

## **Nivethida Thirugnanasambandam, MBBS, MTech, PhD**

Dr. Nivethida Thirugnanasambandam,  
Wellcome Trust/DBT India Alliance Clinical Research Fellow (Intermediate),  
National Brain Research Centre (NBRC),  
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### **EDUCATION**

2007 – 2011	PhD in Systems Neuroscience, Goettingen Graduate School of Neurosciences, Biophysics and Molecular Biosciences, Georg-August University Goettingen, Germany (Supervisor: Prof.Dr.med. Michael Nitsche)
2005 – 2007	M.Tech in Biomedical engineering, School of Biosciences and Bioengineering, Indian Institute of Technology Bombay, Mumbai, India
1998 – 2003	M.B.,B.S., Jawaharlal Institute of Post-graduate Medical Education and Research (JIPMER), Puducherry, India

### **RESEARCH EXPERIENCE**

Jul 2017 – present                      **Wellcome Trust/DBT India Alliance Clinical Research Fellow (Intermediate)**

*National Brain Research Centre (NBRC), Manesar, India*

*(Previously - Department of Neurology, National Institute of Mental Health and NeuroSciences, Bangalore, India)*

#### **Projects:**

Investigating the role of nicotinic neuromodulation in levodopa-induced dyskinesias – a multimodal study.

Detailed evaluation of surround inhibition in the human motor cortex using transcranial magnetic stimulation.

Validating the efficacy of simulation-guided transcranial electrical stimulation in modulating behavior.

Exploring the neural basis and temporal cascade of higher motor control phenomena in humans.

Development of an EEG-based closed-loop non-invasive brain stimulation set up.

Mar 2012 – Mar 2017                      **National Research Service Award Postdoctoral fellow**

*Human Motor Control Section, National Institute of Neurological Disorders and Stroke,  
National Institutes of Health, Bethesda, USA*

Projects:

Detailed evaluation of motor surround inhibition in healthy adults and patients with focal hand dystonia.

Examining the role of parietal conditioning on motor surround inhibition.

Identifying TMS-EEG correlates for motor surround inhibition.

Exploring the neurophysiology of sensory trick in patients with cervical dystonia using concurrent TMS-EEG.

Studying task-specific cortical connectivity in patients with writer's cramp.

Modulating movement selection using transcranial direct current stimulation.

Altering cortico-cortical connectivity by entrainment with repetitive transcranial magnetic stimulation (rTMS) in humans.

Mar 2011 – Jul 2011                      **Postdoctoral fellow**

Aug 2007 – Feb 2011                      **Doctoral thesis research**

*Department of Clinical Neurophysiology, University Medical Centre Goettingen, Germany*

Projects:

Impact of nicotinergeric and dopaminergic activation on focal vs non-focal motor cortex plasticity in healthy subjects.

Time course of induction of homeostatic plasticity using repeated transcranial direct current stimulation of the human motor cortex.

July 2005 – July 2007                      **Masters' thesis research (DAAD fellow)**

*School of Biosciences and Biomedical Engineering, Indian Institute of Technology Bombay, Mumbai, India & Department of Neurology, RWTH-Aachen, Germany*

Project:

Influence of isometric muscle contraction on the after-effects of transcranial direct current stimulation induced motor cortex plasticity.

**RESEARCH INTERESTS**

- Pathophysiology of movement disorders.
- Physiology of motor control.
- Brain oscillations and functional connectivity.
- Physiology of non-invasive neuromodulation.
- Motor cognition.

### **MENTORING EXPERIENCE**

- Supervisor/Co-guide for M.Sc candidate (2020-21) at NBRC
- Supervisor/Co-guide for PhD candidate (2020~25) at NBRC
- Supervisor/Co-guide for PhD candidate at Department of Neurology, NIMHANS 2018-19
- Medical school student (Georgetown University), Medical Students Research Program 2016-17, NIH
- Post-baccalaureate (Emory University), NIH Post- baccalaureate IRTA Fellowship 2016-17.
- Undergraduate student (The George Washington University), NINDS Summer Internship program 2016.
- Undergraduate student (The Catholic University of America), NINDS Summer Internship program 2015.
- Undergraduate student (The George Washington University), NINDS Summer Internship Program 2014.
- Community College student (Atlantic Cape Community College), Community College Summer Education Program 2014.
- Undergraduate student (University of New Mexico), NINDS Summer Internship Program 2013.
- Medical school student (University of Nevada School of Medicine), NINDS Summer Internship Program 2013.
- Post-baccalaureate (University of Illinois at Chicago), NIH Post- baccalaureate IRTA Fellowship Mar-Jun 2013.
- Medical graduate (AIIMS, New Delhi), Research Volunteer Sep 2012 - Feb 2013.
- Trained several doctoral candidates, medical students and postdoctoral fellows on non-invasive brain stimulation techniques.
- Handled tutorial sessions on TMS for summer students at NIH.

