

TRANSCRANIAL MAGNETIC STIMULATION

HERE TO STAY?



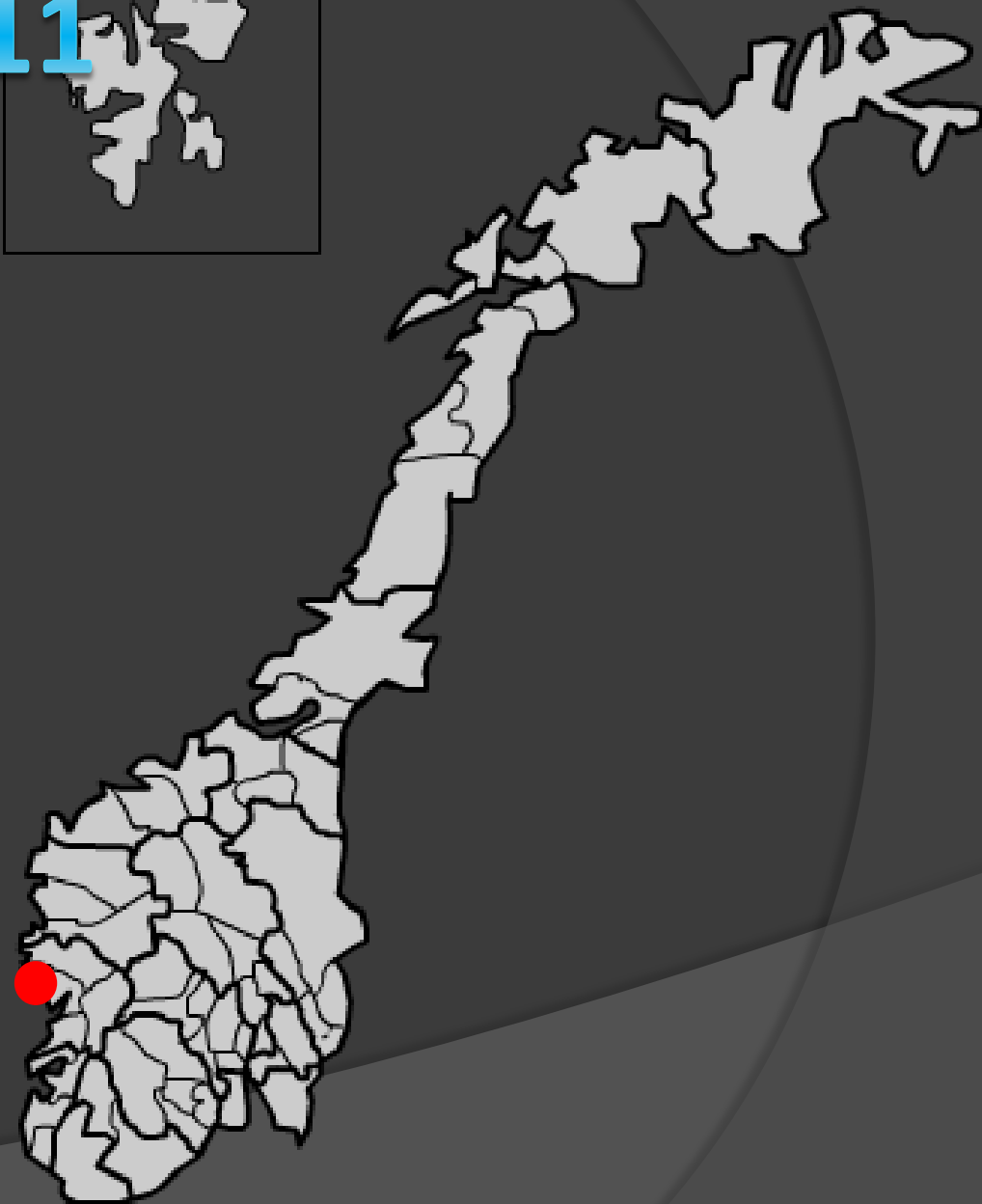
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Marco Hirnstein

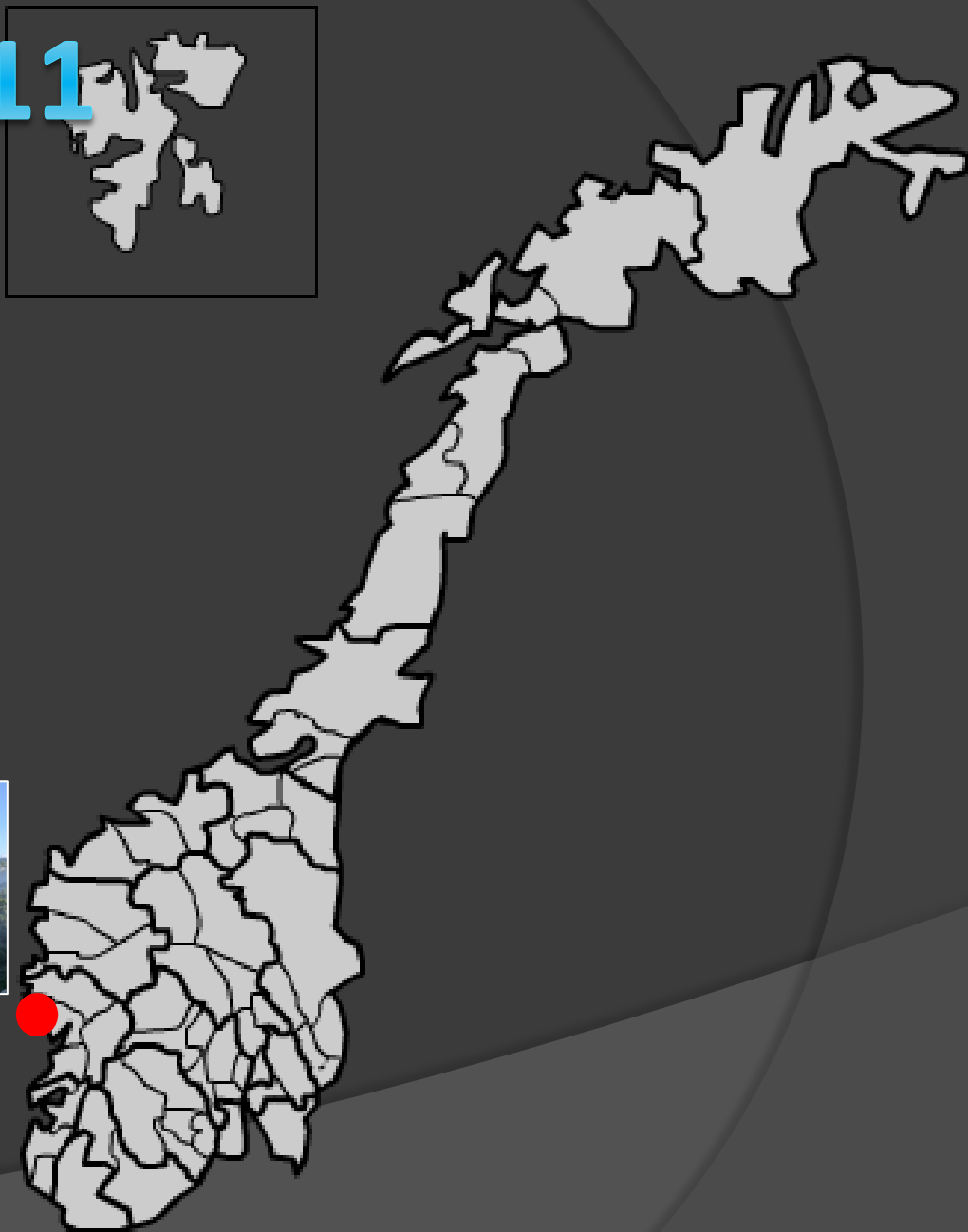
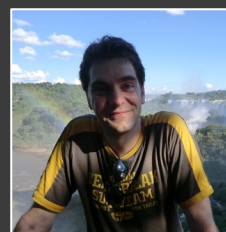
Once upon a time... in 2011



