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MEDICAL DISCOVERY TEAM ON ADDICTION

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Summit on Innovation in Addiction Medicine

Bridging the Gap:
Innovation Needs and Opportunities in **Addiction Medicine** in the Era of Neuroscience and AI

SCAN ME

St Andrews University, 22 September 2025

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Center for Neural Circuits in Addiction, Department of Neuroscience, University of Minnesota

Disclosure of Conflict of Interest:

None!

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Warren Family Foundation, NARSAD, OCAST,
Medical Discovery Team for Addiction (MDTA)

SCAN ME



Prof Alex Baldacchino
School of Medicine



Dr Gosia Mitka
Business School

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Center for Magnetic Resonance Research

CMRR: First fMRI Studies in the World



Center for Magnetic Resonance Research

World's largest MRI: 10.5 T



Boston Scientific

Abbott

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Medical Discovery Team on Addiction

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Addiction Biology
Open Access
SSA SOCIETY FOR THE STUDY OF ADDICTION

Robotic TMS for Circuit Engagement

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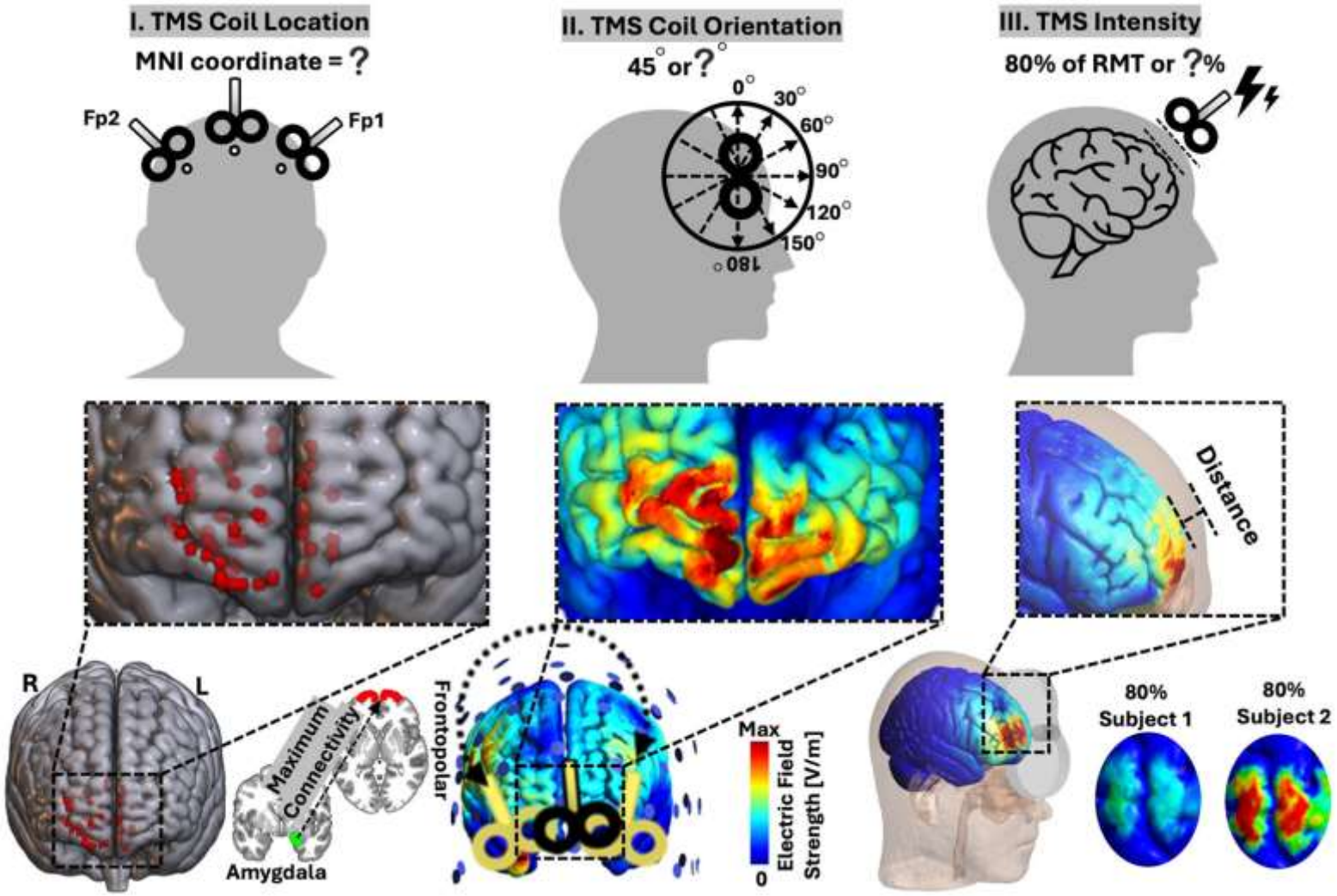
ORIGINAL ARTICLE | Open Access

