

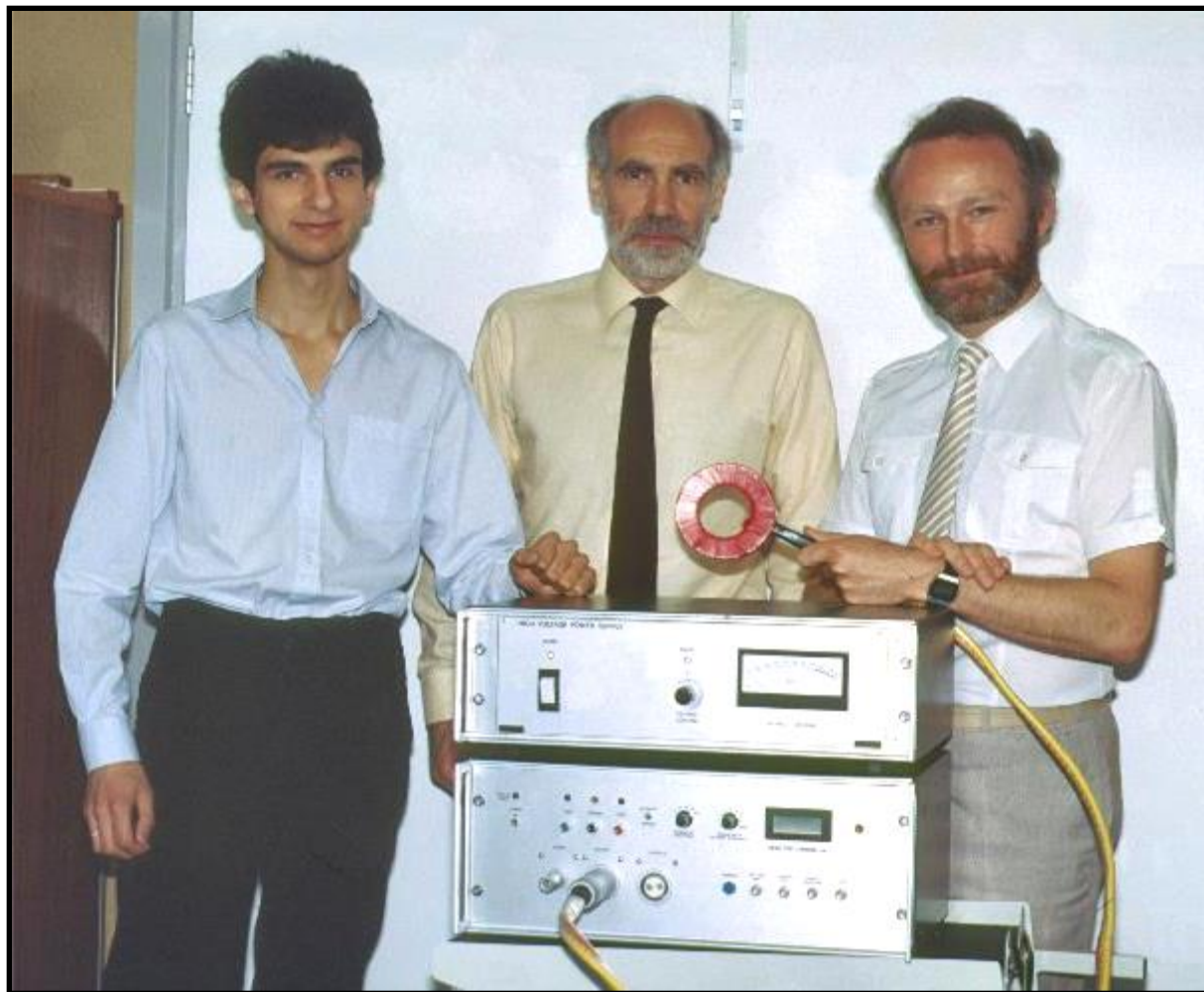
## 16<sup>th</sup> Nordic Experience Meeting



# rTMS for Depression

Marcus Persson





The first transcranial magnetic stimulator, Sheffield 1985  
Reza Jalinous, Ian Freston, Tony Barker

