Columbia University, USA, 2020.

**Kallioniemi E**, Hudgens-Haney M, Zomorrodi R, Blumberger D, Daskalakis J, Tamminga C. *Neurophysiological signature of magnetic seizure therapy (MST) in depression and schizophrenia: A preliminary resting-state electroencephalography study*. 59<sup>th</sup> American College of Neuropsychopharmacology Annual Meeting, USA, 2020.

Reijonen J, Pitkänen M, **Kallioniemi E**, Mohammadi A, Julkunen P. *Defining the motor hotspot as a quantified sub-region of the motor map*. 7<sup>th</sup> International Conference on Non-Invasive Brain Stimulation, Germany, 2020.

McClintock S, Husain M, Cullum CM, **Kallioniemi E**, Greer T, Lisanby S. *Cognitive Control Across the Spectrum of Major Depressive Disorder*. 58<sup>th</sup> American College of Neuropsychopharmacology Annual Meeting, USA, 2019.

**Kallioniemi E**, Pruitt T, Wang X, Husain MM, Liu H. *Effects of Transcranial Infrared Stimulation on Neural Information Flow in Healthy Volunteers*. 57<sup>th</sup> American College of Neuropsychopharmacology Annual Meeting, USA, 2018.

Pannu J, **Kallioniemi E**, Gulser M, Stimpson K, DeSouza D, Sudheimer K, Williams N. *High-Dose Theta-Burst Transcranial Magnetic Stimulation Modulates Heart Rate Variability*. 73<sup>rd</sup> Society of Biological Psychiatry Annual Meeting, USA, 2018.

**Kallioniemi E**, Säisänen L, Gröhn H, Ferreri F, Lakka T, Lintu N, Lindi V, Könönen M, Määttä S. *Developmental differences in motor cortex TMS-EEG responses associate with local white matter microstructure*. 31<sup>st</sup> International Congress of Clinical Neurophysiology of the IFCN, USA, 2018.

**Kallioniemi E**, Määttä S, Könönen M, Mervaala E, Viinamäki H, Valkonen-Korhonen M. *Effects of repetitive transcranial magnetic stimulation on short-latency afferent inhibition: A study in treatment-resistant depression*. 31<sup>st</sup> International Congress of Clinical Neurophysiology of the IFCN, USA, 2018.

Kaarre O, **Kallioniemi E**, Könönen M, Tolmunen T, Kekkonen V, Kivimäki P, Heikkinen N, Ferreri F, Laukkanen E, Määttä S. *Gender differences in the alcohol-related alterations in cortical activity—a combined TMS-EEG study*. 30<sup>th</sup> European College of Neuropsychopharmacology Annual Meeting, France, 2017.

**Kallioniemi E**, Määttä S, Könönen M, Julkunen P, Mervaala E, Kaarre O, Laukkanen E, Tiihonen J, Tuppurainen H. *Abnormal response to a high frequency TMS partly restores to a healthy level after rTMS treatment in Schizophrenic patients*. 2<sup>nd</sup> International Brain Stimulation Conference, Spain, 2017.

**Kallioniemi E**, Määttä S, Könönen M, Julkunen P, Säisänen L, Mervaala E, Kaarre O, Laukkanen E, Tiihonen J, Tuppurainen H. *Repetition suppression in transcranial magnetic stimulation induced motor evoked potentials is impaired in schizophrenic patients*. 2<sup>nd</sup> International Brain Stimulation Conference, Spain, 2017.

**Kallioniemi E**, Awiszus F, Pitkänen M, Julkunen P. *Influence of intertrial interval on measures of motor cortical excitability, Can the resting motor threshold be calculated with a short intertrial interval?* 8<sup>th</sup> International Symposium on Navigated Brain Stimulation in Neurosurgery and Neuromodulation, Germany, 2016.

**Kallioniemi E**, Könönen M, Hakumäki J, Mervaala E, Viinamäki H, Vanninen R, Valkonen-Korhonen M. *Increase of grey matter following bifrontal rTMS in drug resistant major depressive disorder patients: A VBM study*. 24<sup>th</sup> International Society for Magnetic Resonance in Medicine Annual Meeting, Singapore, 2016.