Targeting VMPFC-amygdala circuit with TMS in substance use disorder: A mechanistic framework

Ghazaleh Soleimani, Christine A. Conelea, Rayus Kuplicki, Alexander Opitz, Kelvin O. Lim, Martin P. Paulus, Hamed Ekhtiari

First published: 09 January 2025 | https://doi.org/10.1111/adb.70011





Match the Definitions

1. **Discovery**:
2. **Creativity**:
3. **Invention**:
4. **Innovation**:

A. Finding something that already exists in nature or reality but was previously unknown.

B. Creating a new device, process, or method that has never existed before

C. The ability to generate original and valuable ideas or concepts.

D. Improving or applying inventions and ideas in ways that create practical value, impact, or widespread adoption.

Match the Definitions

- **Discovery**: A
- **Creativity**: C
- **Invention**: B
- **Innovation**: D

A. Finding something that already exists in nature or reality but was previously unknown.

B. Creating a new device, process, or method that has never existed before, often by applying creativity.

C. The ability to generate original and valuable ideas or concepts.

D. Improving or applying inventions and ideas in ways that create practical value, impact, or widespread adoption.

Discovery is finding what exists, **creativity** is imagining what could exist, **invention** is making it real for the first time, and **innovation** is applying it to create value in the world.

Potential Fields of Innovative Solutions in Addiction Medicine

1. Biotechnology and Neuroscience Innovations
(Neurostimulation Devices), (Neurofeedback),
(Genetic & Epigenetic Predictive Tools)

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1. Biotechnology and Neuroscience Innovations
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2. Pharmacological and Pharmaceutical Innovations
(Long-acting Medications), (Drug Delivery Systems), (Novel Withdrawal Management Medications), (Take-home Naloxone), (Personalized Pharmacotherapy)

3. Digital Health and Telemedicine
(Teletherapy & Telemedicine), (Apps for Recovery Support), (Wearable Technology), (AI-driven Chatbots)

4. Behavioral and Psychosocial Innovation
(CBT integration with AI), (Mindfulness & Meditation Apps), (Virtual Peer-support Networks)

5. Virtual Reality (VR) & Augmented Reality (AR)
(VR Exposure Therapy), (VR-based CBT), (AR for Skill Training)

6. Blockchain for Patient Data
(Secure Medical Records), (Smart Contracts for Treatment Compliance), (Blockchain for Addiction Recovery)

7. Cultural and Social Innovation
(Localized Recovery Models), (Community-Based Recovery), (Occupational Skills Training based on Market Needs), (Selecting Preventive Interventions)