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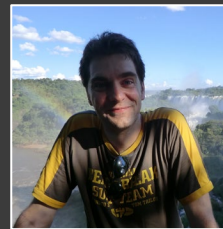


Once upon a time... in 2013



Ketil Ødegaard

Ketil Ødegaard introduced TMS as treatment for depression at the psychiatric clinic in Sandviken, (Haukeland University Hospital) Bergen.



Torkild Hjelmtveit & Kirsten Moe Nilsen

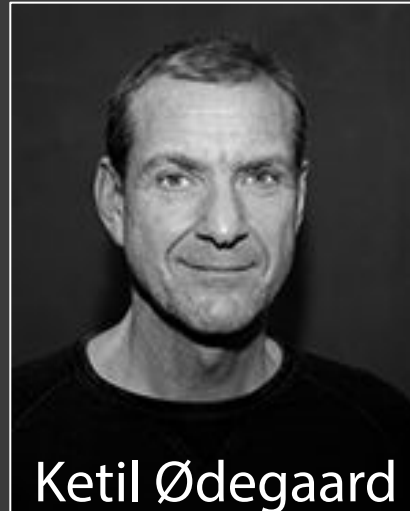


Renata Alisauskiene

Marco Hirnstein



Once upon a time... in 2013



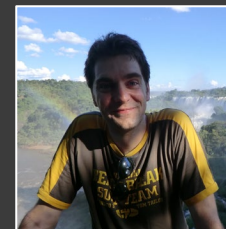
Ketil Ødegaard



Torkild Hjelmtveit &
Kirsten Moe Nilsen

Treatment

- Left DLPFC
 - Determined with «5cm rule»
- 1 TMS session per day for 4-6 weeks
- 10Hz protocol
 - **Between 2013-2016:** 3000 pulses, 37.5 min
 - **2016 – :** 1500 pulses, 9.5 min

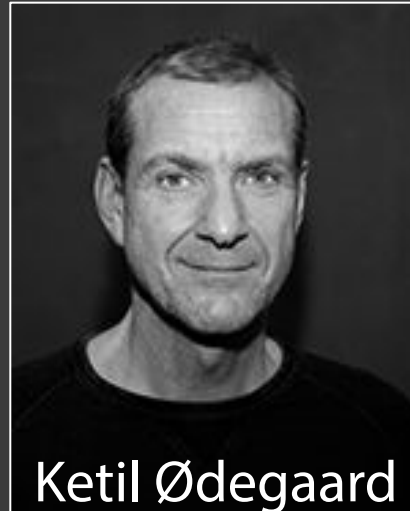


Renata
Alisauskiene



Marco Hirnstein

Once upon a time... in 2023



Ketil Ødegaard



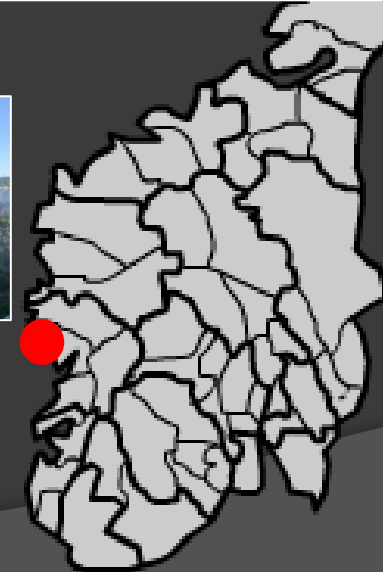
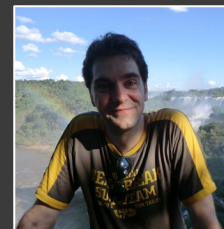
Ute Kessler



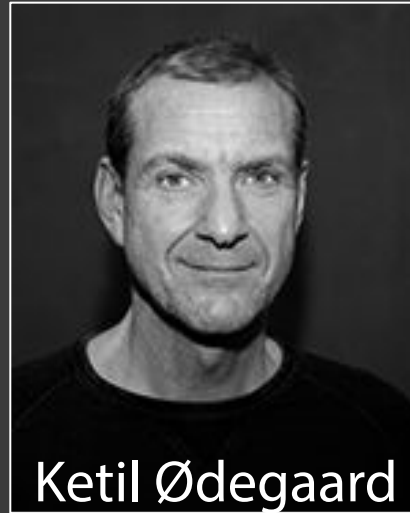
Isabell Brekke Fyllingen
Carina Bjørkman Taule
& Heidi Pedrero Waage

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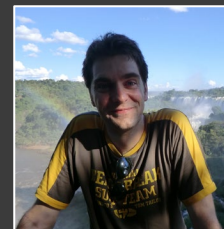
Ketil Ødegaard



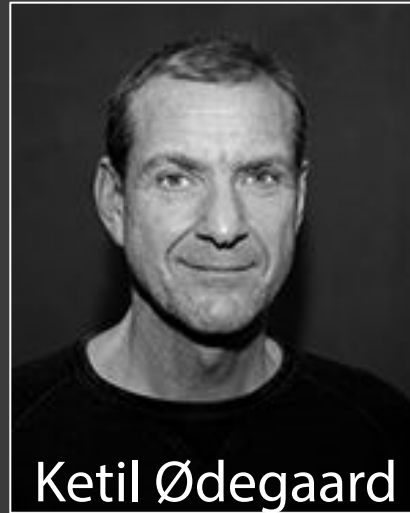
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Regional TMS & ECT register

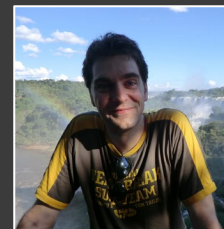


Ketil Ødegaard



Ute Kessler

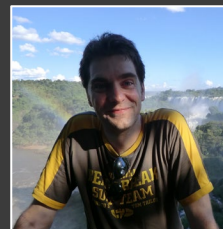
Since 2013, all patients getting either ECT or TMS treatment are invited to provide data about themselves and their treatment