**Kallioniemi E**, Könönen M, Säisänen L, Gröhn H, Julkunen P. *Interaction of neuronal anisotropy and motor cortex excitability: a navigated TMS-DTI study*. 30<sup>th</sup> International Congress on Clinical Neurophysiology of the IFCN, Germany, 2014.

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#### FELLOWSHIPS (Role: P.I.)

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2021	Oskar Huttunen Foundation Postdoctoral Fellowship (50 000€)
2020	Instrumentarium Science Foundation Postdoctoral Fellowship (60 000€)
2019	Orion Research Foundation sr Postdoctoral Fellowship (37 500€)
2018	Finnish Cultural Foundation Postdoctoral Fellowship (49 000€)
2016	Päivikki and Sakari Sohlberg Foundation Postdoctoral Fellowship (25 000€)
2015	Finnish Foundation for Technology Promotion Predoctoral Fellowship (5 000€)
2014–2015	Radiological Society of Finland Predoctoral Fellowship (7 850€)
2013–2015	The Finnish Brain Research and Rehabilitation Center Neuron Predoctoral Fellowship (10 000€)
2014	The Finnish Concordia Fund Predoctoral Fellowship (4 000€)
2013–2014	Paulo Foundation Predoctoral Fellowship (17 000€)
2013	Kaute Foundation Predoctoral Fellowship (5 700€)

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#### AWARDS

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2020	Rising Star in Engineering in Health, global competition organized by Columbia University
2020	American College of Neuropsychopharmacology Travel Award
2020	Article selected to Editor's Choice Collection for 2020, Human Brain Mapping
2020	North American Neuromodulation Society Travel Award
2018	International Federation of Clinical Neurophysiology Travel Award
2017	European Chapter, International Federation of Clinical Neurophysiology Travel Award
2016	Graduation with Distinction (top 5% of all Ph.D. theses)
2016	International Society for Magnetic Resonance in Medicine Educational Stipend
2015	European Chapter, International Federation of Clinical Neurophysiology Travel Award
2015	Finnish Neuroradiology Society Young Investigator Award
2013–2018	The Finnish Society of Clinical Neurophysiology Travel Awards (five times)

2013	Best Poster Award, Second Runner-Up, 5 <sup>th</sup> International Symposium on Navigated Brain Stimulation in Neurosurgery
2013	Best Poster Award, International Doctoral Program in Biomedical Engineering and Medical Physics

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## TEACHING AND MENTORING

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### **Instructor on record:**

*Functional MRI for Linguistics*, Masters-level course, Kuopio University Hospital, Finland, 2015-2017;  
*Clinical Neurophysiology*, Masters-level course, School of Medicine, University of Eastern Finland, Finland, 2014–2016.

### **Guest lecturer:**

*Functional MRI for Physicists*, Masters-level course, Department of Applied Physics, University of Eastern Finland, Finland, 2015.

### **Formal training in teaching**

*Learning to Teach Online*, interactive online course, UNSW Sydney, approximately 18 hours of work, completed October 31, 2020.

*Teaching Science at University*, interactive online course, University of Zurich, approximately 13 hours of work, completed July 11, 2020.

*University Teaching*, interactive online course, organized by the University of Hong Kong, approximately 18 hours of work, completed May 15, 2020.

*Knowledge of the Fundamentals of TBL certificate*, 5 interactive face-to-face workshops, organized by the Team-Based Learning Collaborative (in total approximately 18 hours of work) in team-based learning, completed April 29, 2020.

*Teaching Workshop for Stanford Post Doctoral Scholars*, 2-day interactive face-to-face workshop, Stanford, USA, January 25-26, 2018.

### **Officially appointed thesis mentor (possible in Finland, together with a senior mentor):**

Minna Pitkänen, D.Sc. (Tech.), 2013-2018. Co-mentor in both M.Sc. (Tech.) thesis (*Mapping of cortical hand representations using navigated transcranial magnetic stimulation and functional imaging*) and D.Sc. (Tech.) thesis (*Characterization of motor cortical function with navigated transcranial magnetic stimulation*). Currently a postdoctoral researcher at A.I. Virtanen Institute for Molecular Sciences, Finland.

