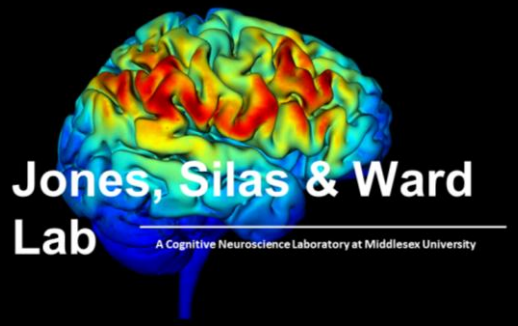

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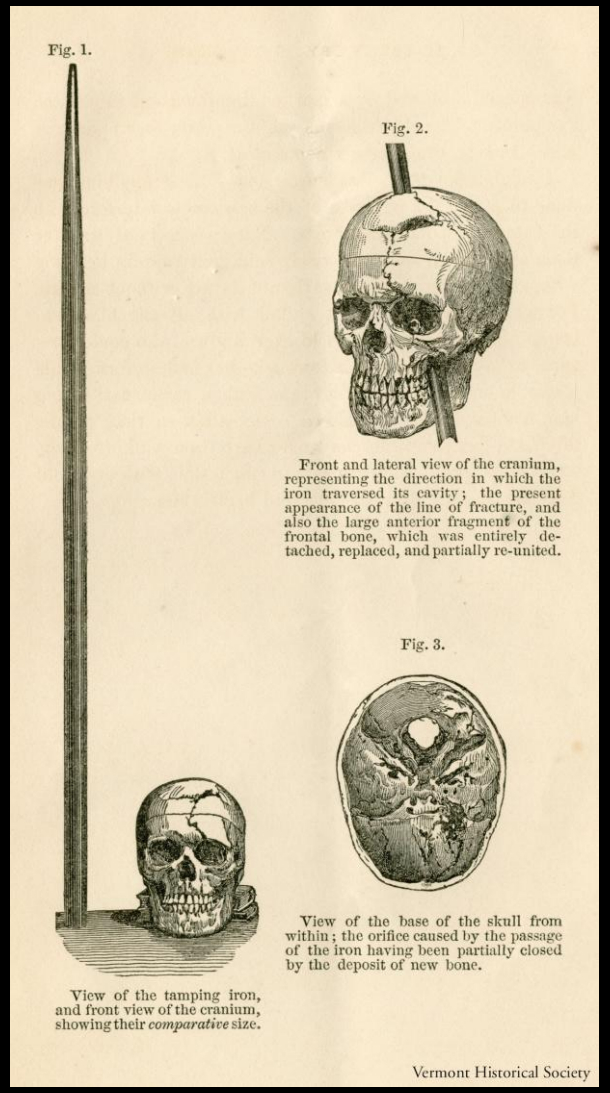
Stimulating Brains Without Touching Them

A Story of Magnets, Hype, and Open Science

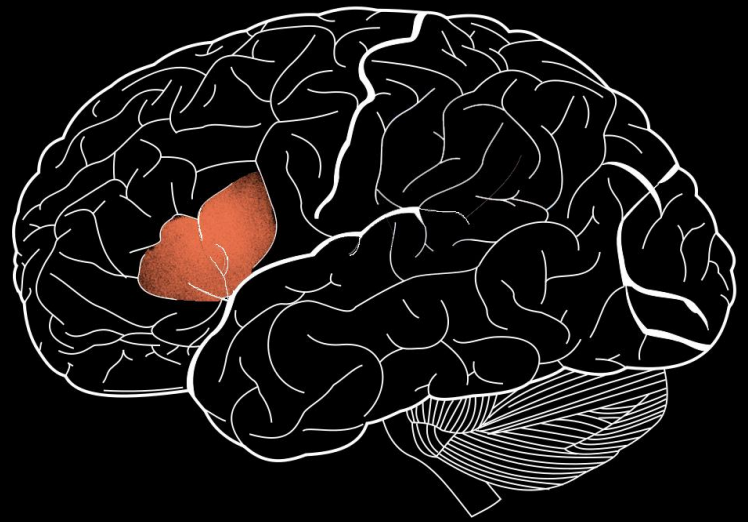
Middlesex University London

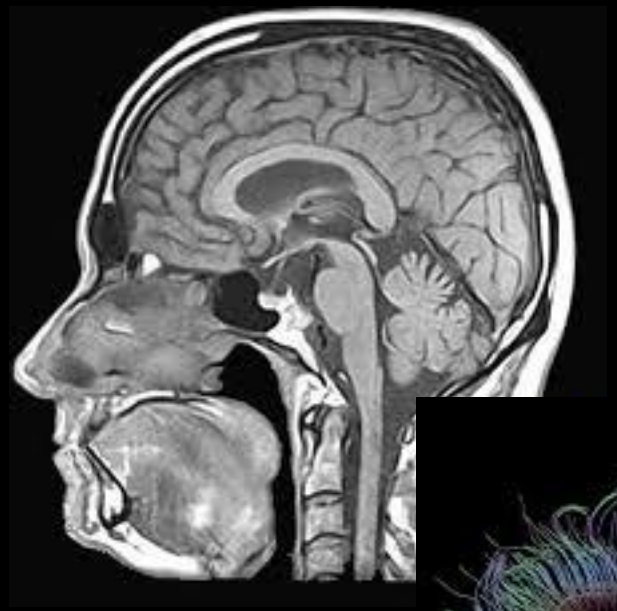


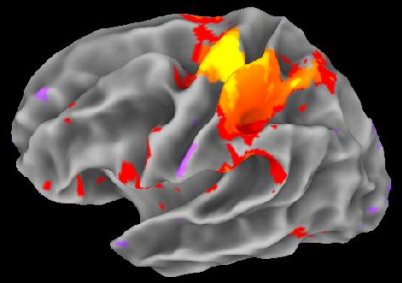
Lesion in area X of brain → Disrupts cognitive ability Y