### **AWARDS & SCHOLARSHIPS**

DBT/Wellcome Trust India Alliance Clinical Research Fellowship (Intermediate) 2017 – 2022.

Ramalingaswamy Re-entry Fellowship, Department of Biotechnology, India (did not activate).

Ruth L. Kirschstein National Research Service Award (NRSA) NINDS Competitive Postdoctoral Fellowship 2013-2016.

The German Academic Exchange Service (DAAD) Scholarship for the Masters' sandwich program 2006-07.

### **PROFESIONAL MEMBERSHIPS**

Elected member of the Indian National Young Academy of Sciences (INYAS) (2021-25)

Life member of the Indian Academy of Neurosciences

Member of the International Parkinson and Movement Disorder Society

### **PEER-REVIEWED PUBLICATIONS**

1. **Thirugnanasambandam N\***, Singh S\*, Cho HJ, Shitara H, Panyakaew P, Lee SW, Hallett M. Site-specific decrease in cortical reactivity during sensory trick in cervical dystonia patients – a TMS-EEG study. (*submitted*).
2. **Thirugnanasambandam N**, Zimmerman T, Pillai AS, Shields J, Horovitz SG, Hallett M. Task-specific interhemispheric hypoconnectivity in writer's cramp – an EEG study. *Clin Neurophysiol.* 2020. 131(5):985-993. doi: 10.1016/j.clinph.2020.01.011.
3. **Thirugnanasambandam N**, Leodori L, Popa T, Kassavetis P, Mandel A, Shaft A, Kee J, Kashyap S, Khodorov G, Hallett M. Parietal conditioning enhances motor surround inhibition. *Brain Stimul.* 2020. 13(2):447-449. doi: 10.1016/j.brs.2019.12.011.
4. **Thirugnanasambandam N**, Contreras-Castro FG, Hallett M. Dual hemispheric transcranial direct current stimulation (tDCS) to the primary motor cortex does not affect movement selection. *PLoS One.* 2019. 14(12):e0226103. doi: 10.1371/journal.pone.0226103.
5. Leodori G\*, **Thirugnanasambandam N\***, Conn H, Popa T, Berardelli A, Hallett M. Intracortical inhibition and surround inhibition in the motor cortex – a TMS-EEG study. *Front Neurosci.* 2019; 13:612. doi: 10.3389/fnins.2019.00612. (\*equal contribution)
6. Grundey J, **Thirugnanasambandam N**, Amu R, Paulus W, Nitsche M. Nicotinic restoration of excitatory neuroplasticity is linked to improved implicit motor learning skills in deprived smokers. *Front. Neurol.* 2018; 9:367. doi: 10.3389/fneur.2018.00367.
7. Ramos VFML, Srivanitchapoom P, **Thirugnanansambandam N**, Pandey S, Holmes A, Kukke SN, Paine R, Considine E, Dang N, Wu T, Hallett M. Failed attempt with paired associative stimulation to separate functional and organic dystonia. *Mov Disord.* 2018; 33(3):495-497. doi: 10.1002/mds.27245.
8. Hussain SJ, **Thirugnanasambandam N**. Probing phase- and frequency-dependent characteristics of cortical neurons using combined transcranial alternating current stimulation and transcranial magnetic stimulation. *J Neurophysiol.* 2017; 117(6):2085-2087. doi: 10.1152/jn.00060.2017.
9. Muessgens D, **Thirugnanasambandam N**, Shitara H, Popa T, Hallett M. Dissociable roles of pre-SMA in motor chunking and hand switching - a TMS study. *J Neurophysiol.* 2016; 116(6):2637-2646. doi: 10.1152/jn.00565.2016.
10. Cho HJ, Panyakaew P, **Thirugnanasambandam N**, Wu TA, Hallett M. Dynamic modulation of corticospinal excitability and short-latency afferent inhibition during onset and maintenance phase selective finger movement. *Clin Neurophysiol.* 2016; 127(6):2343-9. doi: 10.1016/j.clinph.2016.02.020.