Teemu Karjalainen, M.D., 2016- 2017. Co-mentor in MSc thesis in medicine (*Arterial spin labeling – the effects of excessive alcohol use during adolescence to cerebral perfusion*). Currently a doctoral candidate at Department of Internal Medicine, University of Helsinki, Finland.

Aleksi Montonen, M.D., 2014-2015. Co-mentor in MSc thesis in medicine (*The use of transcranial magnetic stimulation in rehabilitation of stroke patients with motor deficits*). Currently in clinical practice.

Karita Salo, M.Sc. (Tech.) 2014. Co-mentor in MSc. (Tech.) thesis (*Combining Transcranial Magnetic Stimulation and Electroencephalography to Estimate Cortical Excitability*). Currently a postdoctoral researcher at Department of Neuroscience and Biomedical Engineering, Aalto University, Finland.

Olli Rantula, B.Sc. (Tech.), 2014. Co-mentor in B.Sc. (Tech.) thesis (*Navigated magnetic stimulation combined with magnetoencephalography in clinical applications*). Currently a doctoral candidate at Department of Signal Processing and Acoustics, Aalto University, Finland.

Rasmus Zetter, B.Sc. (Tech), 2014. Co-mentor in B.Sc. (Tech.) thesis (*Navigated transcranial magnetic stimulation and magnetoencephalography - Technology, applications and combined use*). Currently a doctoral candidate at Department of Neuroscience and Biomedical Engineering, Aalto University, Finland.

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## PROFESSIONAL SERVICE AND LEADERSHIP

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Topic Editor, Non-invasive brain stimulation section, Applied Science, December 22, 2020-present.

Ad hoc reviewer for scientific journals (85 verified reviews): <https://publons.com/researcher/1527503/elisa-kallioniemi/>

Chair of the Advances in Transcranial Magnetic Stimulation session at the joint conference of European Medical and Biological Engineering and Nordic-Baltic Biomedical Engineering, Finland, Tampere, 2017.

Chair of the Multimodal Imaging session, World Congress on Medical Physics and Biomedical Engineering, Canada, Toronto 2015.

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## SCIENCE OUTREACH AND VOLUNTEERING

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Abstract reviewer for the Annual Biomedical Research Conference for Minority Students, California, 2019.

Wrote a chapter for a Finnish Clinical Neurophysiology textbook used to educate Finnish physicians about TMS-EEG: **Kallioniemi E**, Määttä S. *TMS-EEG*. In *Klininen neurofysiologia*, First Edition, Edited by Mervaala E, et al. Published 2019 by Duodecim. Pages: 370-372.

Wrote a chapter for a Biomedical Engineering book about TMS-EEG: **Kallioniemi E**, Könönen M and Määttä S. *TMS-EEG*. In *Biomedical Engineering Challenges*, Edited by V. Piemonte, A. Basile, T. Ito and L. Marrelli. Published 2018 by Wiley. Pages: 175-197.

Participated in the Stanford Science PenPals Program, which connects high school students with scientists to support students interested in science careers, 2017.

Taught English and computer skills to disadvantaged adolescents, Bom Jesus Coração de Jesus, Brazil, 2007.

Mentor for incoming exchange students, European Union Erasmus Programme, Aalto University, 2004-2012.

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## MEDIA COVERAGE

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Over 300 international press reports (e.g., Forbes, The Sun, The New York Post, CBS News, Times of India) referencing the abstract: Kaarre O, **Kallioniemi E**, et al., *Gender differences in the alcohol-related alterations in cortical activity – a combined TMS-EEG study*. 30<sup>th</sup> Annual ECNP Congress, France, 2017.

“Heavy alcohol use in adolescence alters brain electrical activity”. Science Daily, January 18, 2017. Referencing the article: Kaarre O, **Kallioniemi E**, et al., *Heavy alcohol use in adolescence is associated with altered cortical activity: a combined TMS-EEG study*. *Addiction Biology*, 2018;23:268-280. Available at: <https://www.sciencedaily.com/releases/2017/01/170118082434.htm>

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## MEMBERSHIP

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2019 – present	International Neuromodulation Society
2019 – present	North American Neuromodulation Society
2017 – present	Organization of Human Brain Mapping