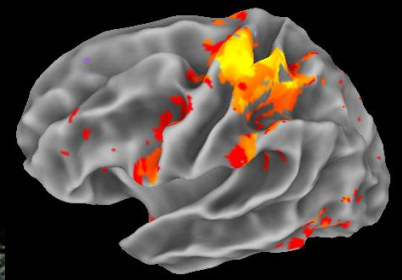
∴

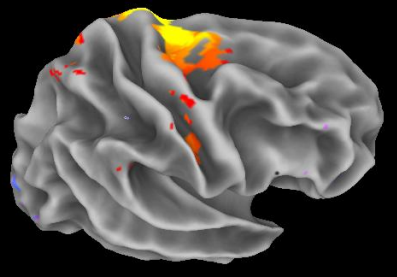
Area X causally linked to ability Y

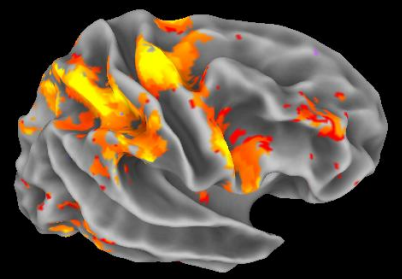


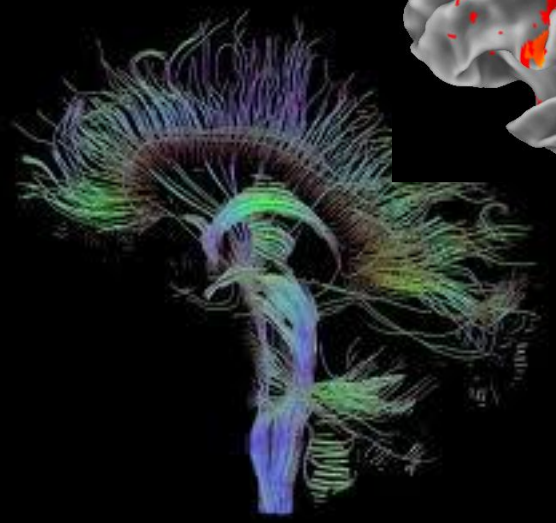


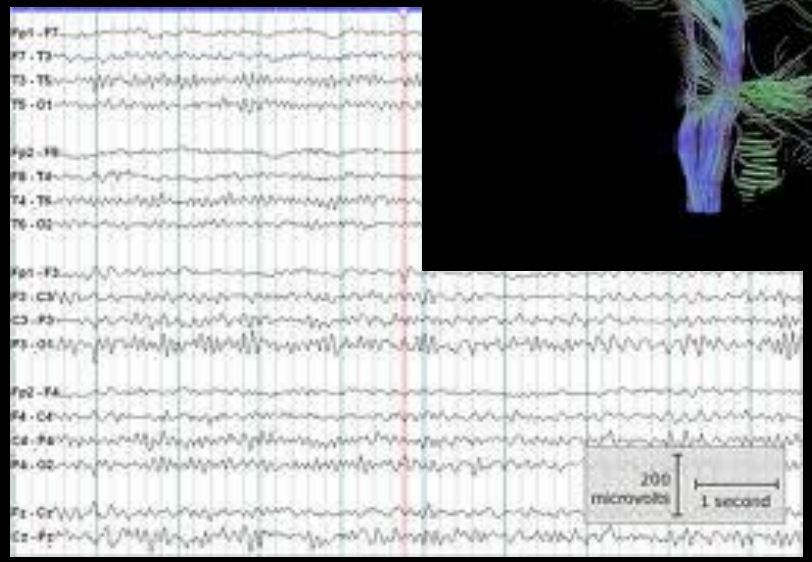








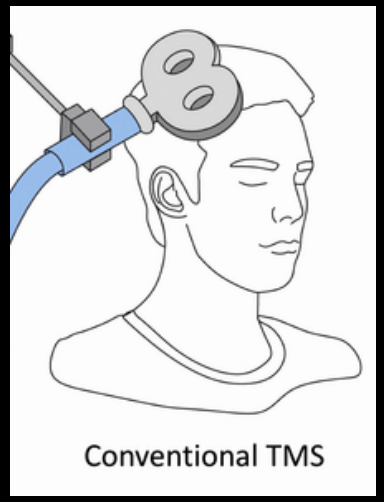




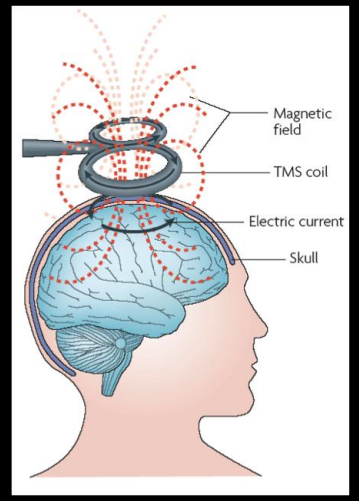
Presented clip

Clip reconstructed from brain activity