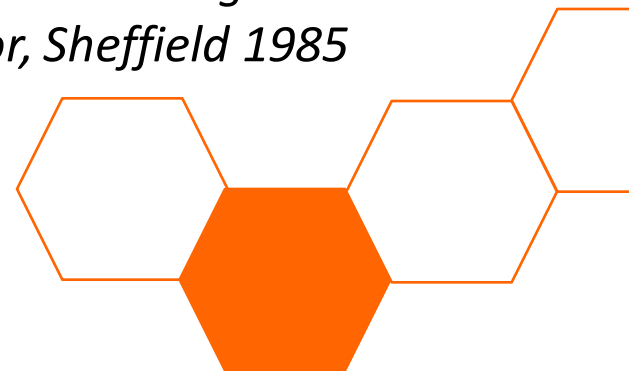




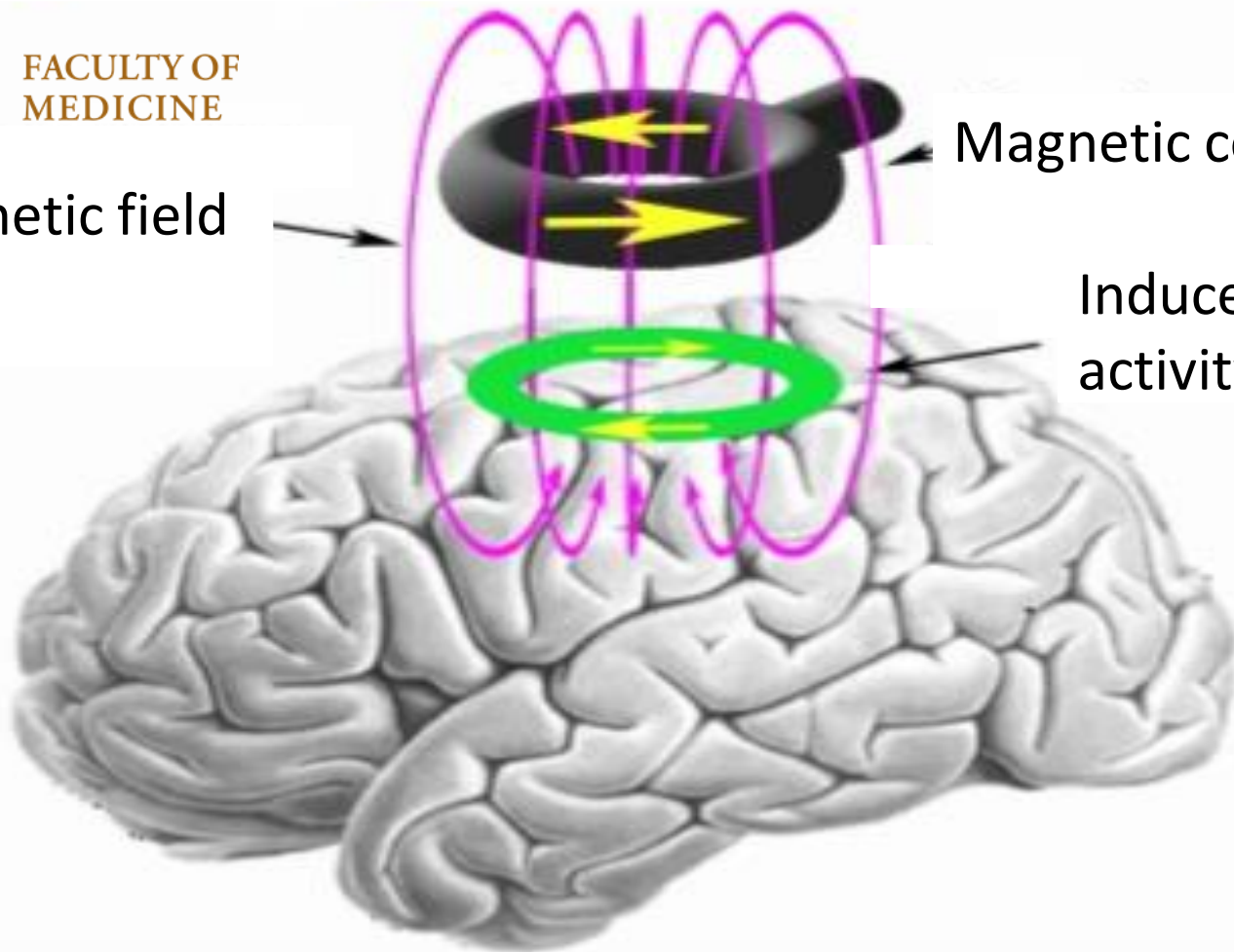




*The first clinical magnetic  
stimulator, Sheffield 1985*



Magnetic field



Magnetic coil

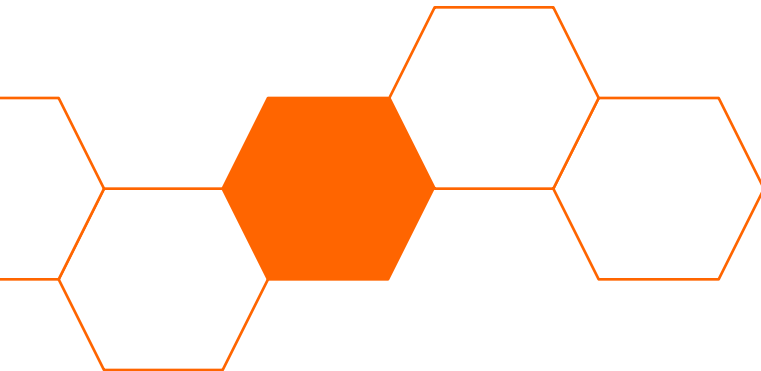
Induced electric  
activity

***TMS operates based on Faraday's law  
of electromagnetic induction***



# rTMS

- Repeated stimulation can induce changes in neuroplasticity
- Low frequency (1Hz) = inhibition (LTD)
- High frequency (10Hz) = potentiation (LTP)