Regional TMS & ECT register

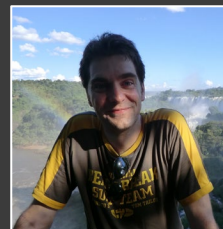
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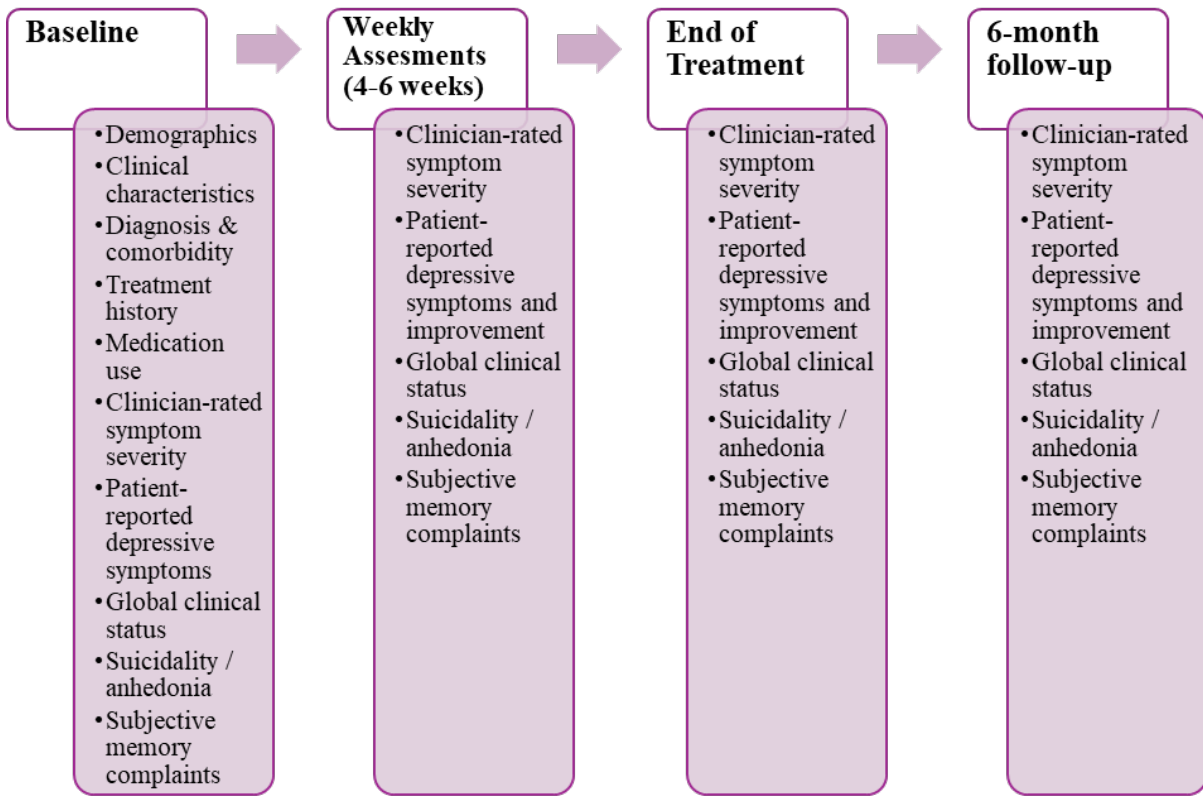
- Comprises data on...
 - Demographic info (age, sex/gender, weight...)
 - Info about illness and treatment
 - Basic neuropsychological tests and cognitive functioning
 - Depression ratings (MADRS, BDI)



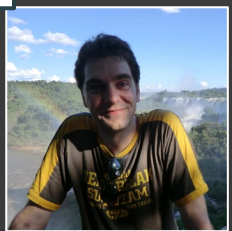
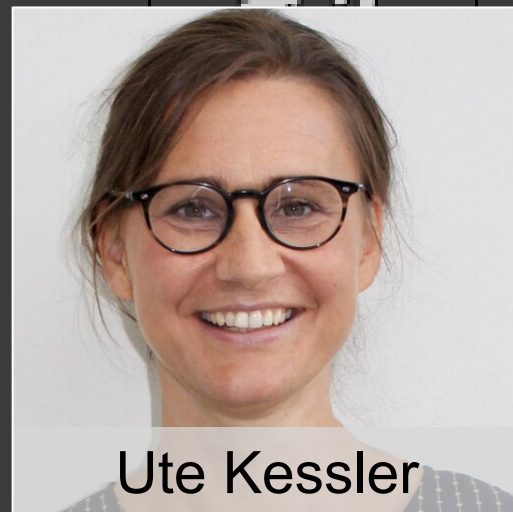
Regional TMS & ECT register

- ◉ Comprises data on...
 - Demographic info (age, sex/gender, weight...)
 - Info about illness and treatment
 - Basic neuropsychological tests and cognitive functioning
 - Depression ratings (MADRS, BDI)
- ◉ Data collected
 - Before treatment
 - Every week
 - At the end of treatment
 - At 6-month follow-up





egister

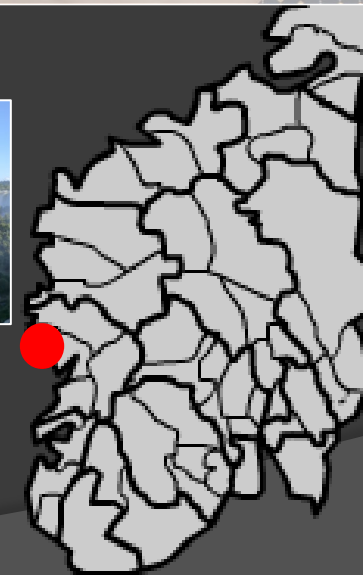
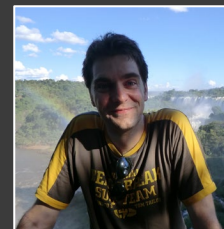
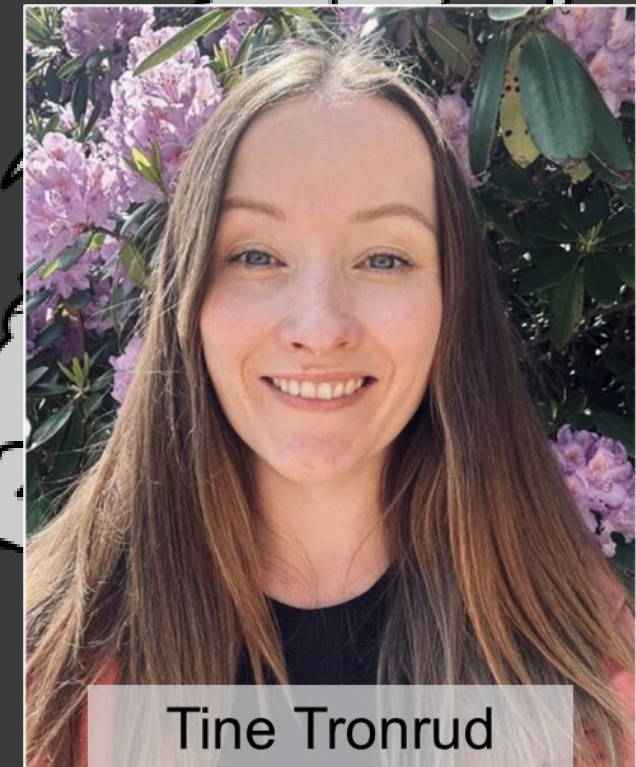


- Data collected
 - Before treatment
 - Every week
 - At the end of treatment
 - At 6-month follow-up



Regional TMS & ECT register

- 254 patients in total
 - Some patients received treatment more than once
- Age range: 18-75 ($M \approx 43$); 53% women
- Primary diagnose:
 - ~ 54 % unipolar depression
 - ~ 23 % bipolar disorder
 - ~ 20 % other/unspecified