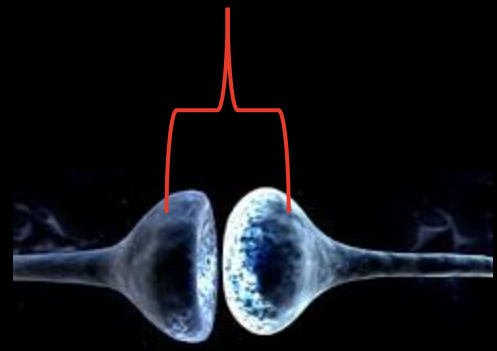
Transcranial Magnetic Stimulation - TMS



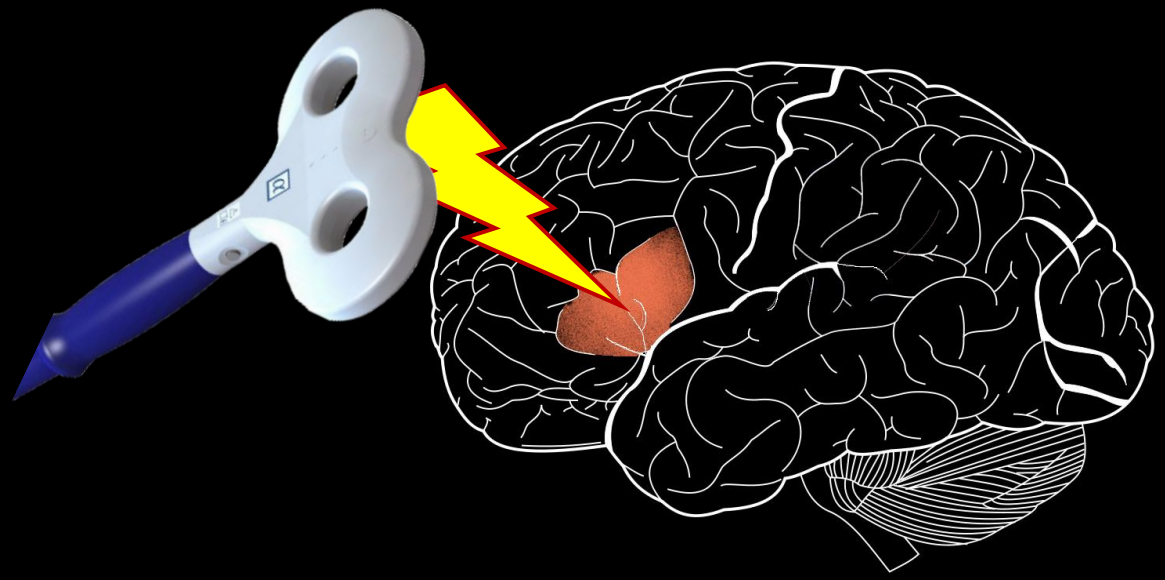
Conventional TMS



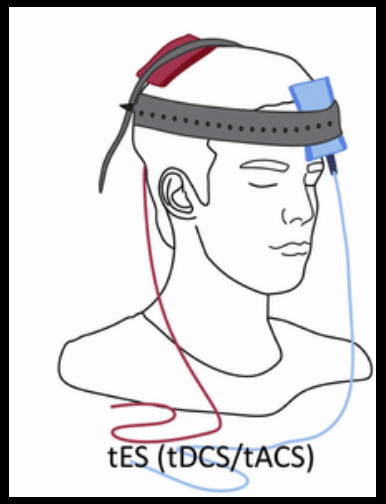
Transsynaptic induction

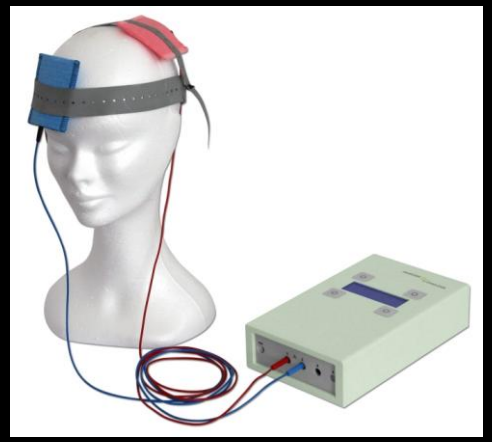


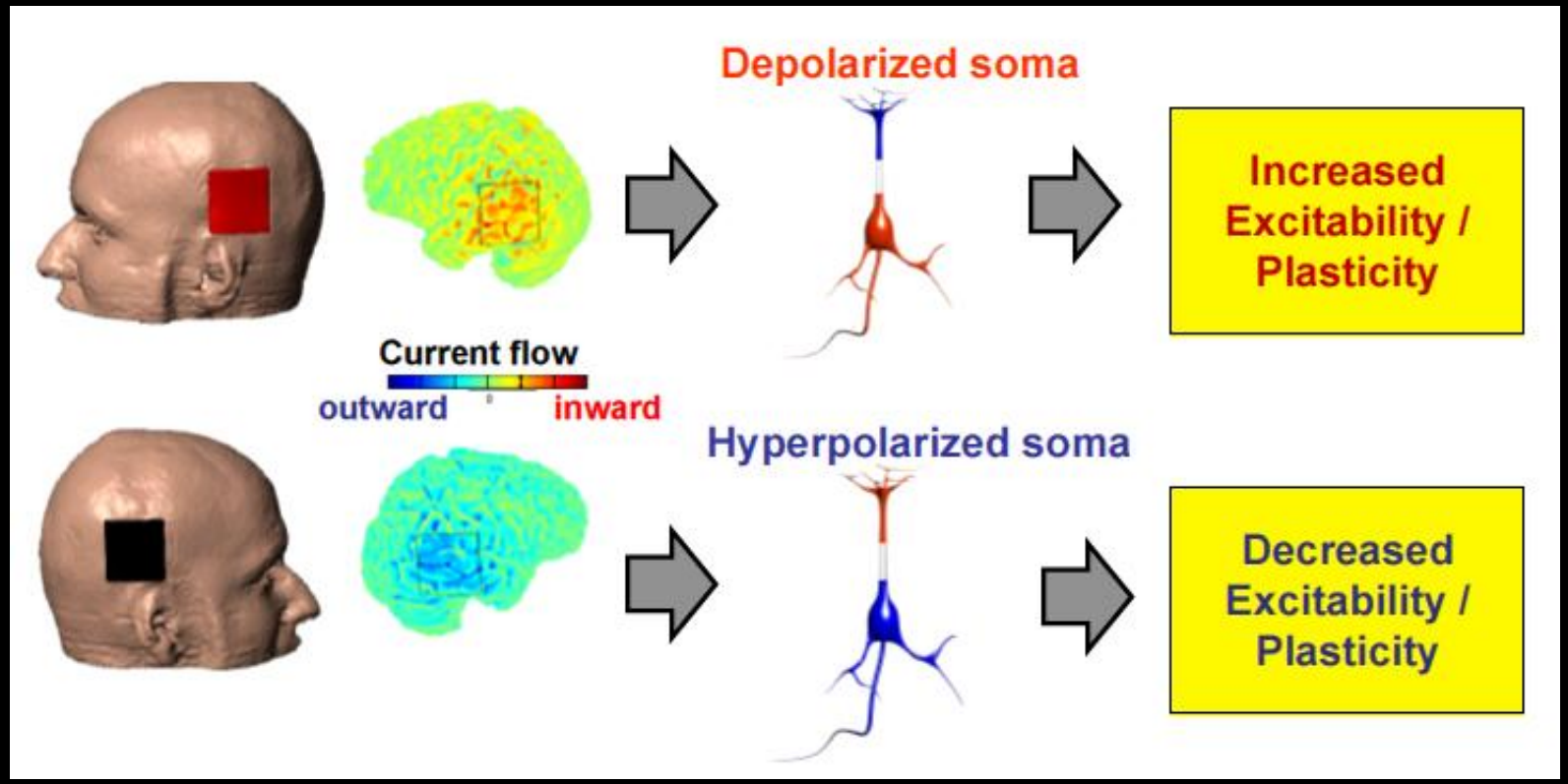
Virtual lesion



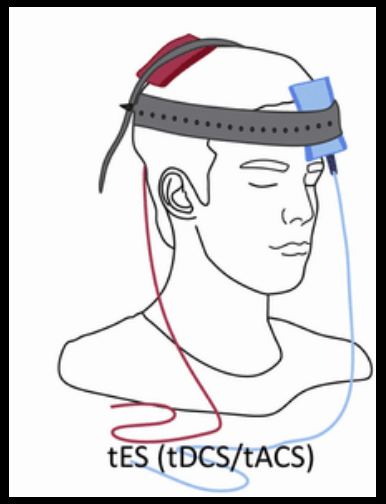
Transcranial Electrical Stimulation - TES