THE LANCET

Volume 348, Issue 9022, 27 July 1996, Pages 233-237




Early Report

Rapid-rate transcranial magnetic stimulation of left dorsolateral prefrontal cortex in drug-resistant depression

Prof Alvaro Pascual-Leone <sup>1</sup> *MD*, Belen Rubio <sup>2</sup>, Prof Federico Pallardó <sup>3</sup> *MD*, Prof Maria Dolores Catalá <sup>4</sup> *MD*

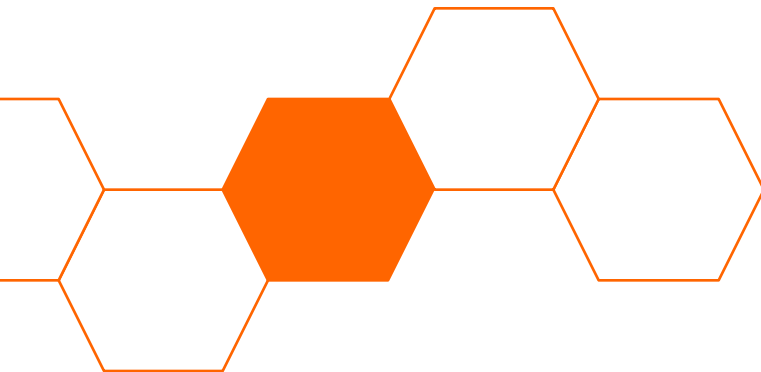
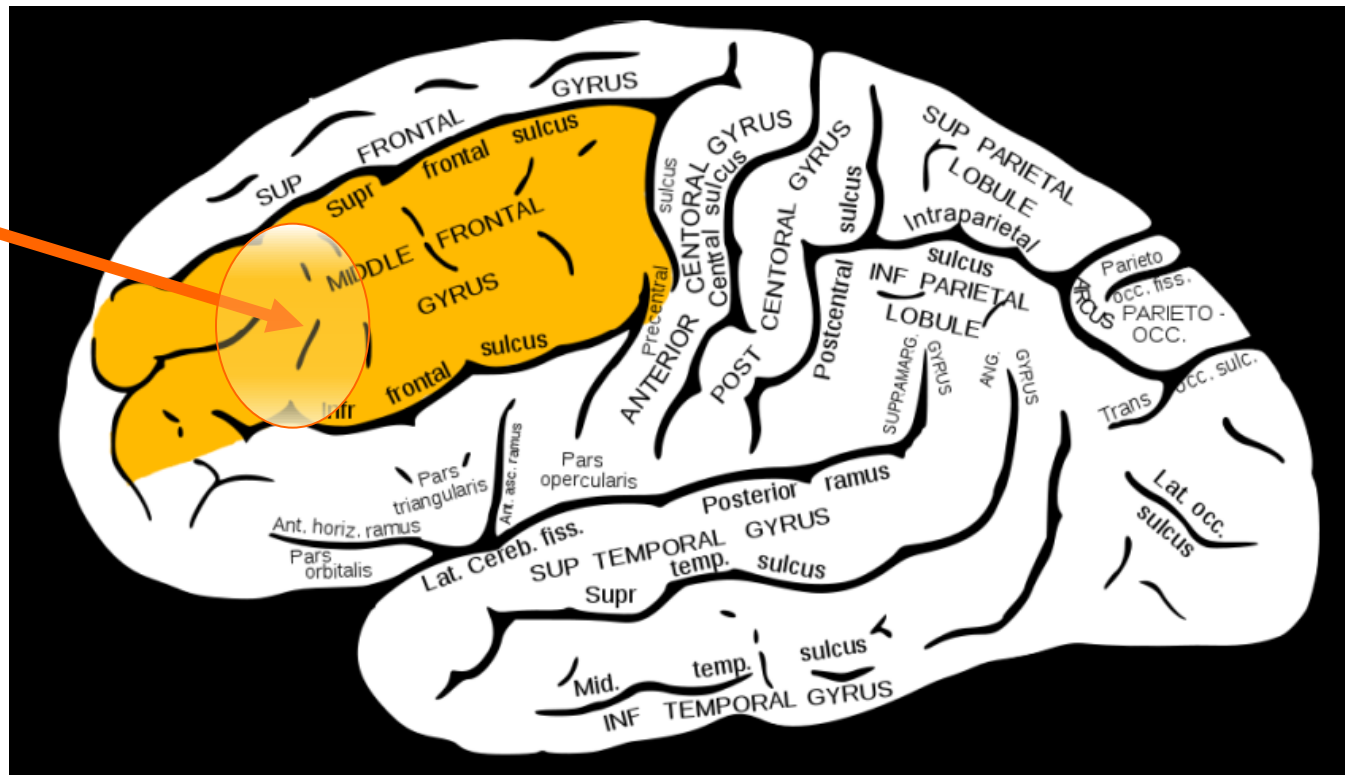
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[https://doi.org/10.1016/S0140-6736\(96\)01219-6](https://doi.org/10.1016/S0140-6736(96)01219-6)