8. Behavioral Economics & Incentive-Based Treatment
(Contingency Management Programs), (Cryptocurrency-Based Rewards)

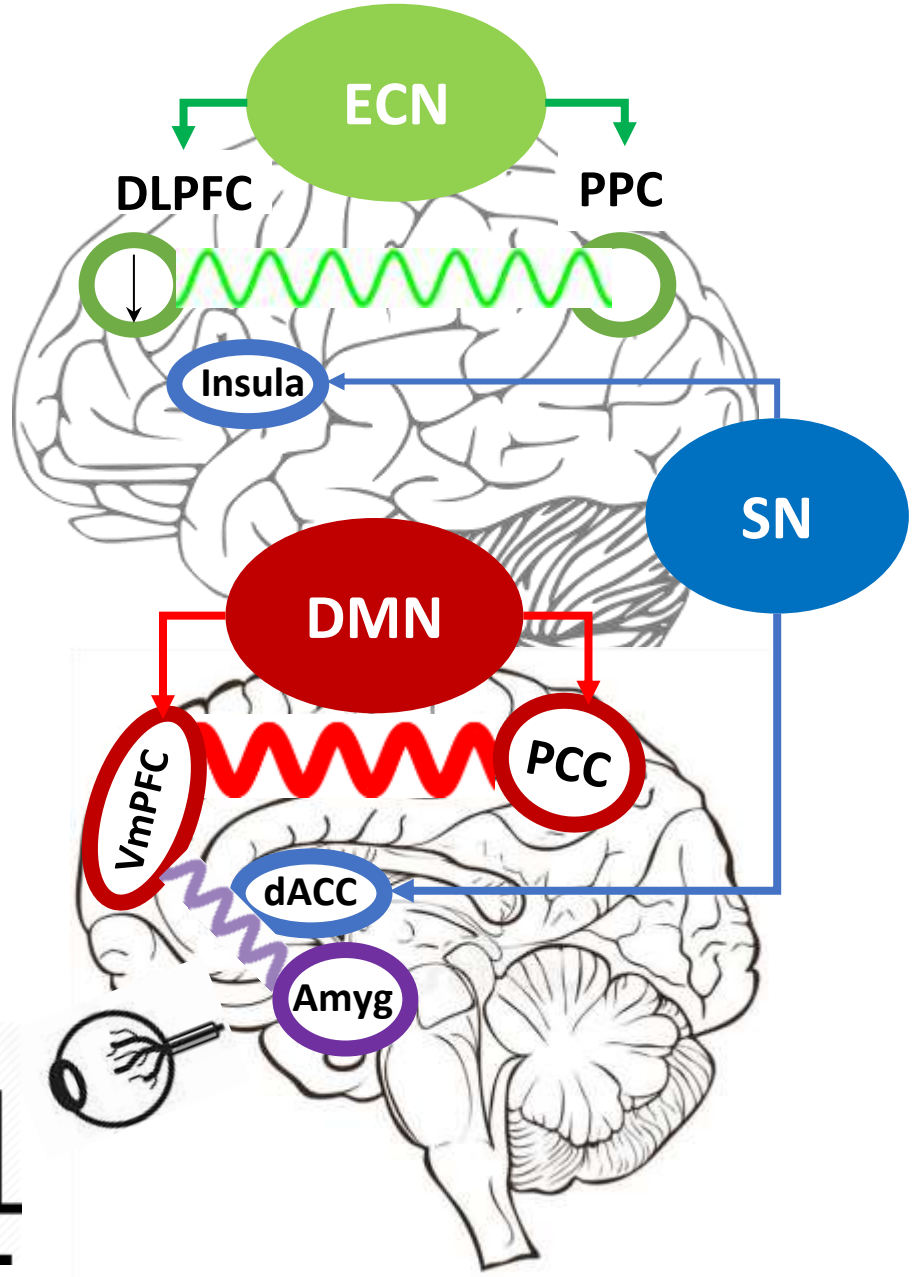
9. Integrated Care Models
(Collaborative Care Platforms), (Incarceration Integrated Care), (Promoting Referrals for Addiction Treatment)

10. Workforce and Training Innovations
(Virtual Training for Healthcare Providers), (Interactive Certification and Education Platforms)

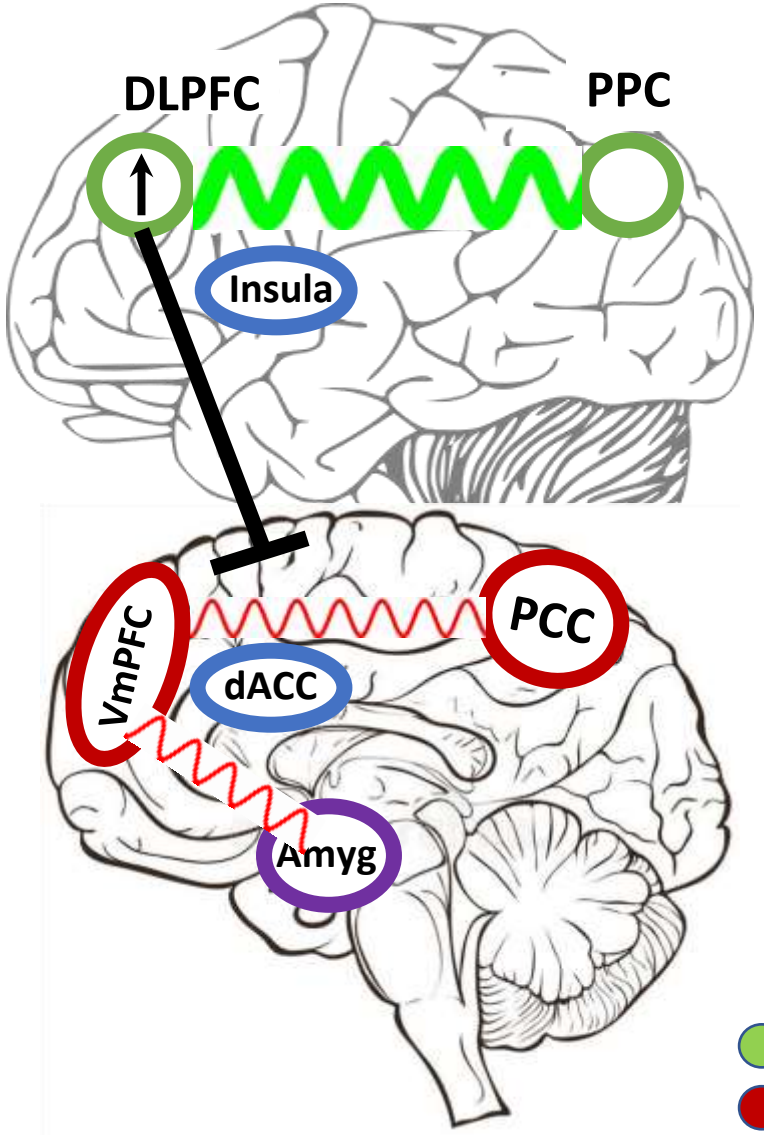
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1. Biotechnology and Neuroscience Innovations
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Craving State