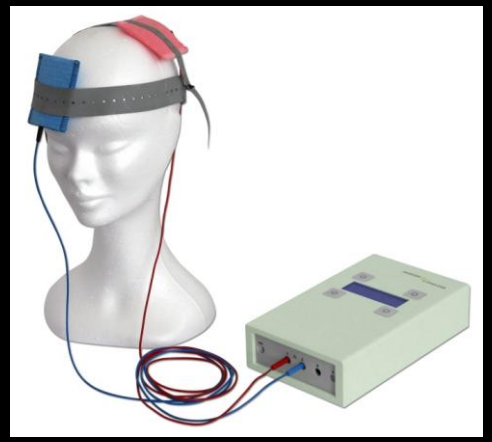


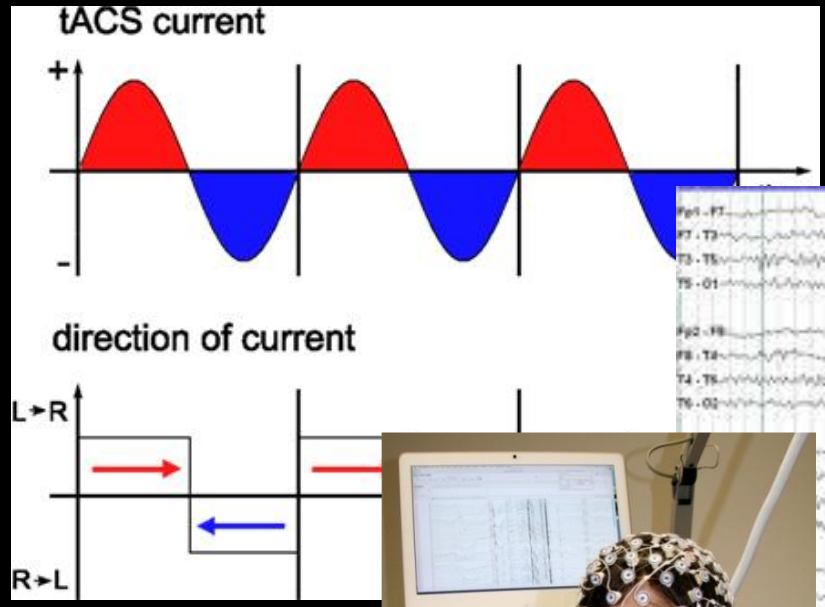


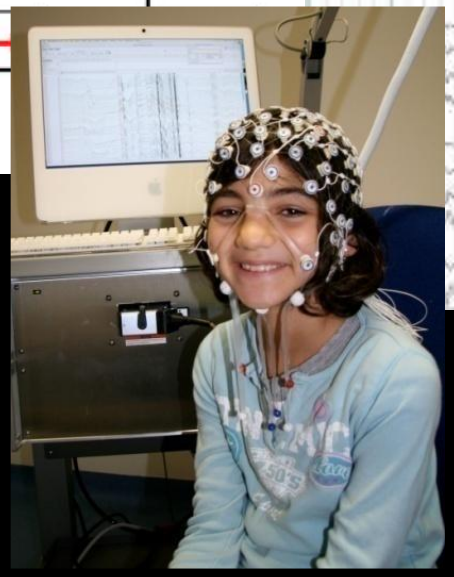


Transcranial Electrical Stimulation - TES

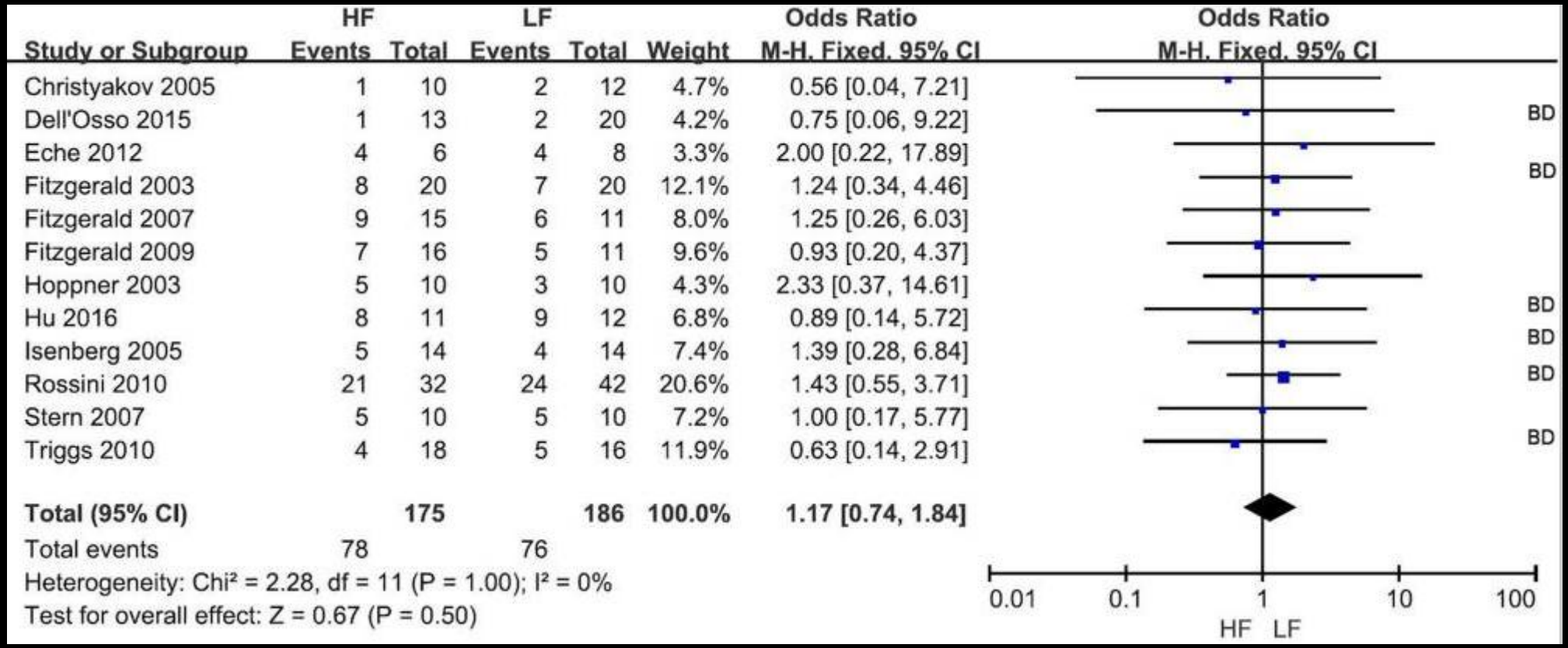








Applications...?



Study or Subgroup	HF Events	HF Total	LF Events	LF Total	Weight	Odds Ratio M-H, Fixed, 95% CI
Christyakov 2005	1	10	2	12	4.7%	0.56 [0.04, 7.21]
Dell'Osso 2015	1	13	2	20	4.2%	0.75 [0.06, 9.22]
Eche 2012	4	6	4	8	3.3%	2.00 [0.22, 17.89]
Fitzgerald 2003	8	20	7	20	12.1%	1.24 [0.34, 4.46]
Fitzgerald 2007	9	15	6	11	8.0%	1.25 [0.26, 6.03]
Fitzgerald 2009	7	16	5	11	9.6%	0.93 [0.20, 4.37]
Hoppner 2003	5	10	3	10	4.3%	2.33 [0.37, 14.61]
Hu 2016	8	11	9	12	6.8%	0.89 [0.14, 5.72]
Isenberg 2005	5	14	4	14	7.4%	1.39 [0.28, 6.84]
Rossini 2010	21	32	24	42	20.6%	1.43 [0.55, 3.71]
Stern 2007	5	10	5	10	7.2%	1.00 [0.17, 5.77]
Triggs 2010	4	18	5	16	11.9%	0.63 [0.14, 2.91]
Total (95% CI)		**175**		**186**	**100.0%**	**1.17 [0.74, 1.84]**
Total events	78		76			

Heterogeneity: Chi² = 2.28, df = 11 (P = 1.00); I² = 0%

Test for overall effect: Z = 0.67 (P = 0.50)

Berlim, M. T., Van den Eynde, F., Tovar-Perdomo, S., & Daskalakis, Z. J. (2014). Response, remission and drop-out rates following high-frequency repetitive transcranial magnetic stimulation (rTMS) for treating major depression: a systematic review and meta-analysis of randomized, double-blind and sham-controlled trials. *Psychological medicine*, *44*(2), 225-239.

TMS treatment for ADHD

TMS for BPD, PTSD, ADHD + other

How Will I Know TMS Treatment for Autism is Working?