Regional TMS & ECT register

Clinical effects



Intention-to-treat sample,
N = 254 (= all treatment series, regardless
of whether patients finished)

Response*

- 27% - MADRS
- 30% - BDI

Remission*

- 24 % - MADRS
- 31 % - BDI

Per-protocol sample,
n = 186 (= patients with at least 15 TMS
sessions)

Response*

- 30% - MADRS
- 36% - BDI

Remission*

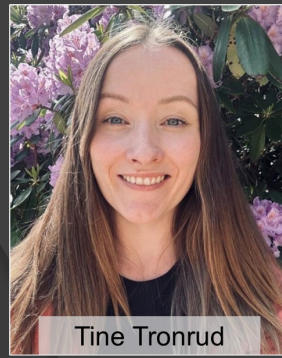
- 26 % - MADRS
- 32 % - BDI

*Response = at least 50% symptom reduction

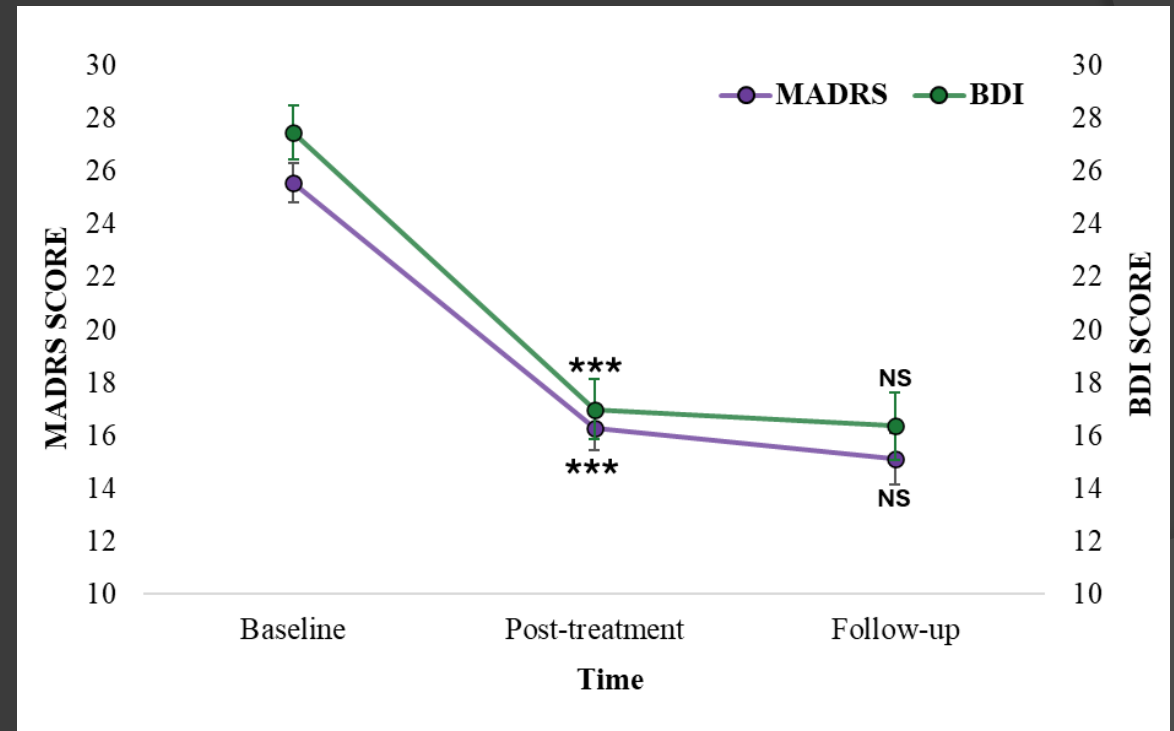
* Remission = MADRS score \leq 10, BDI \leq 12

Regional TMS & ECT register

Long-term effects



Per-protocol sample,
n = 186



Cohen's d = 1.05 - 1.24



Regional TMS & ECT register

Predictors
(based on MADRS)



Tine Tronrud

Predictor	Response: OR (p), n	Remission: OR (p), n
Age (continuous)	1.01 (.627), n = 231	1.01 (.314), n = 236
Gender (Female vs Male)	1.34 (.307), n = 231	1.51 (.165), n = 236
Baseline depressive symptom severity (continuous)	1.02 (.310), n = 231	0.88 (.001), n = 231
Prior ECT (Yes vs No)	0.70 (.314), n = 231	0.51 (.076), n = 236
Concurrent benzodiazepine use (Yes vs No)	1.39 (.362), n = 231	0.51 (.124), n = 236
Number of rTMS sessions (continuous)	1.01 (.404), n = 229	1.02 (.249), n = 234
Motor threshold (continuous)	1.00 (.279), n = 183	0.97 (.185), n = 187
Prior rTMS (Yes vs No)	0.97 (.922), n = 231	1.15 (.664), n = 236
Prior suicide attempt (Yes vs No)	0.77 (.439), n = 229	0.78 (.466), n = 234
Stimulation protocol (New vs Old)	0.73 (.306), n = 231	1.01 (.980), n = 231
Family history of severe mental illness (Yes vs No)	0.95 (.858), n = 230	1.05 (.880), n = 235
Age at onset (continuous)	1.00 (.760), n = 229	0.99 (.659), n = 234
Primary diagnosis (Bipolar vs Unipolar)	0.85 (.642), n = 172	0.90 (.777), n = 176



Regional TMS & ECT register

- ◎ Substantial improvement in 24-36% of patients
 - ~ 10 point reduction in MADRS/BDI → large effect
 - lasts at least 6 months
 - No discernible predictors

Swedish national register for TMS & ECT

- ◎ [Nordenskjöld, 2021](#):
 - 25% treatment responders
 - 15% remission (MADRS-S score < 11)
- ◎ [Ekman et al., 2023](#) (only iTBS):
 - Unipolar depression
 - 41% treatment responders
 - 15.6 % remission
 - Bipolar
 - 46.5% treatment responders
 - 18.6 % remission

Regional TMS & ECT r

- Substantial improvement in 24-36% of patients
 - ~ 10 point reduction in MADRS/BDI → large effect
 - lasts at least 6 months
 - No discernible predictors

Slightly worse than RCTs and meta-analyses with response rates ~60%, remission rates ~ 30%



Repetitive Transcranial Magnetic Stimulation for Treatment-Resistant Depression: A Systematic Review and Meta-Analysis

Bradley N. Gaynes, MD, MPH;
 Stacey W. Lloyd, MPH; Linda Lux, MPA;
 Gerald Gartlehner, MD, MPH; Richard A. Hansen, PhD;
 Shannon Brode, MPH; Daniel E. Jonas, MD, MPH;

Unilateral and bilateral repetitive transcranial magnetic stimulation for treatment-resistant depression: a meta-analysis of randomized controlled trials over 2 decades

Shayan Sehatzadeh, MD, MSc; Zafiris J. Daskalakis, MD, PhD; Belinda Yap, MPH, PhD;
 Hong-Anh Tu, PhD; Stefan Palimaka, MBIotech; James M. Bowen, MSc; Daria J. O'Reilly, PhD, MSc