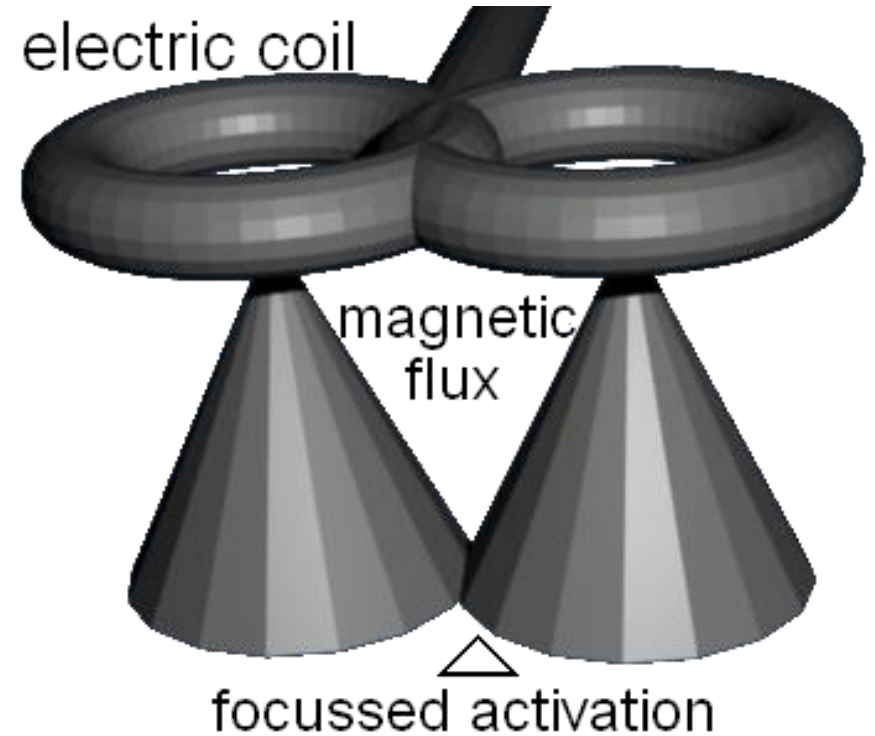
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DLPFC



# Coils

- Figure-eight coil
- Double cone coil
- H-coil



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© Nexstim



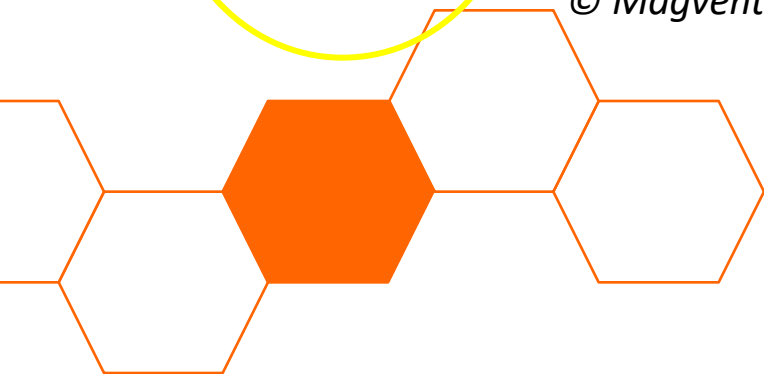
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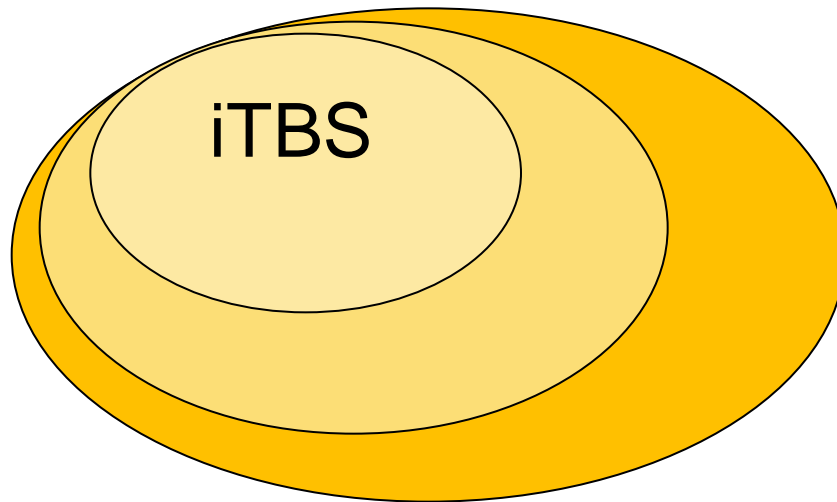
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# Theta Burst Stimulation



- Shorter treatment sessions
- At least as efficacious
- Mimics endogenous theta rhythms.