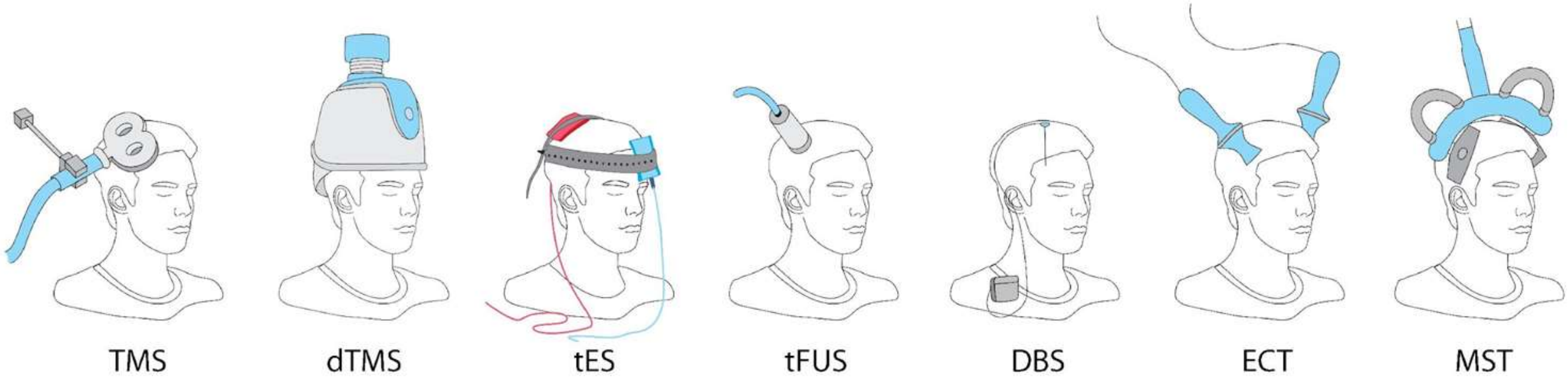
Control State





Executive Control Netwo
Default Mode Network
Salience Network

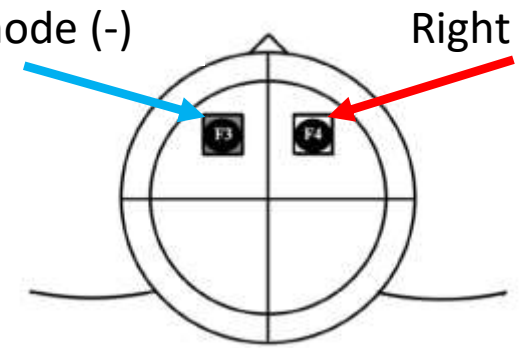
Invention of Circuit-based Therapeutics



International Journal of Neuropsychopharmacology (2014), **17**, 1591–1598. © CINP 2014
doi:10.1017/S1461145714000686