11. Shields JA, Park JE, Srivanitchapoom P, Paine R, **Thirugnanasambandam N**, Kukke SN, Hallett M. Probing the interaction of the ipsilateral posterior parietal cortex with the premotor cortex using a novel transcranial magnetic stimulation technique. *Clin Neurophysiol*. 2016; 127(2):1475-80. doi: 10.1016/j.clinph.2015.06.031.
12. Srivanitchapoom P, Park JE, **Thirugnanasambandam N**, Panyakaew P, Ramos VFM, Pandey S, Wu TA, Hallett M. Inducing LTD-like effect in the human motor cortex with low frequency and very short duration paired associative stimulation. *Neural Plast*. 2016. doi:10.1155/2016/3920298.
13. **Thirugnanasambandam N**, Khera R, Wang H, Kukke S, Hallett M. Distinct interneuronal networks influence excitability of the surround during movement initiation. *J Neurophysiol*. 2015; 114(2): 1102–8. doi: 10.1152/jn.00791.2014.
14. Ramos VF, Paine RW, **Thirugnanasambandam N**. Supplementary motor area stimulation for Parkinson's disease: a randomized control study. *Neurology*. 2013; 81(21):1881-2. doi: 10.1212/01.wnl.0000438373.32335.cf.
15. Grundey J, **Thirugnanasambandam N**, Kaminsky K, Drees A, Skwirba AC, Lang N, Paulus W, Nitsche MA. Rapid effect of nicotine intake on neuroplasticity in non-smoking humans. *Front Pharmacol*. 2012; 3:186. doi: 10.3389/fphar.2012.00186.
16. Grundey J, **Thirugnanasambandam N**, Kaminsky K, Drees A, Skwirba AC, Lang N, Paulus W, Nitsche MA. Neuroplasticity in cigarette smokers is altered under withdrawal and partially restituted by nicotine exposition. *J Neurosci*. 2012; 32(12): 4156-62. doi: 10.1523/JNEUROSCI.3660-11.2012.
17. **Thirugnanasambandam N**, Sparing R, Dafotakis M, Meister IG, Paulus W, Nitsche MA, Fink GR. Isometric contraction interferes with transcranial direct current stimulation (tDCS) induced plasticity: evidence of state-dependent neuromodulation in human motor cortex. *Restor Neurol Neurosci*. 2011; 29(5): 311-20. doi: 10.3233/RNN-2011-0601.
18. **Thirugnanasambandam N**, Grundey J, Paulus W, Nitsche MA. Dose-dependent nonlinear effect of L-DOPA on paired associative stimulation-induced neuroplasticity in humans. *J Neurosci*. 2011; 31(14): 5294-9. doi: 10.1523/JNEUROSCI.6258-10.2011.
19. Fricke K, Seeber AA, **Thirugnanasambandam N**, Paulus W, Nitsche MA, Rothwell JC. Time course of the induction of homeostatic plasticity generated by repeated transcranial direct current stimulation of the human motor cortex. *J Neurophysiol*. 2011; 105(3): 1141-9. doi: 10.1152/jn.00608.2009.
20. **Thirugnanasambandam N**, Grundey J, Adam K, Drees A, Skwirba AC, Lang N, Paulus W, Nitsche MA. Nicotinic impact on focal and non-focal neuroplasticity induced by non-invasive brain stimulation in non-smoking humans. *Neuropsychopharmacology*. 2011; 36(4): 879-86. doi: 10.1038/npp.2010.227.

21. Antal A, Chaieb L, Moliadze V, Monte-Silva K, Poreisz C, **Thirugnanasambandam N**, Nitsche MA, Shoukier M, Ludwig H, Paulus W. Brain-derived neurotrophic factor (BDNF) gene polymorphisms shape cortical plasticity in humans. *Brain Stimul.* 2010; 3(4): 230-7. doi: 10.1016/j.brs.2009.12.003.
22. Nitsche MA, Jakoubkova M, **Thirugnanasambandam N**, Schmalfluss L, Hulleman S, Sonka K, Paulus W, Trenkwalder C, Happe S. Contribution of the premotor cortex to consolidation of motor sequence learning in humans during sleep. *J Neurophysiol.* 2010; 104(5): 2603-14. doi: 10.1152/jn.00611.2010.
23. Monte-Silva K, Kuo MF, **Thirugnanasambandam N**, Liebetanz D, Paulus W, Nitsche MA. Dose-dependent inverted U-shaped effect of dopamine (D2-like) receptor activation on focal and nonfocal plasticity in humans. *J Neurosci.* 2009; 29(19): 6124-31. doi: 10.1523/JNEUROSCI.0728-09.2009.
24. Meister IG, Weier K, Staedtgen M, Buelte D, **Thirugnanasambandam N**, Sparing R. Covert word reading induces a late response in the hand motor system of the language dominant hemisphere. *Neuroscience.* 2009; 161(1): 67-72. doi: 10.1016/j.neuroscience.2009.03.031.
25. Sparing R, Dafotakis M, Meister IG, **Thirugnanasambandam N**, Fink GR. Enhancing language performance with non-invasive brain stimulation - a transcranial direct current stimulation study in healthy humans. *Neuropsychologia.* 2008; 46(1): 261-8. doi: 10.1016/j.neuropsychologia.2007.07.009.