**Neuron**

Volume 45, Issue 2, 20 January 2005, Pages 201-206




Report

## Theta Burst Stimulation of the Human Motor Cortex

Ying-Zu Huang<sup>1,2</sup>, Mark J. Edwards<sup>1</sup>, Elisabeth Rounis<sup>1</sup>, Kailash P. Bhatia<sup>1</sup>, John C. Rothwell<sup>1,2</sup>


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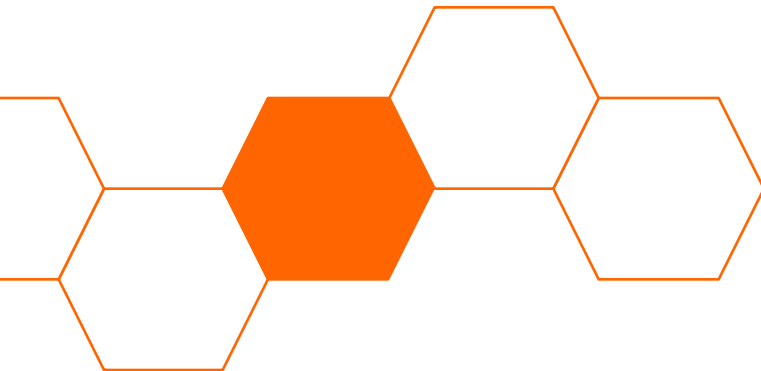
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<https://doi.org/10.1016/j.neuron.2004.12.033>

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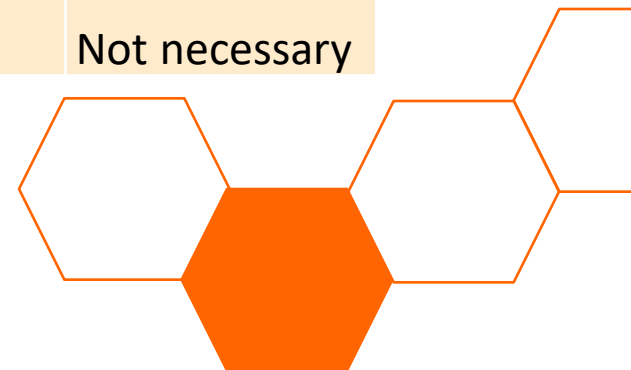
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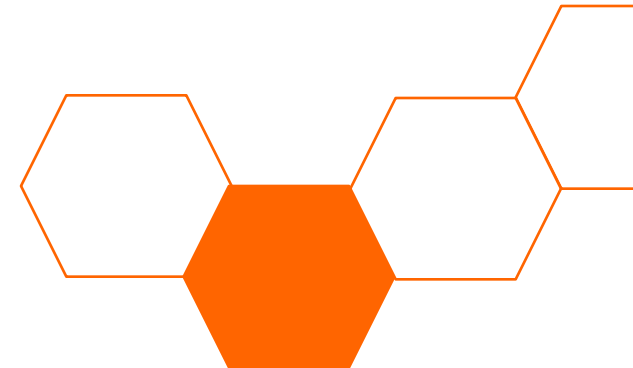
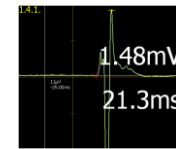
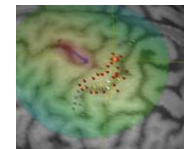
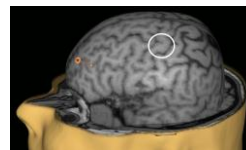
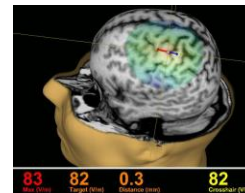
# ECT vs rTMS

	ECT	rTMS (iTBS)
MADRS-score	> 30	> 20
Age	Older better	> 18
Psychotic symptoms	Yes please!	No!
Substance use disorder	OK	No
Bipolar disorder	Yes	Perhaps not?
Suicidality	Yes	OK
Pregnancy	OK	Not yet?
Epilepsy	OK	No
Failed antidepressant trials	Preferably	Not necessary

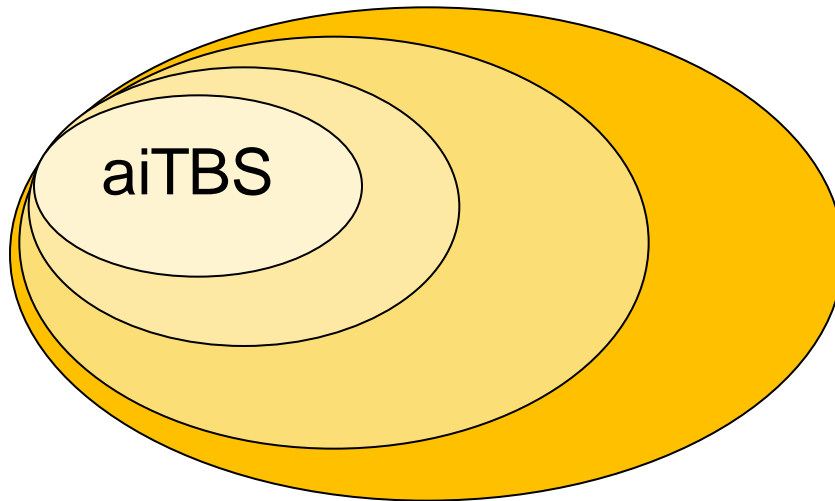


# The treatment

- MRI for navigation
- Start-up visit:
  - Motor threshold determination
  - Targeting the DLPFC
- 20 sessions
- Evaluation