Conditions We Treat with TMS Therapy

Wondering if **TMS therapy** is right for you? Initially developed as a breakthrough **treatment for Depression**, TMS therapy has also shown effectiveness in treating:

- Anxiety
- Obsessive Compulsive Disorder
- PTSD (Trauma)
- Postnatal Depression
- Seasonal Affective Disorder
- Chronic Insomnia
- Fibromyalgia

onditions

Services We Offer

TMS Therapy - Bioresonance Treatment - Person-Centered Therapy- QEEG BRAIN MAPPING

- Depression
- Anger Management
- Detox
- Panic Attack
- Motor Stroke Issues
- Weight Loss
- Anxienty
- Tinnus and Alzheimer etc.
- Immune System Booster
- Stress
- Cigarette Cessation
- Color Therapy
- PTSD
- Stop Alcoholism
- Salt Therapy
- OCD
- Drug Addiction
- Allergy
- Autism
- Disease

“Brain boosting”

Journal of Integrative Neuroscience, Vol. 2, No. 2 (2003) 149–158
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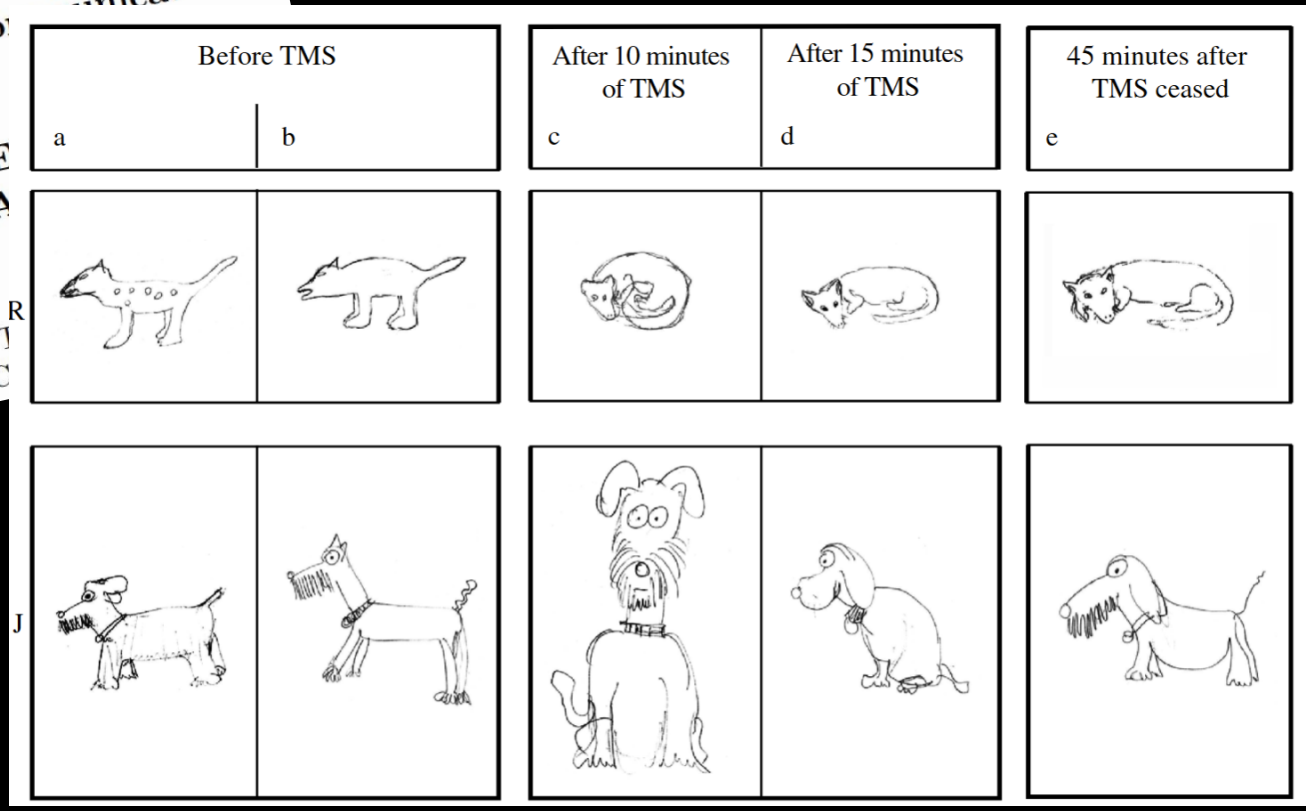
Short Co nication