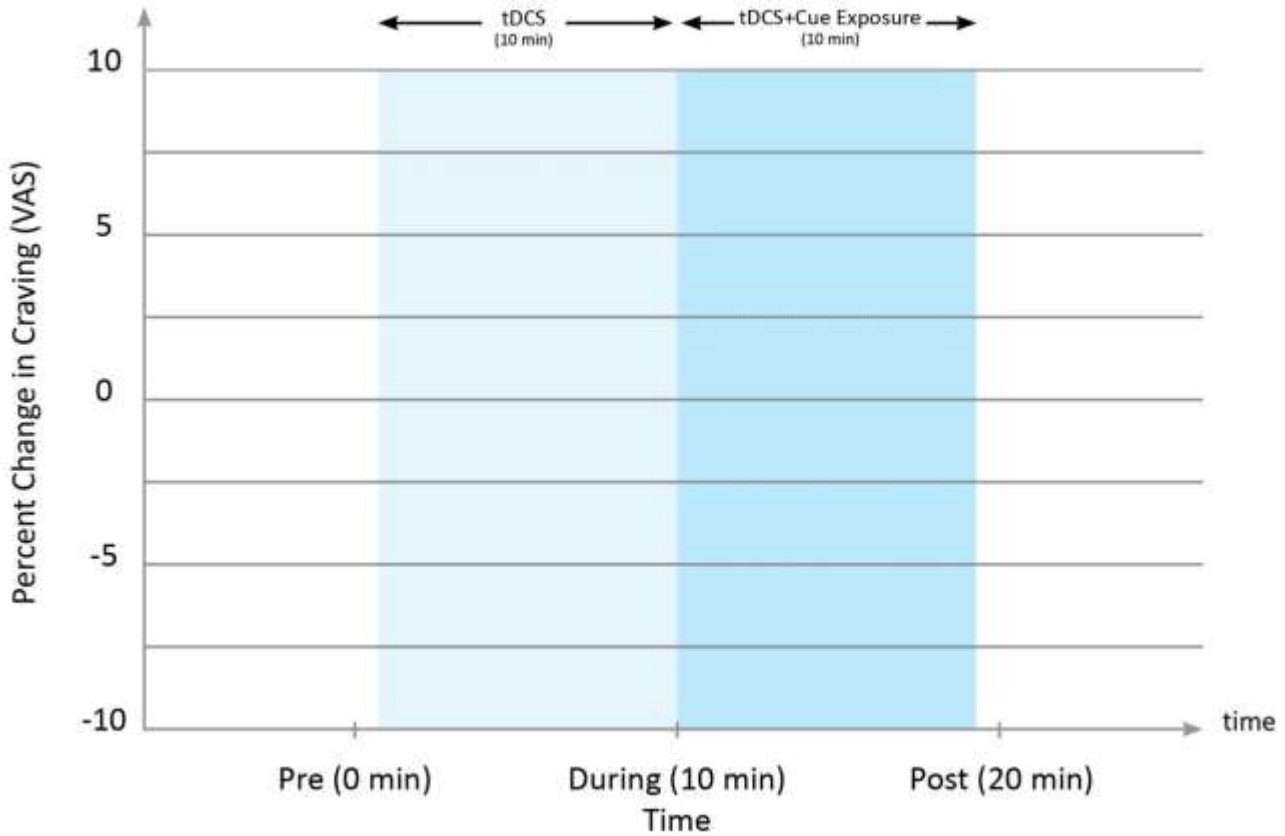
State dependent effect of transcranial direct current stimulation (tDCS) on methamphetamine craving

Alireza Shahbabaie[1,2,3], Mehrshad Golesorkhi[1,3], Behnam Zamanian[2], Mitra Ebrahimpoor[3], Fatemeh Keshvari[4], Vahid Nejati[4], Felipe Fregni[5] and Hamed Ekhtiari[1,2,3]





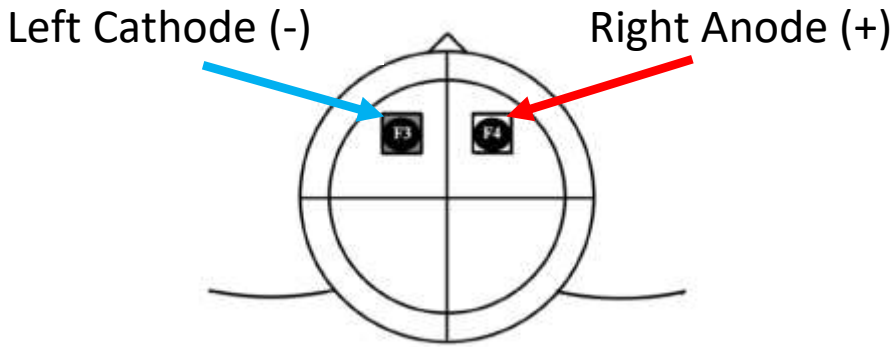
	Descriptive statistics
Gender (men)	30/30
Age	29.90±1.04
Education (years)	11.90±0.39
Duration of meth abstinence (d)	73.33±9.64
Duration of meth dependence (months)	58±5.75
Marital status (married)	30/12
Number of subjects with a history of opium abuse	30/19
Number of subjects with a history of heroin abuse	30/2
Number of subjects with a history of crystalline heroin abuse	30/6
Number of subjects with a history of alcohol abuse	30/17
Number of subjects with a history of hashish abuse	30/22
Number of subjects with a history of cocaine abuse	30/3
Number of subjects with a history of cigarette smoking	30/29