Molecular Psychiatry

www.nature.com/mp

SYSTEMATIC REVIEW OPEN

Check for updates

Efficacy of neurostimulation across mental disorders: systematic review and meta-analysis of 208 randomized controlled trials

Joshua Hyde^{1,2,3}, Hannah Carr¹, Nicholas Kelley², Rose Seneviratne¹, Claire Reed⁴, Valeria Parlatini³, Matthew Garner^{1,4}, Marco Solmi^{5,6}, Stella Rosson⁷, Samuele Cortese^{1,4,8,9,10,11} and Valerie Brandt^{1,11}



Neuroscience and Biobehavioral Reviews

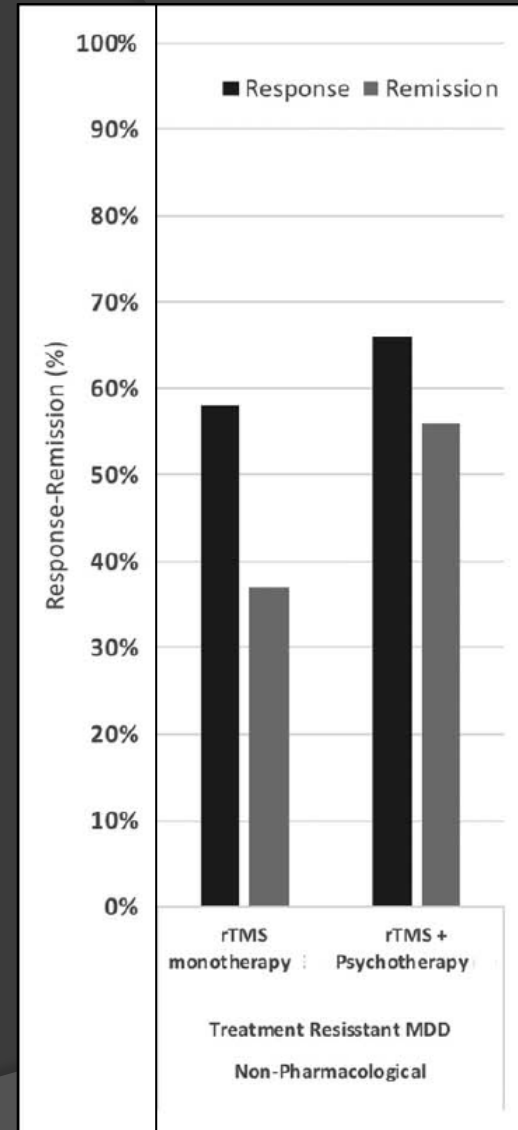
journal homepage: www.elsevier.com/locate/neubiorev



Efficacy and acceptability of non-invasive brain stimulation for the treatment of adult unipolar and bipolar depression: A systematic review and meta-analysis of randomised sham-controlled trials

Julian Mutz^{a,b,*}, Daniel R. Edgumbe^c, Andre R. Brunoni^{d,e}, Cynthia H.Y. Fu^{c,f}

Check for updates



Baeken et al. 2019

Marco Hirnstein

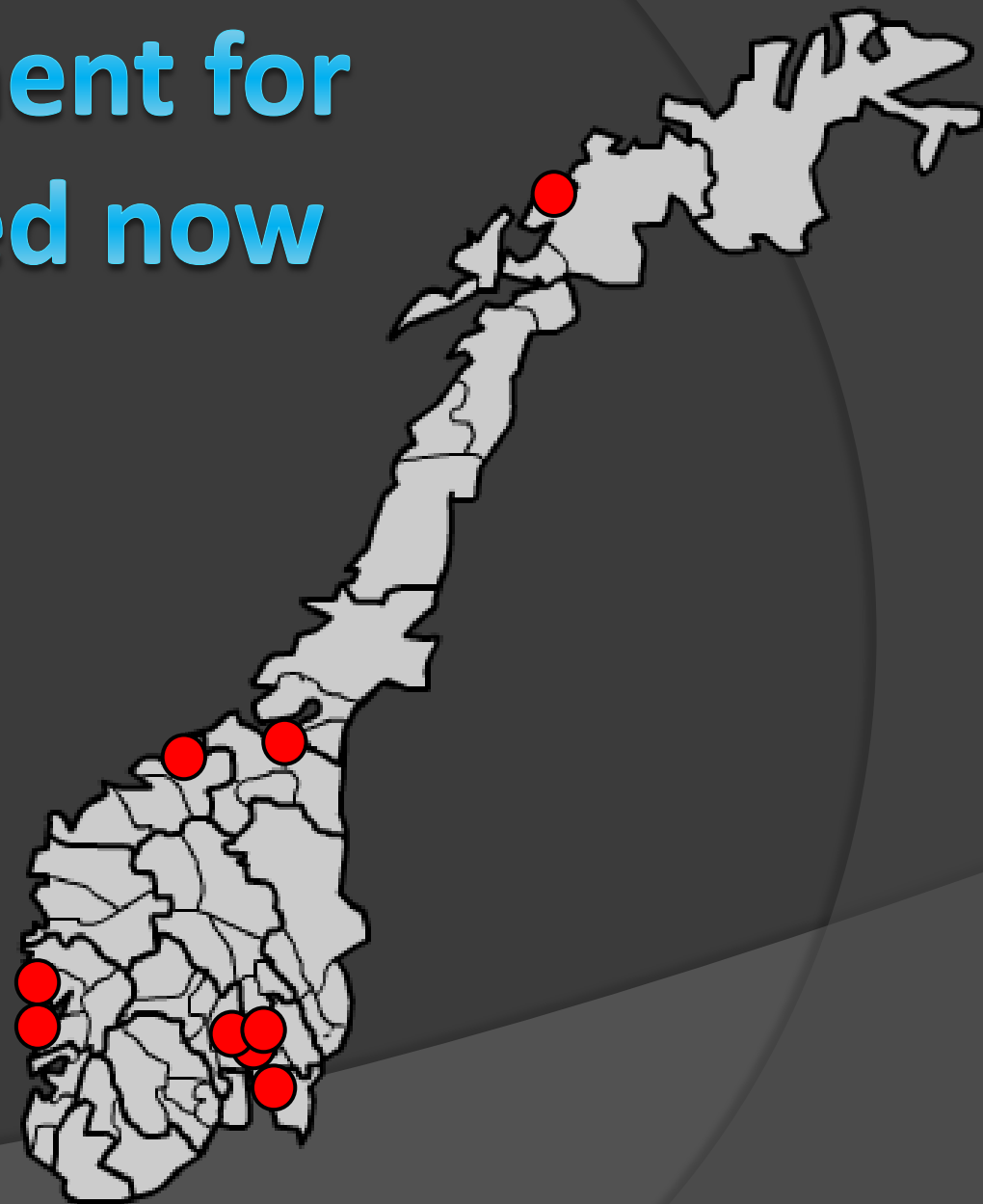


Regional TMS & ECT register

- No miracle cure, but it works!
- Not bad given...
 - ... that most patients had unsuccessfully tried out other treatments before
 - ... that treatment procedures have improved in the meantime
 - ... that sample is from a “natural” setting → “real-life settings”
 - However, no placebo control



Places where TMS treatment for mental disorders is offered now



What do the clinicians say?