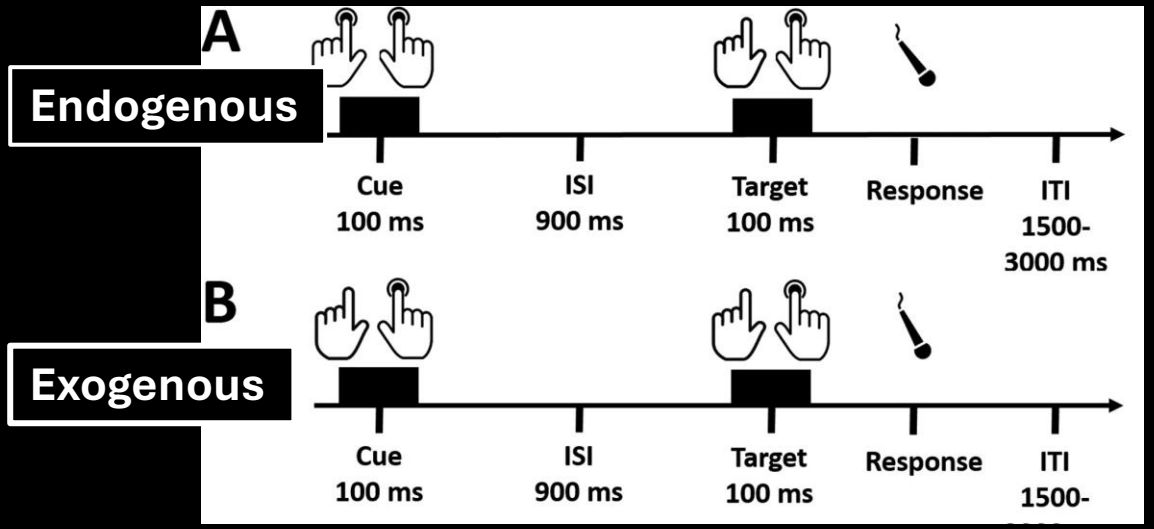
**SAVANT-LIKE SKILLS EXPOSED IN NORMAL PE
SUPPRESSING THE LEFT FRONTO-TEMPORA**

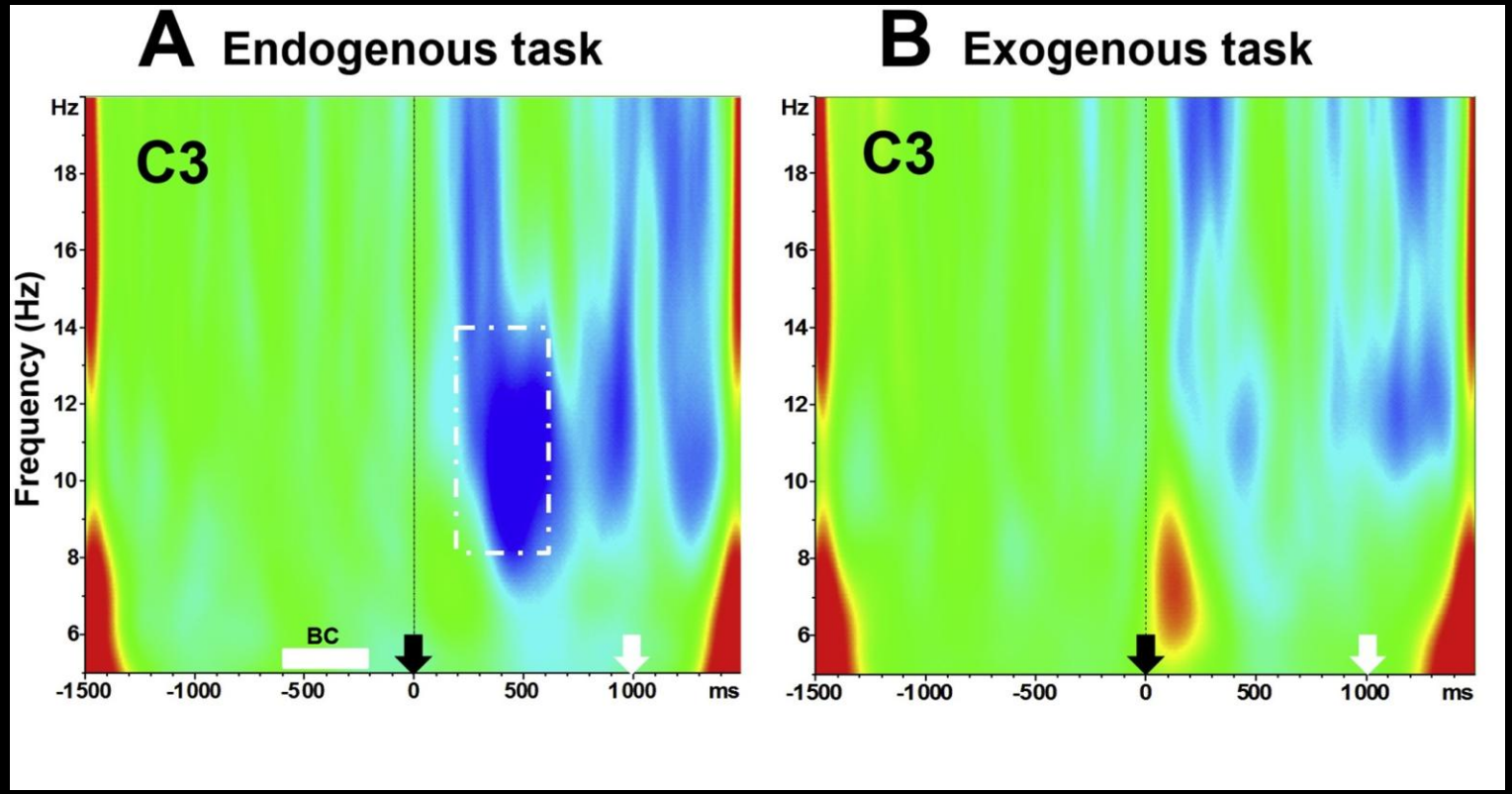
ALLAN W. SNYDER*,†, ELAINE MULCAHY†,‡, JANET L. T
D. JOHN MITCHELL†, PERMINDER SACHDEV¶ and SIMON C



Open science to the rescue

- Open Data
  - Share raw data (anonymised; where possible)
- Reproducible Analyses
  - Share analysis code/syntax; check outcome
- Pre-registration
  - Specify hypotheses & analysis in advance
- “Registered Reports”
  - Acceptance for publication before results are known





Silas, J., Tipple, A., & Jones, A. (2019). Event-related alpha desynchronization in touch–Comparing attention and perception. *Neuroscience Letters*.

Open science - pre-registration

Open data

Open materials

Hypotheses pre-registered

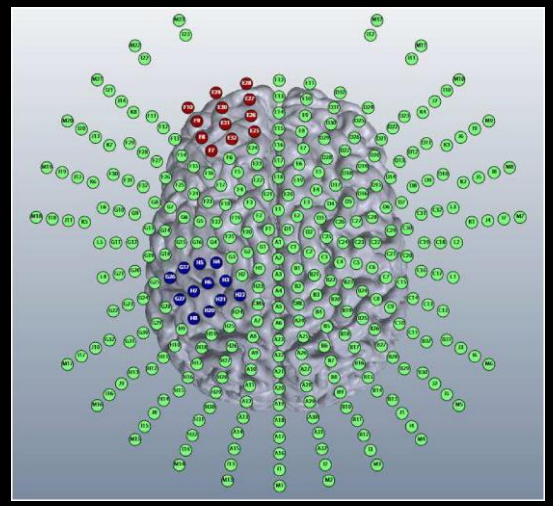
Registered report – peer reviewed before data was gathered

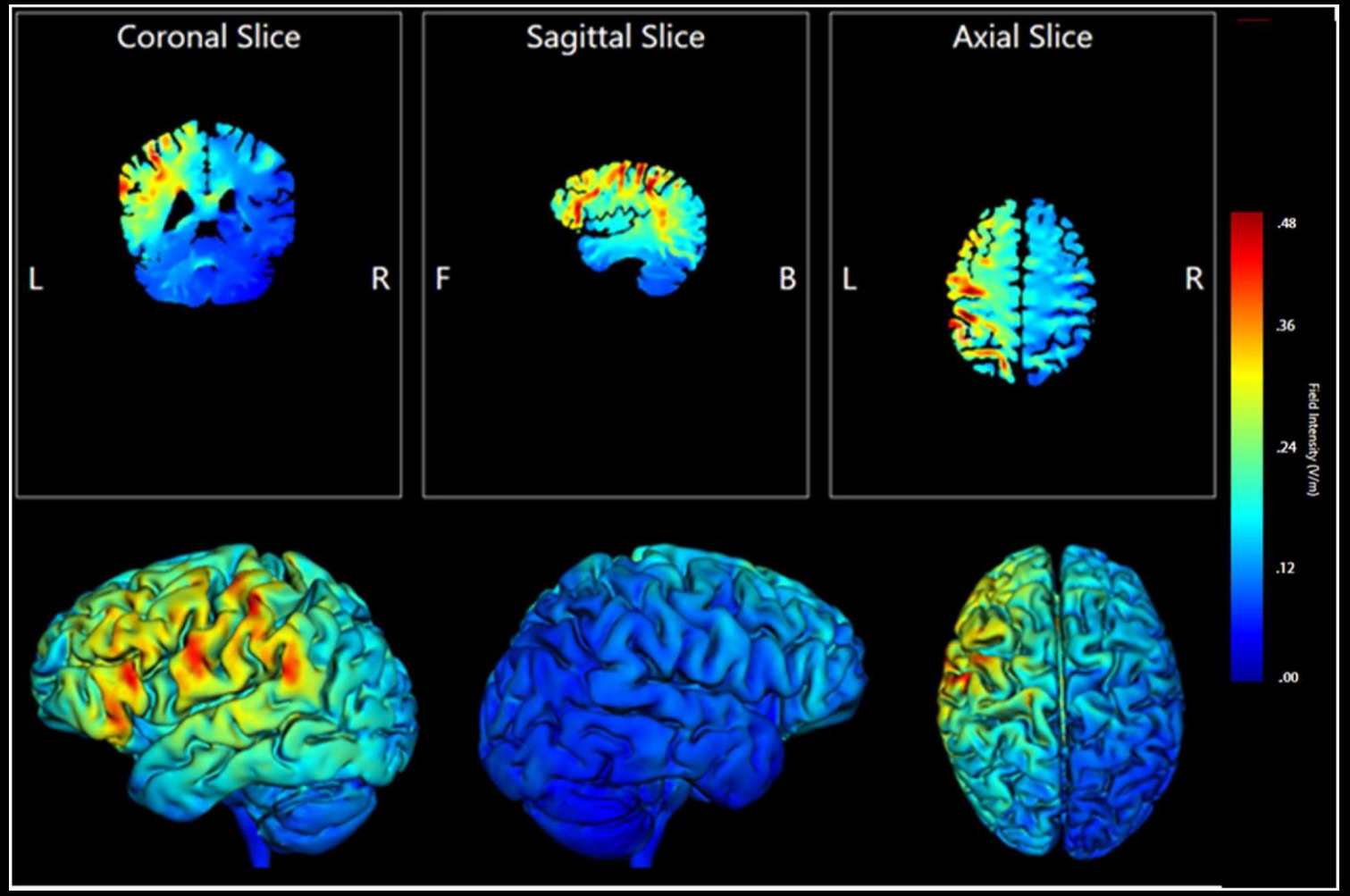
Careful control

Alpha + sham + control (beta)