# Accelerated iTBS



- SAINT
- 5 days
- 19/21 in remission!
- Time to response 2,5 days



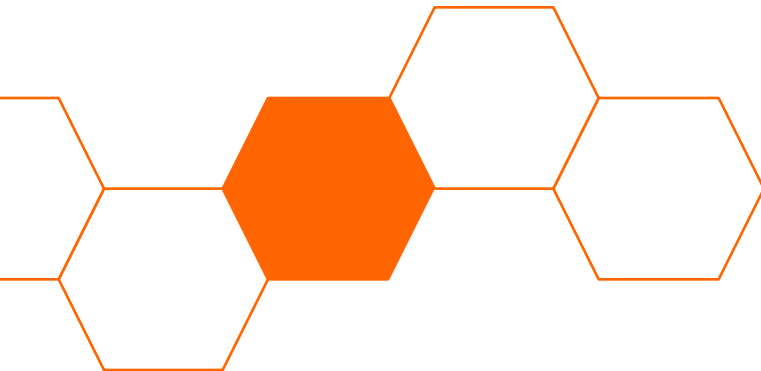
Articles

Full Access

## Stanford Accelerated Intelligent Neuromodulation Therapy for Treatment-Resistant Depression

Beazar J. Cole, Ph.D., Katy H. Stimpson, B.S., Brandon S. Bentzler, M.D., Ph.D., Merve Gulber, B.S., Kirsten Cherian, Ph.D., Claudia Tischler, B.S., Romina Hejad, M.S., Heather Parkov, B.S., Elizabeth Choi, B.S., Haley Aaron, B.S., ... [See all authors](#)

Published Online: 7 Apr 2020 | <https://doi.org/10.1176/appi.ajp.2019.19070720>



CLINICAL  
**TMS**  
SOCIETY

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There has been widespread interest in a recent study published by Cole et al. (6) using a novel accelerated, high-dose intermittent theta burst stimulation protocol for treatment-resistant depression, which they named the Stanford Accelerated Intelligent Neuromodulation Therapy, or SAINT. Neuro-imaging was used for targeting and placement of the coil on the patients' heads was performed prospectively and at the single-subject level.

Shorter stimulation protocols such as iTBS are now available to improve clinical efficiency. While exciting, the results should be considered preliminary as the authors point out resulting effect sizes cannot be considered reliable given the small sample size and the uncontrolled study design. The administration of all-day stimulation sessions certainly increases the possibility of a placebo effect. The field of brain stimulation, much like the rest of psychiatry, has often failed to replicate positive results under double-blind conditions. Thus, enthusiasm for these results must be tempered until we have results from a sufficiently powered randomized controlled trial. A larger study, with randomization to sham or active SAINT, is necessary to determine efficacy before it could be called an evidence-based, standard-of-care approach to treatment of depression. Additionally, neuroimaging expertise, with specific MRI protocols and data pre-processing and analysis pipelines, are resources required to perform individualized connectivity analysis and deliver MRI-navigated stimulation in SAINT, the way these researchers did. This is not easily available to the wider TMS community at this time. At the end of the SAINT week 86% were in remission (MADRS score < or equal to 10). One month following SAINT, 57% of the participants were in remission and 67% were responders. Therefore, additional data is required to assess durability of this TMS treatment protocol

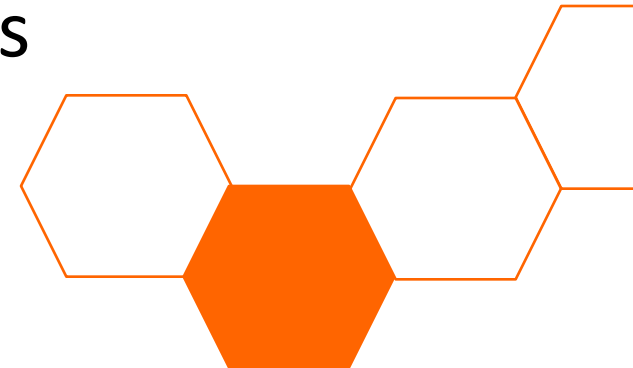
At this time the SAINT protocol should be considered experimental and is not recommended for widespread community use.