Survey among 481 physicians in the Norwegian psychiatric society (Orbø et al. 2025)

Tidsskriftet 

KORT RAPPORT

Transkraniell magnetisk stimulering i psykisk helsevern

Marte C. Ørbo, Camilla Larsen, Martin Bystad, Lars Lien Om forfatterne

Awareness and knowledge of TMS	Somewhat / Strongly Agree	Somewhat / Strongly Disagree	Neither Agree nor Disagree
I have no knowledge of TMS	49.1%	42.2%	8.7%
There is an opportunity for TMS treatment in my health trust (yes, no, or do not know)	22.0%	28.4%	49.6%
I have theoretical training in TMS	19.0%	76.5%	4.4%

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Reasons for limited use of TMS in mental health care	Somewhat / Strongly Agree	Somewhat / Strongly Disagree	Neither Agree nor Disagree
The method is insufficiently known	86.8%	3.4%	9.9%
Physicians lack training	83.8%	2.9%	13.3%
We know too little about which patients benefit from TMS	56.6%	6.8%	36.6%

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Interest in TMS	Somewhat / Strongly Agree	Somewhat / Strongly Disagree	Neither Agree nor Disagree
I want more knowledge about TMS	81.6%	2.7%	15.7%
I would refer patients to TMS if the service were available in my health trust	53.3%	8.2%	38.6%
I would like training in administering TMS	48.8%	16.7%	34.5%

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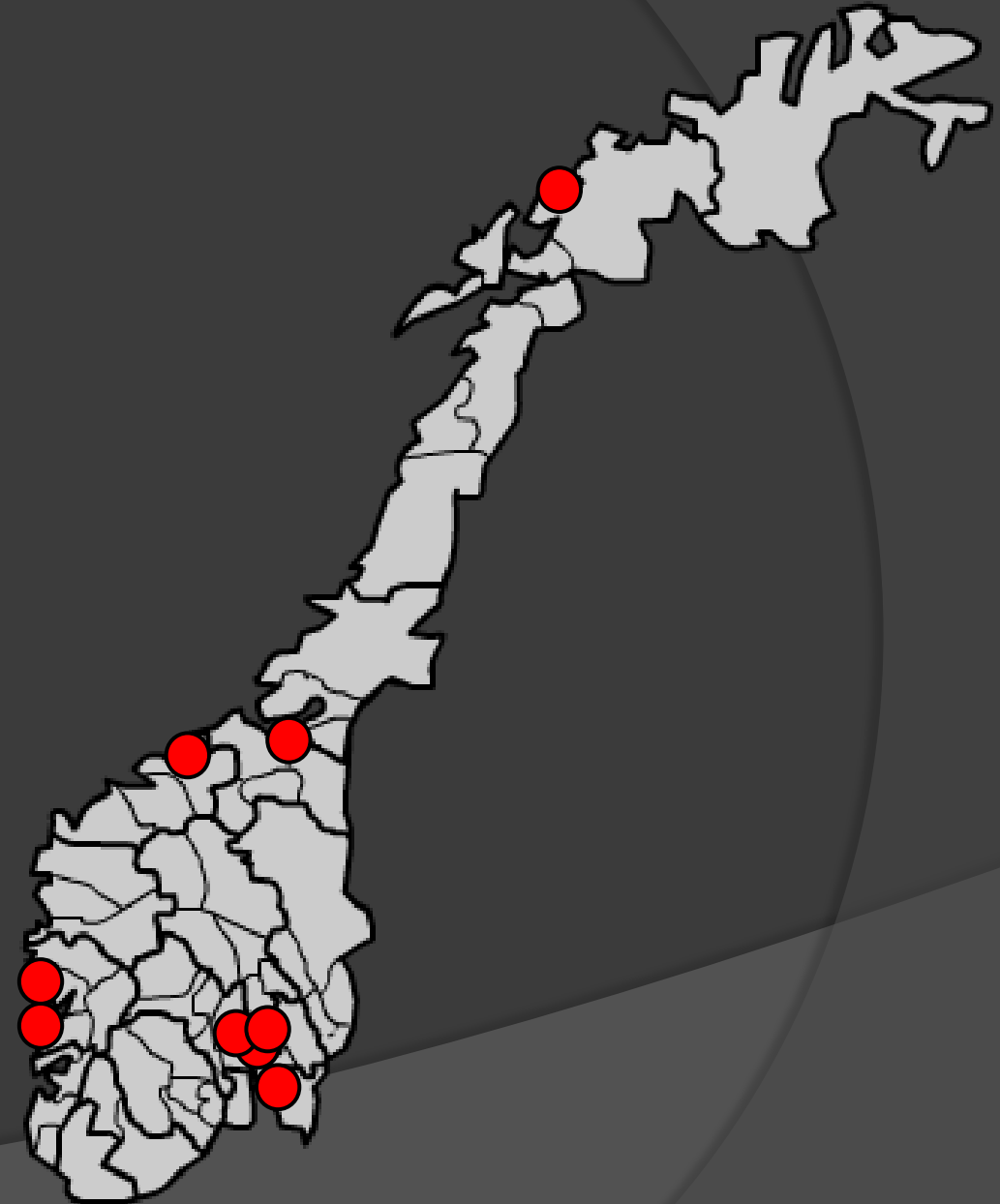
Marte C. Orbø, Camilla Larsen, Martin Bystad, Lars Lien Om forfatterne

What is needed for wider use of TMS?	Somewhat / Strongly Agree	Somewhat / Strongly Disagree	Neither Agree nor Disagree
Training of more physicians with TMS expertise	80.6%	1.6%	17.8%
Updated national clinical guidelines for use	78.9%	4.9%	15.2%
Research showing that TMS is superior to standard treatment	56.2%	7.0%	36.8%
Demand for TMS from patients or patient organizations	51.1%	13.9%	35.0%



TMS - Here to stay?

- National guidelines
- National ECT/TMS register
- Integration in curriculum for psychiatrists
- Research
 - How can we further improve the treatment?
 - What are the underlying neuronal mechanisms?
 - Who benefits, who does not?
- Training



Training



European Society
for Brain Stimulation

HOME ABOUT THE ESBS WHAT IS BRAIN STIMULATION EVENTS & EDUCATION CERTIFICATION CONTACT

ESBS CERTIFICATION

The **European Society for Brain Stimulation (ESBS)** has developed harmonised of education, training, and certification in non-invasive brain stimulation (NIBS), in and transcranial electrical stimulation (tES).