Sample size estimation

- Modelling sample size based on pilot data = 77




Coronal Slice
L
R
Sagittal Slice
F
B
Axial Slice
L
R
.48
.36
.24
.12
.00
Field Intensity (V/m)

ALPHA

BETA

SHAM

tACS = 2mA

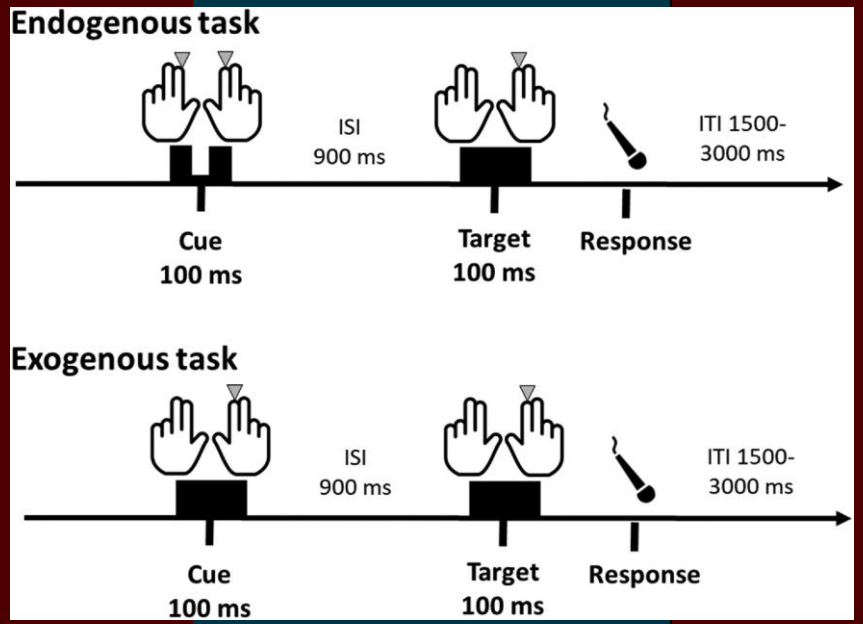
> 12 hours

> 12 hours

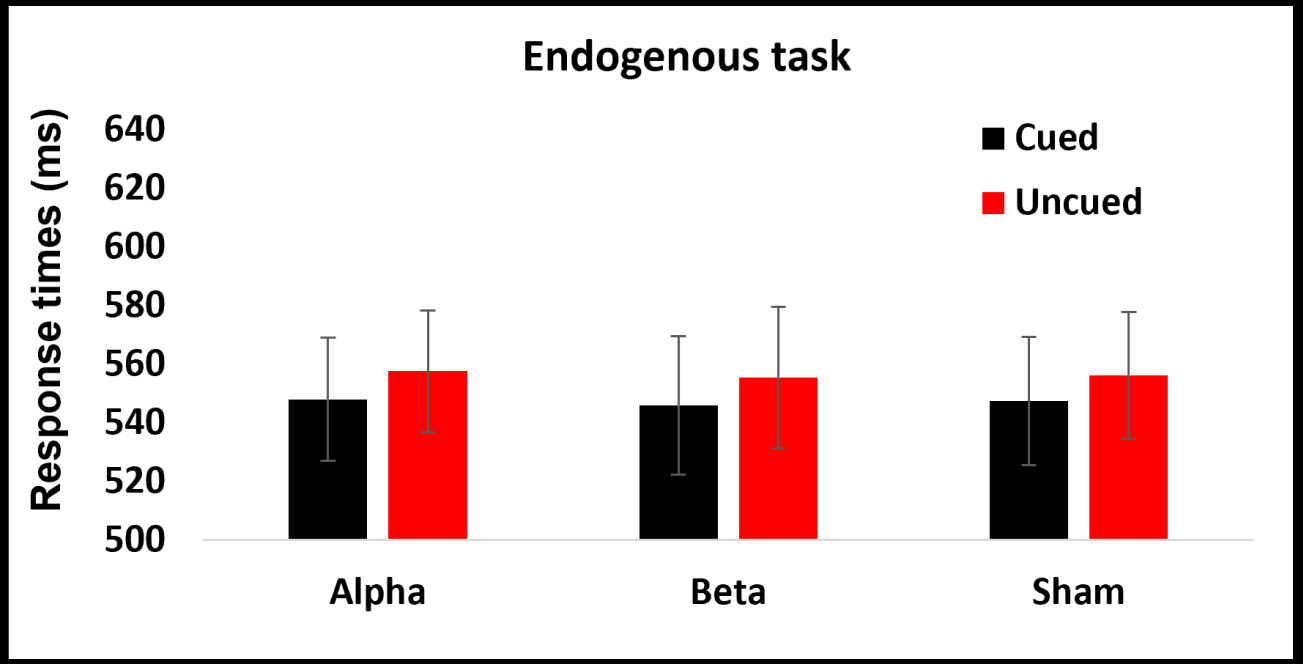
tACS: Endogenous & Exogenous

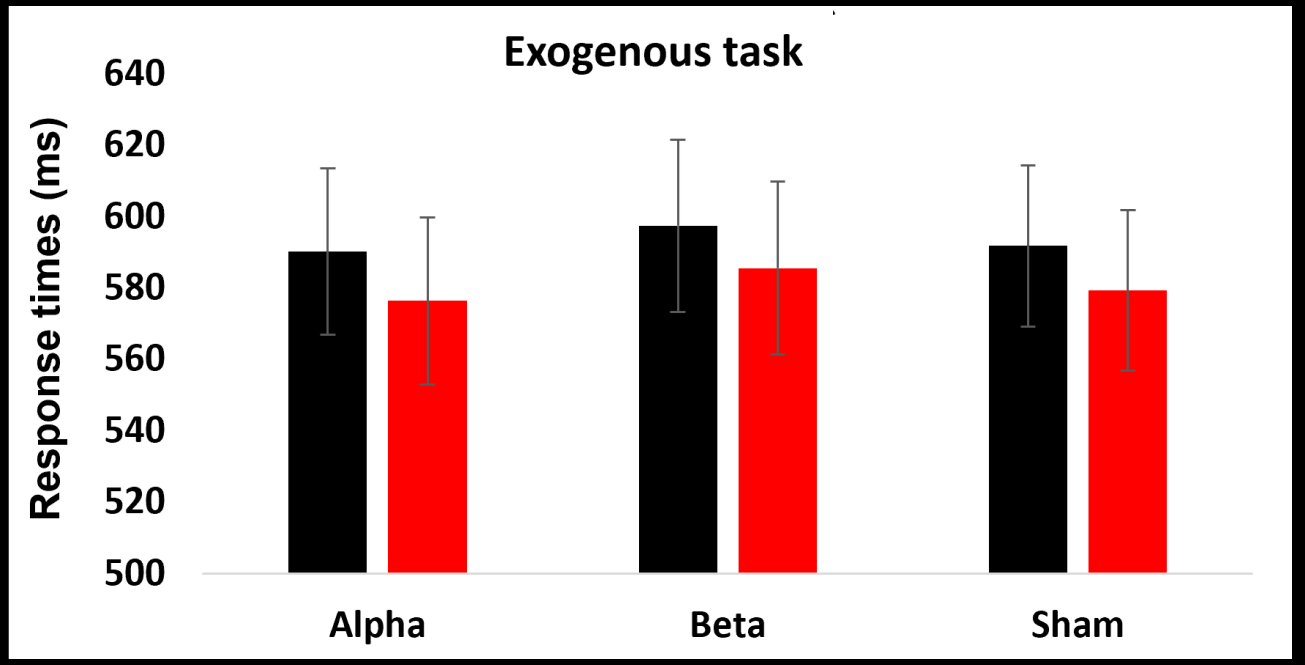
tACS: Endogenous & Exogenous

tACS: Endogenous & Exogenous



Silas, J., Jones, A., Yarrow, K., & Anderson, W. (2023). Spatial attention is not affected by alpha or beta transcranial alternating current stimulation: A registered report. *Cortex*, *164*, 33-50.


Endogenous task