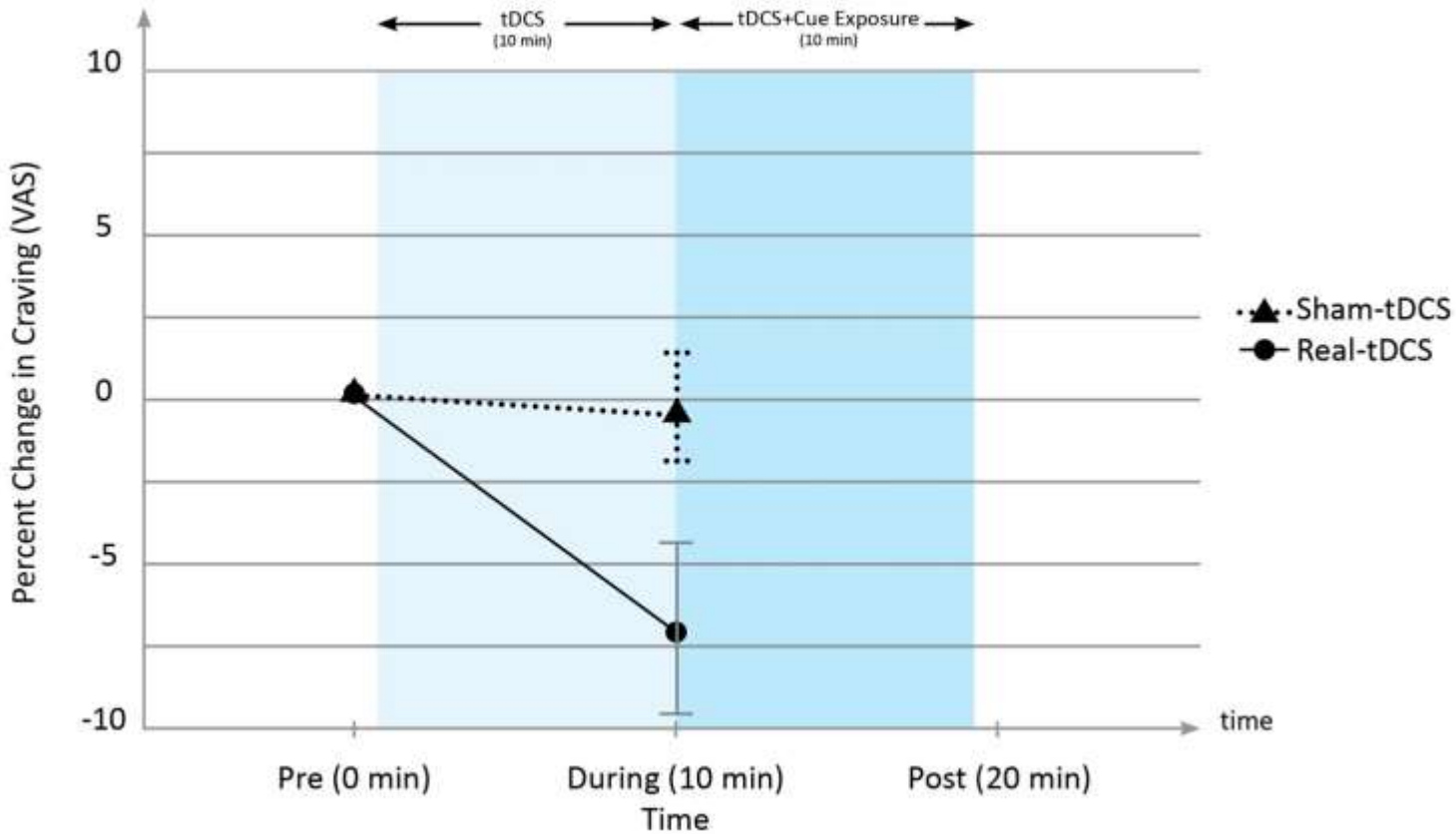
International Journal of Neuropsychopharmacology (2014), **17**, 1591–1598. © CINP 2014
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