# SATIS

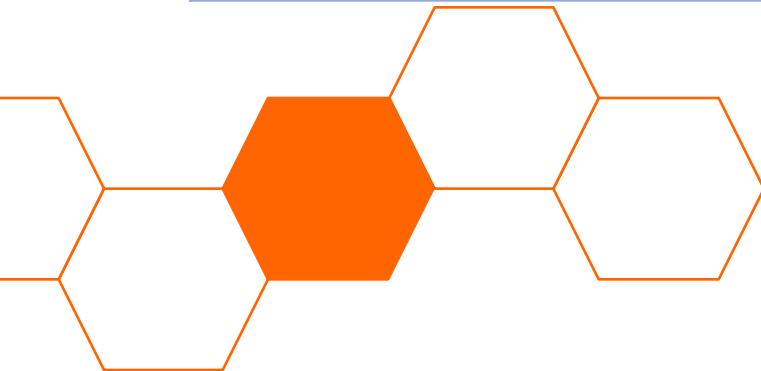
*(The Scania aiTBS implementation study)*

- "A poor mans SAINT"
- Feasibility, tolerability and preliminary efficacy
- 20 participants + 5 nurses
- Qualitative data from nurses
- Quantitative data from patients



Parameter	HE rTMS	iTBS	SAINT	SATIS
Intensity (% of Motor Threshold)	120	120	90*	120
Frequency (Hertz)	10	50/5	50/5	5/50
Pulse train duration (seconds)	4	2	2	2
Intertrain interval (seconds)	26	8	8	8
Session duration (minutes, seconds)	37, 30	03, 17	09, 51	09, 51
Intersession interval (hours, minutes)	24, 00	24, 00	00, 50	00, 50
Pulses per session	3000	600	1800	1800
Sessions per day	1	1	10	7†
Total number of sessions	30	20	50	33
Total treatment duration (days)	42	28	5	5
Total pulses	90000	12000	90000	59400
Method of neuronavigation	-	-	rs-fMRI**	MRI

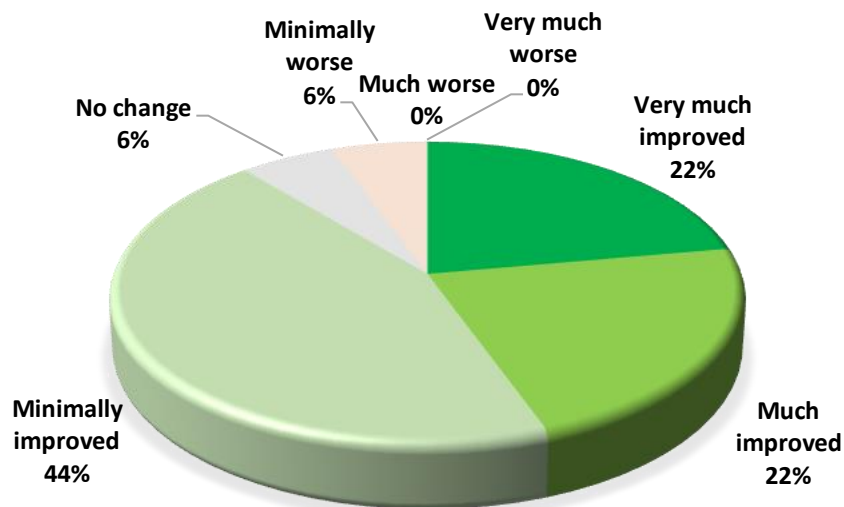
\* Depth correction to consistently achieve 90 of rMT at the depth of the functional target,, max 120% of rMT. † Only five sessions day 1. \*\* Resting-state functional MRI.



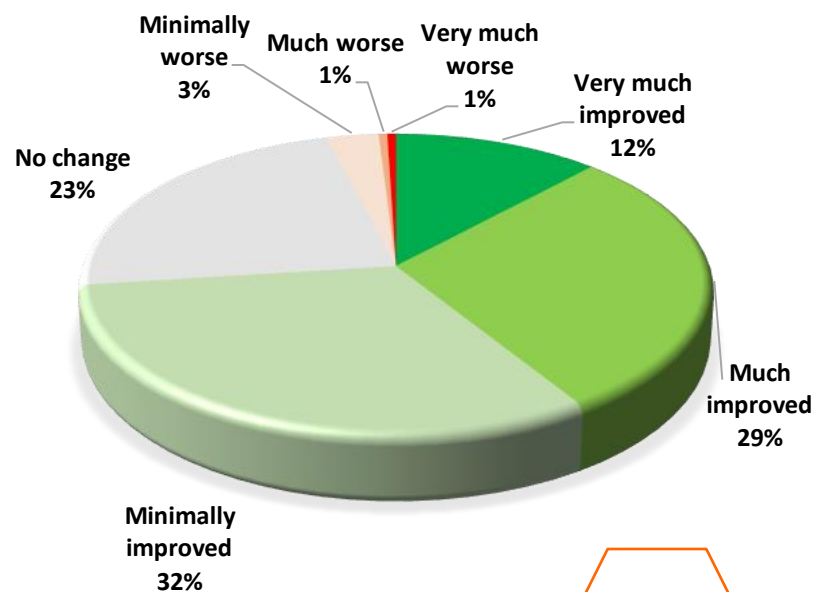
# CGI

## SATIS vs The national registry for rTMS 2021\*

CLINICAL GLOBAL IMPROVEMENT  
(CGI-I)