Response times (ms)
640
620
600
580
560
540
520
500
Cued
Uncued
Alpha
Beta
Sham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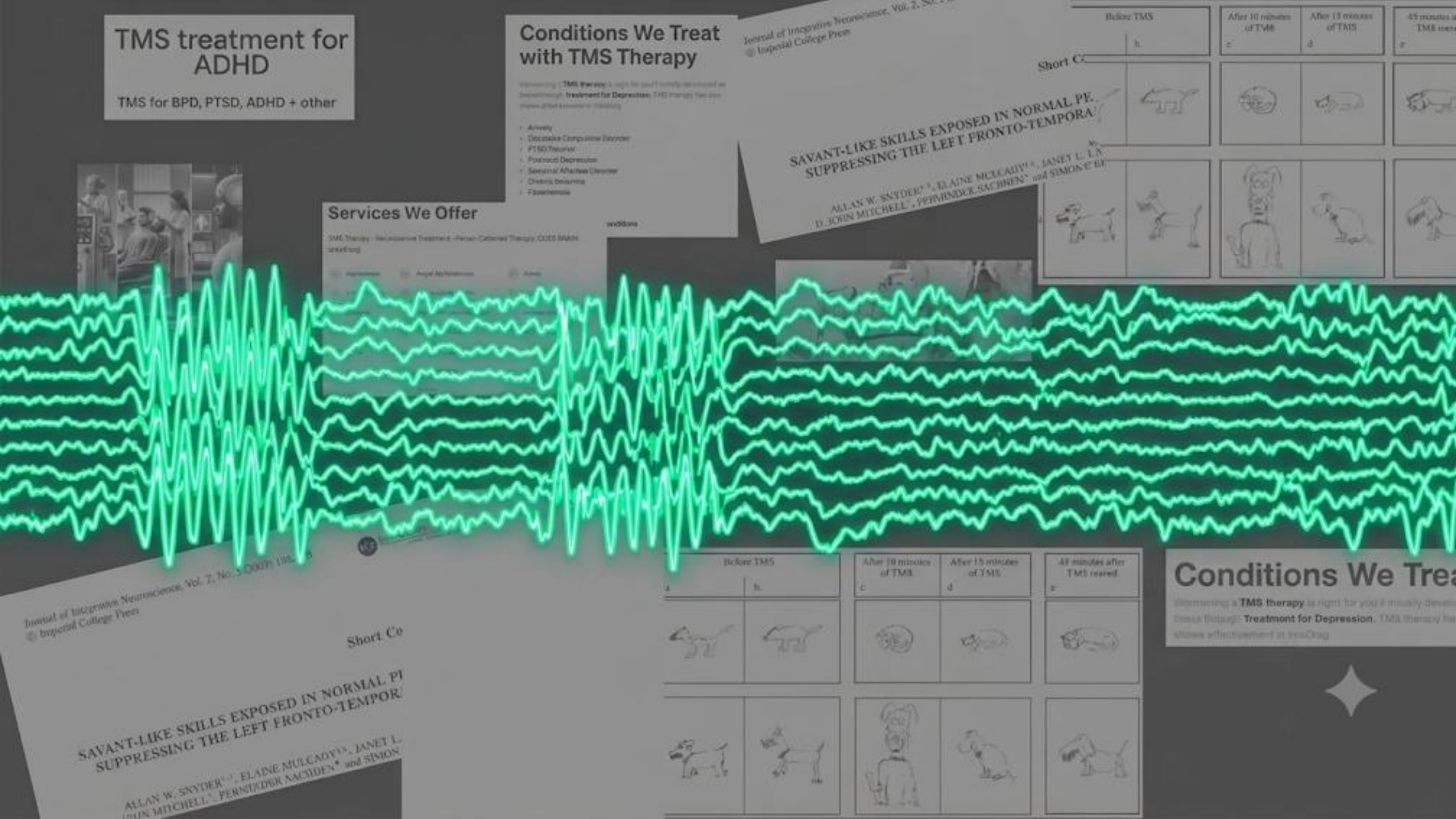
Sham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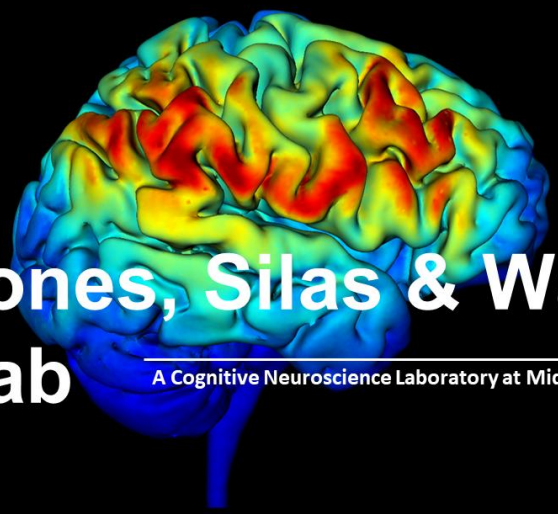
SUPPRESSING THE LEFT FRONTO-TEMPORA
Short Co
Before TMS
After 10 minutes of TMS
After 15 minutes of TMS
45 minutes after TMS reared
Conditions We Trea

Alex Jones

Emma Ward



Jones, Silas & Ward Lab

A Cognitive Neuroscience Laboratory at Middlesex University

Middlesex University London

Wayne Anderson

Kielan Yarrow

Thanks!

FUNDAÇÃO Bial
Institution of public utility

www.jswlab.co.uk