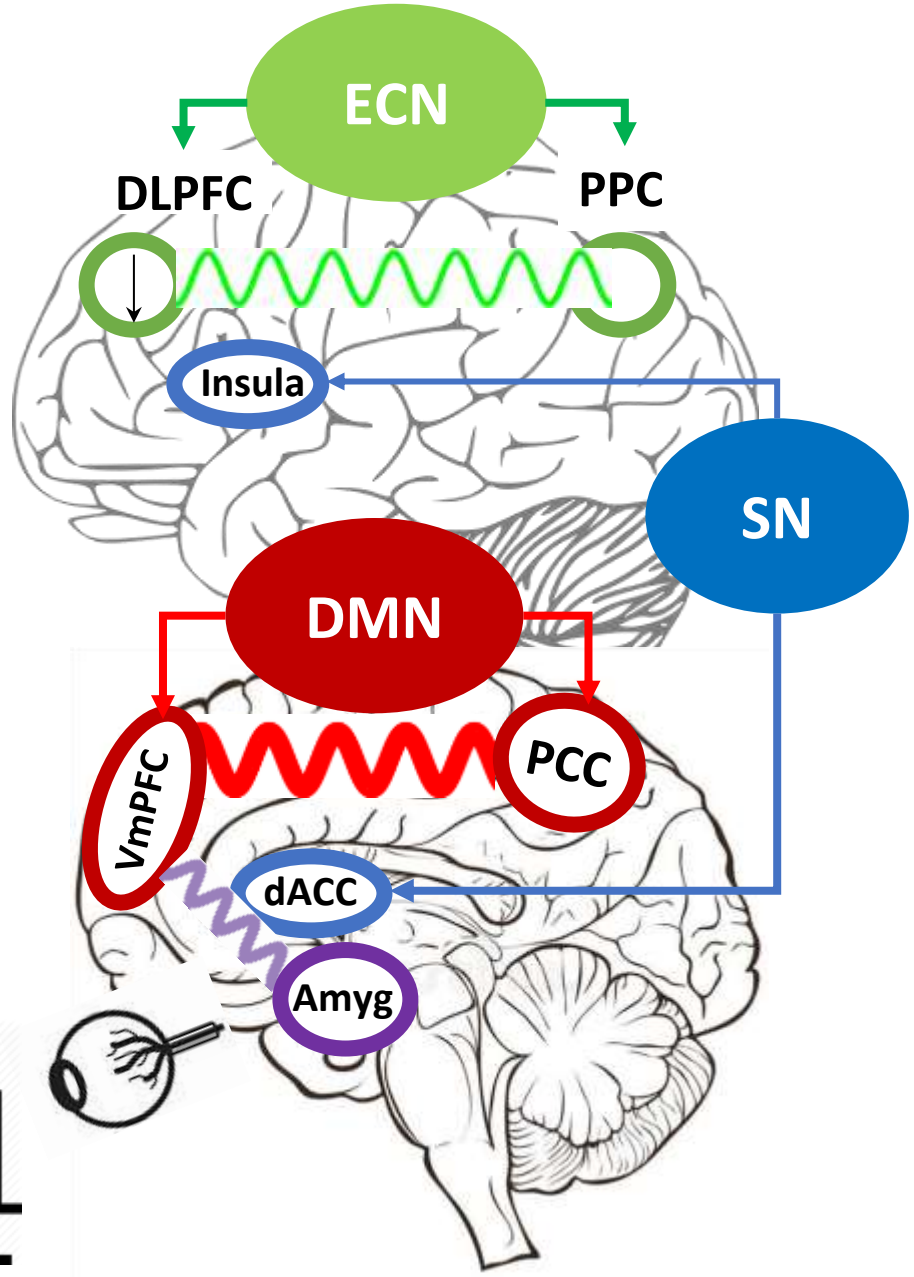
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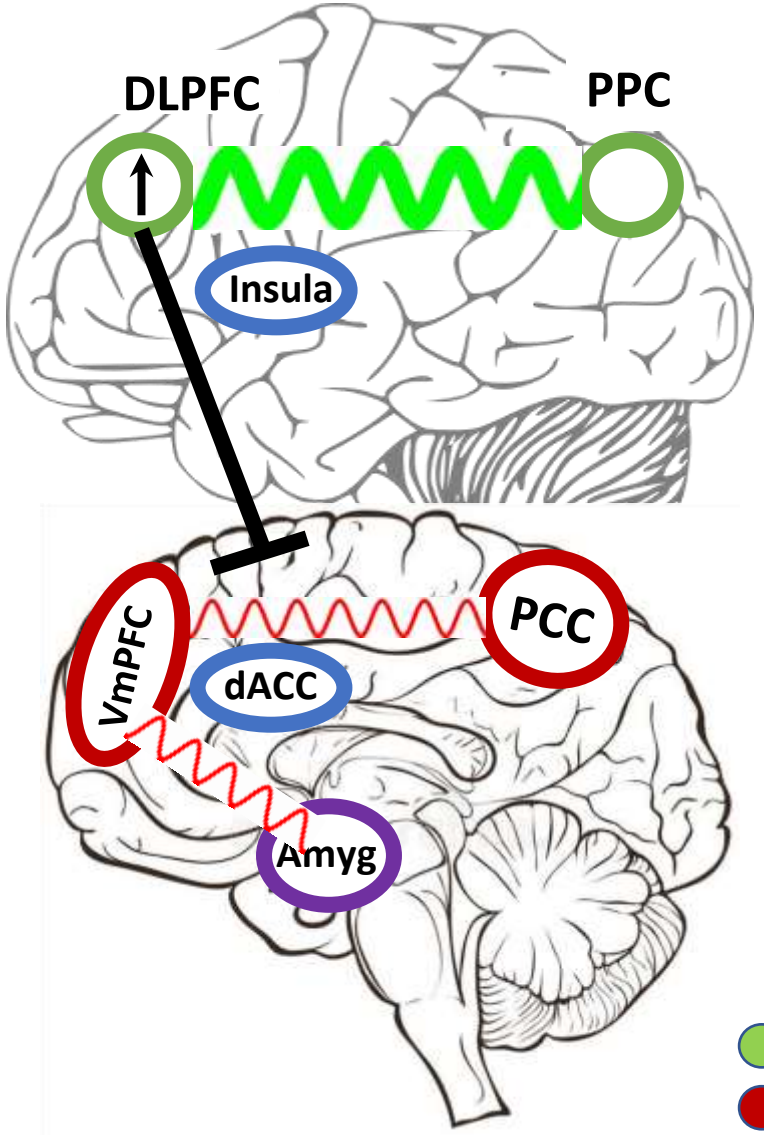
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Craving State