## **CONFERENCE PRESENTATIONS**

Site-specific decrease in cortical reactivity during sensory trick in cervical dystonia patients. 7<sup>th</sup> Asia-Oceania Congress of Clinical Neurophysiology, Kuala Lumpur, Malaysia, January 2021 (virtual).

Bridging the gap between intracortical mechanisms and behavior. 7<sup>th</sup> International Conference on Non-invasive Brain Stimulation, Baden-Baden, Germany, November 2020 (virtual).

Using multimodal approach to probe neural network dynamics of non-invasive brain stimulation, Clinical Neurophysiology Symposium & Workshop, NIMHANS, Bengaluru, March 2018

Low intensity Transcranial Electrical Stimulation, Asia-Oceania Congress of Clinical Neurophysiology, Bengaluru, November 2017.

Exploring the neurophysiology of sensory trick in cervical dystonia using TMS-EEG. Asia-Oceania Congress of Clinical Neurophysiology, Bengaluru, November 2017.

Using pharmacological agents to explore the physiology of non-invasive brain stimulation,

NWG (German Neuroscience Society) Symposium on Transcranial magnetic and electrical stimulation, Goettingen, Germany, February 2010 & 2011.

Pharmacological influences on cortical plasticity induced by non-invasive brain stimulation (invited), 7<sup>th</sup> EEG and Clinical Neuroscience Society meeting, Istanbul, Turkey, September 2010.

## **PUBLIC OUTREACH**

Evaluating cortical connectivity with non-invasive brain stimulation, Monsoon Brain Meeting, June 2020.

Rhythms of the Brain, National Brain Research Centre (NBRC) Outreach event at the India International Science Festival, December 2020.

## **POSTER PRESENTATIONS**

Modulating inter-hemispheric coherence to influence behavior – a TMS-EEG study, 6<sup>th</sup> International Conference on Transcranial Brain Stimulation, Goettingen, Germany, September 2016.

Investigating premotor-parietal connectivity in patients with writer's cramp – an EEG study, Society for Neuroscience meeting, Chicago, USA, October 2015.

Effect of transcranial direct current stimulation (tDCS) on movement selection in humans, 1<sup>st</sup> International Brain Stimulation Conference, Singapore, February 2015.

Distinct interneuronal networks influence excitability of the surround during movement initiation in humans, Society for Neuroscience meeting, Washington DC, USA, November 2014.

Parietal – premotor connectivity in patients with writer's cramp, American Clinical Neurophysiology Society meeting, Atlanta, USA, February 2014.

A detailed evaluation of surround inhibition in human motor cortex using transcranial magnetic stimulation, 5<sup>th</sup> International Congress for Non-invasive Brain Stimulation, Leipzig, Germany, March 2013.

Nicotinergic impact on focal and non-focal neuroplasticity induced by non-invasive brain stimulation in non-smoking humans, 67<sup>th</sup> Society of Biological Psychiatry Annual Meeting, San Francisco, USA, May 2012.

Dose-dependent effect of L-DOPA on paired associative stimulation-induced neuroplasticity in humans, NWG (German Neuroscience Society) Symposium on Transcranial magnetic and electrical stimulation, Goettingen, Germany, February 2011.

Influence of voluntary muscle contraction on the after-effects of transcranial direct current

stimulation, WICN Summer School of Cognitive Neuroscience at Bangor, UK, September 2008.

### **JOURNAL REVIEWING & EDITING**

*Reviewer* - PLoS One; Cerebral Cortex; Brain Stimulation; European Journal of Neuroscience; Experimental Brain Research; Frontiers in Neuroscience; Human Brain Mapping; Neurobiology of Aging; Neuromodulation; Parkinsonism and Related Disorders; Schizophrenia Research; Neurobehavioral Reviews.

*Associate guest editor* – Frontiers in Human Neuroscience: Brain imaging and stimulation.

### **ADMINISTRATIVE/ ORGANIZATIONAL ACTIVITIES**

Member of the PhD Admission Committee at NBRC, Manesar

Member of the Students Grievance Redressal Committee at NBRC, Manesar

Core volunteer for organizing the NeuroFemIndia 2021 – a BiaswatchIndia Conference