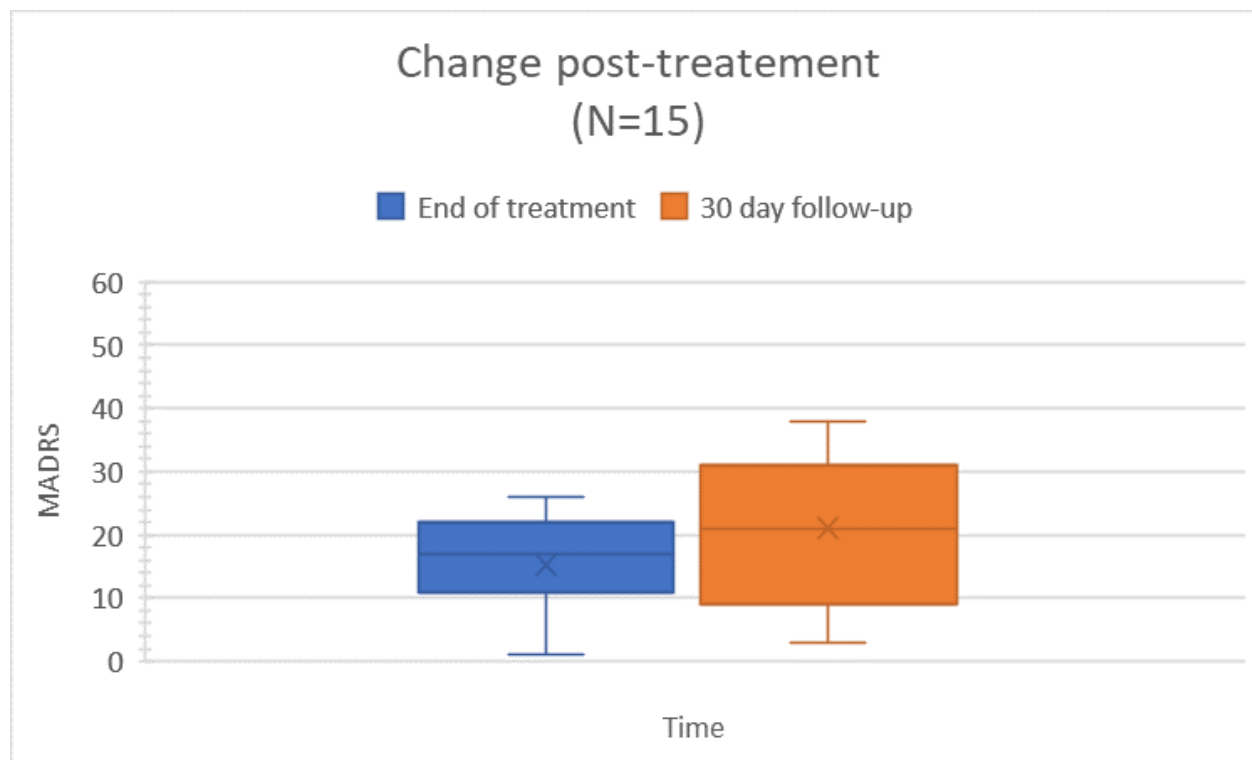
CLINICAL GLOBAL IMPROVEMENT  
(CGI-I)



\*Preliminary data

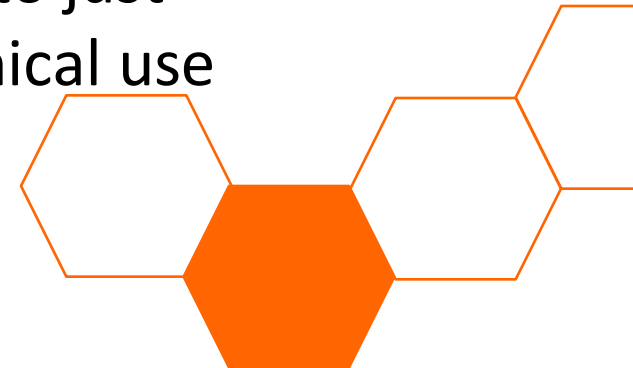


# 30 day follow-up



# Take home message

- rTMS (=iTBS) is a safe and well tolerated treatment for depression
- New accelerated protocols could potentially give a faster response
- There is still an urgent need to replicate the full SAINT protocol to unlock higher remission rates
- Our findings suggest that it's too soon to just accelerate the protocols that are in clinical use today



**Thank you for listening!**  
**I'm happy to answer any questions at**  
**[marcus.n.persson@skane.se](mailto:marcus.n.persson@skane.se)**



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