The ESBS Certification process provides a structured framework that defines the **experience, and safety competencies** required for professionals applying Certification is valid for five years and requires renewal to ensure continuous quality

To make the information accessible, the certification materials are organised in **four**

- **Certification of Trainees**

Individual applicants (clinicians, scientists, or technical staff) may apply for theoretical courses and supervised practical training, as documented in their training

- **Certification of Trainers**

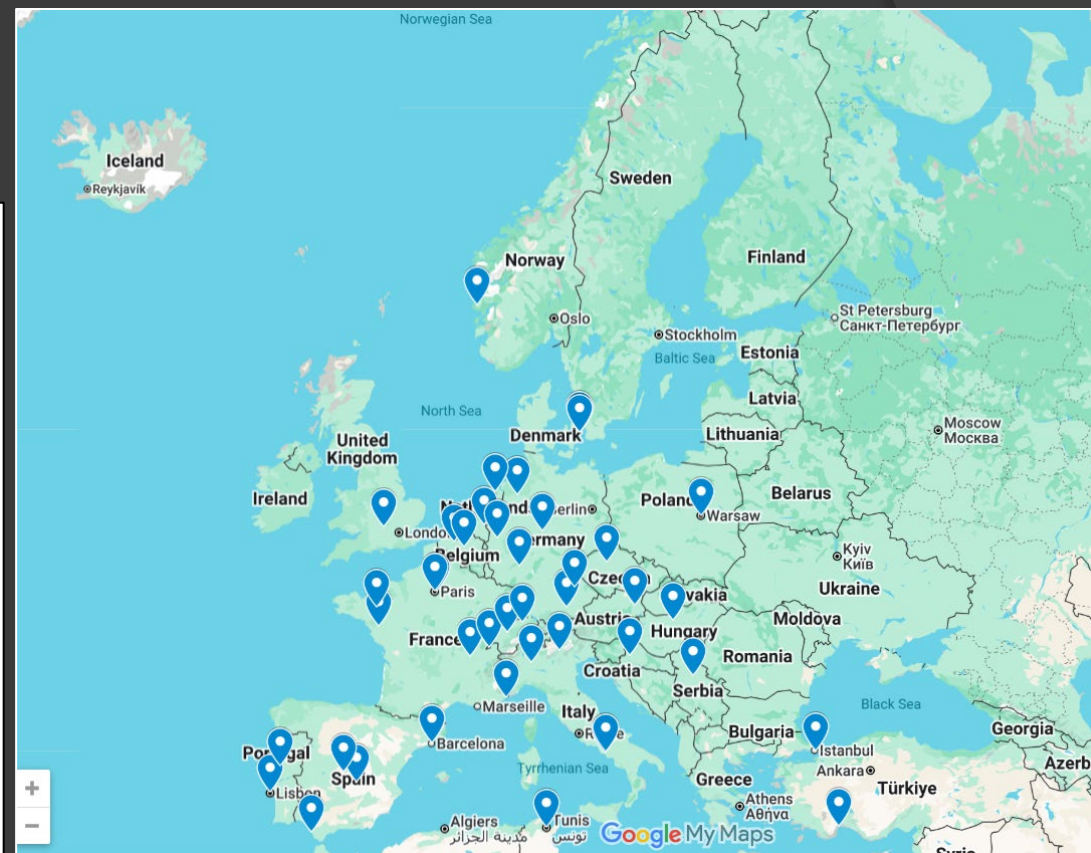
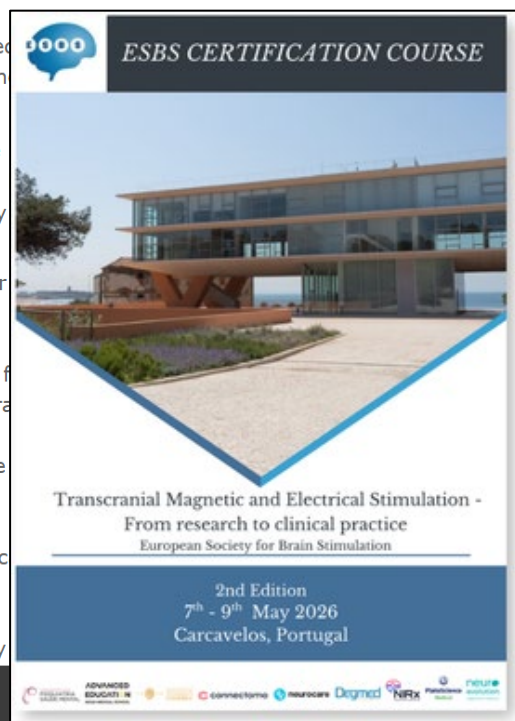
Experienced professionals can be certified as ESBS trainers if they meet the ensuring quality supervision and training

- **Certification of Courses**

Courses that fulfil the ESBS requirements in theoretical and practical training of society's educational standards

- **Certification of Training Centres**

Institutions offering clinical or research training in TMS and/or tES may apply



Training



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To make the information accessible, the certification material is available in multiple languages.

- **Certification of Trainees**

Individual applicants (clinicians, scientists, or technicians) can be certified after completing theoretical courses and supervised practical training, as well as passing a written exam.

- **Certification of Trainers**

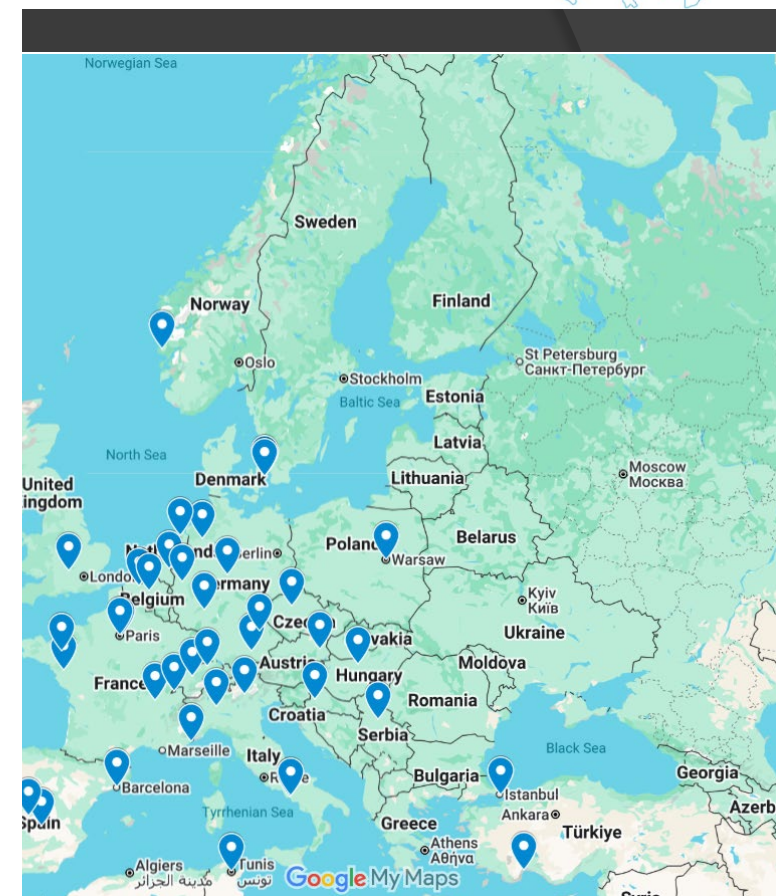
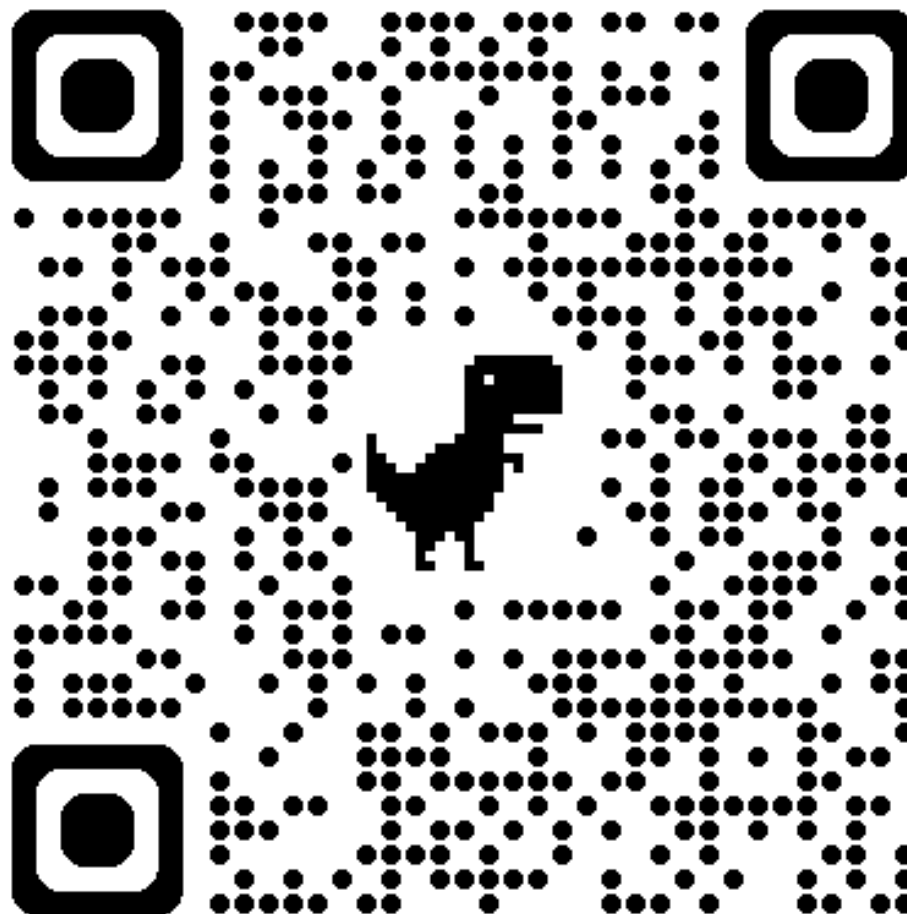
Experienced professionals can be certified as ESBS trainers after demonstrating quality supervision and training experience.

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Courses that fulfil the ESBS requirements in theoretical and practical aspects are certified by the society's educational standards.

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Institutions offering clinical or research training in TMS can be certified by the society.

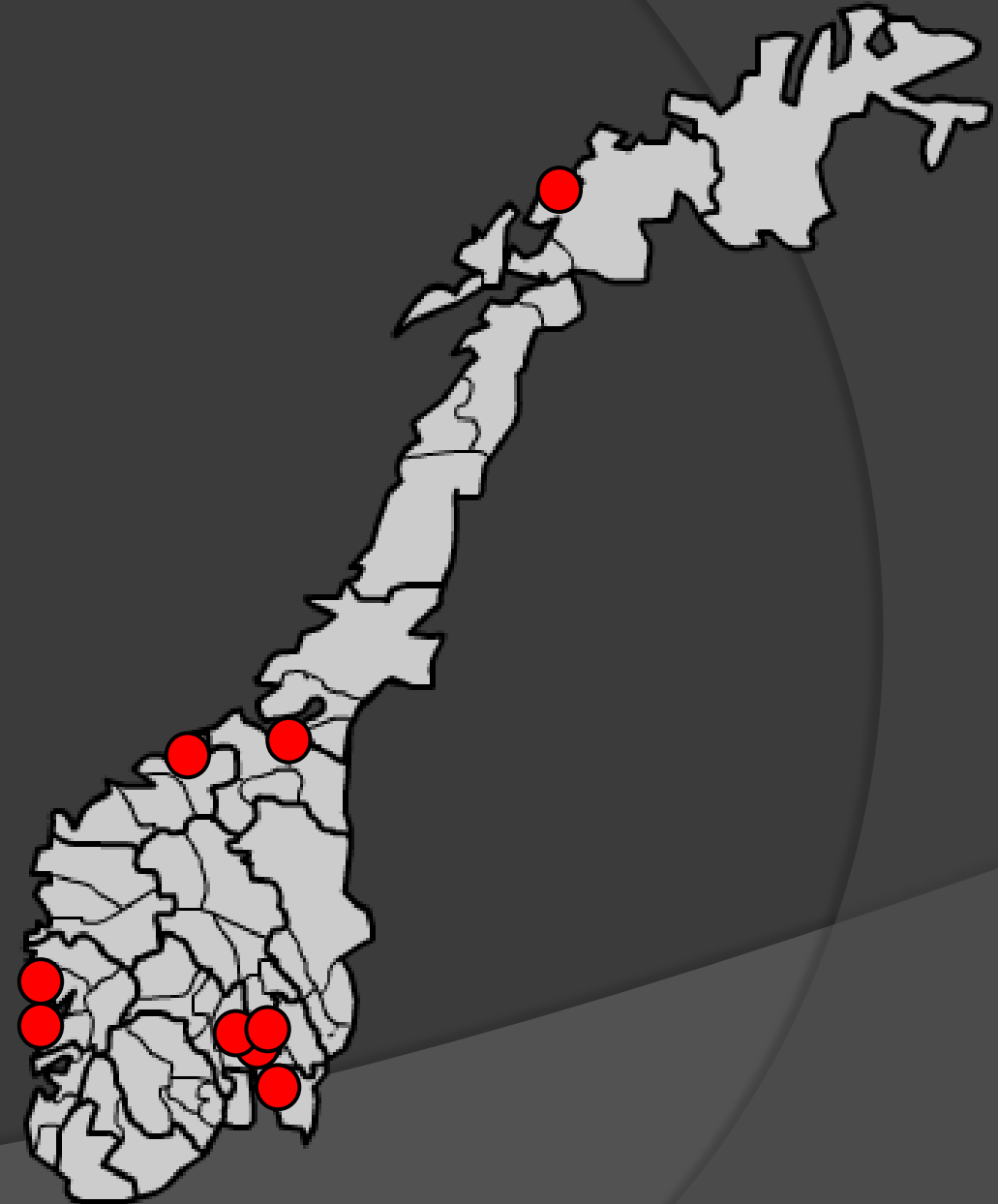


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Thank you!!



Ute Kessler

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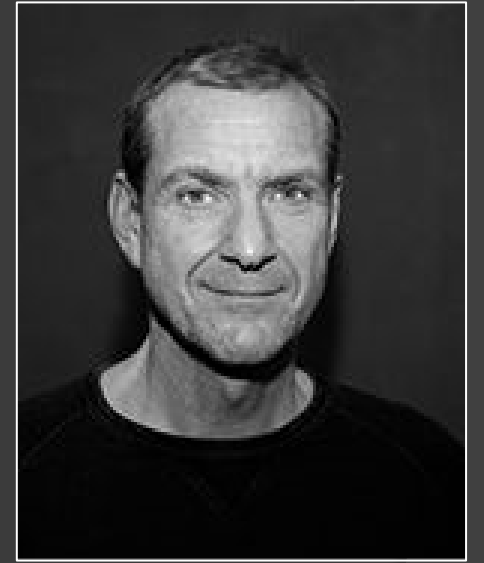
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