Control State



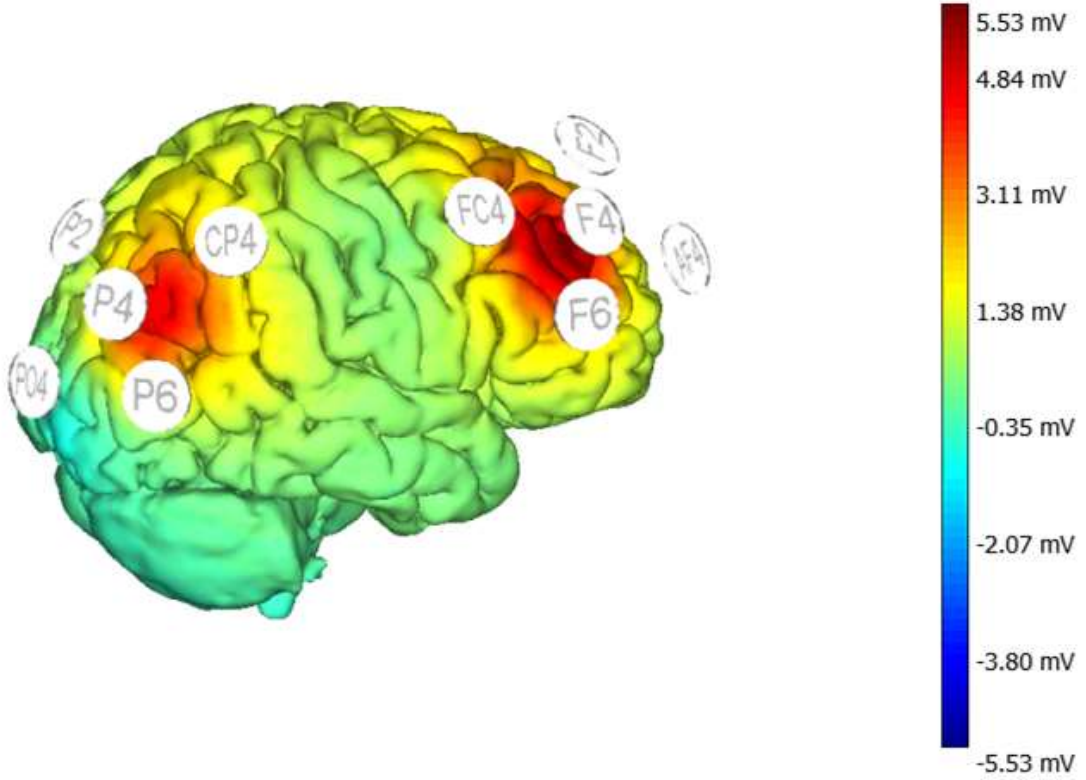


Executive Control Netwo
Default Mode Network
Salience Network

Frontoparietal Stimulation

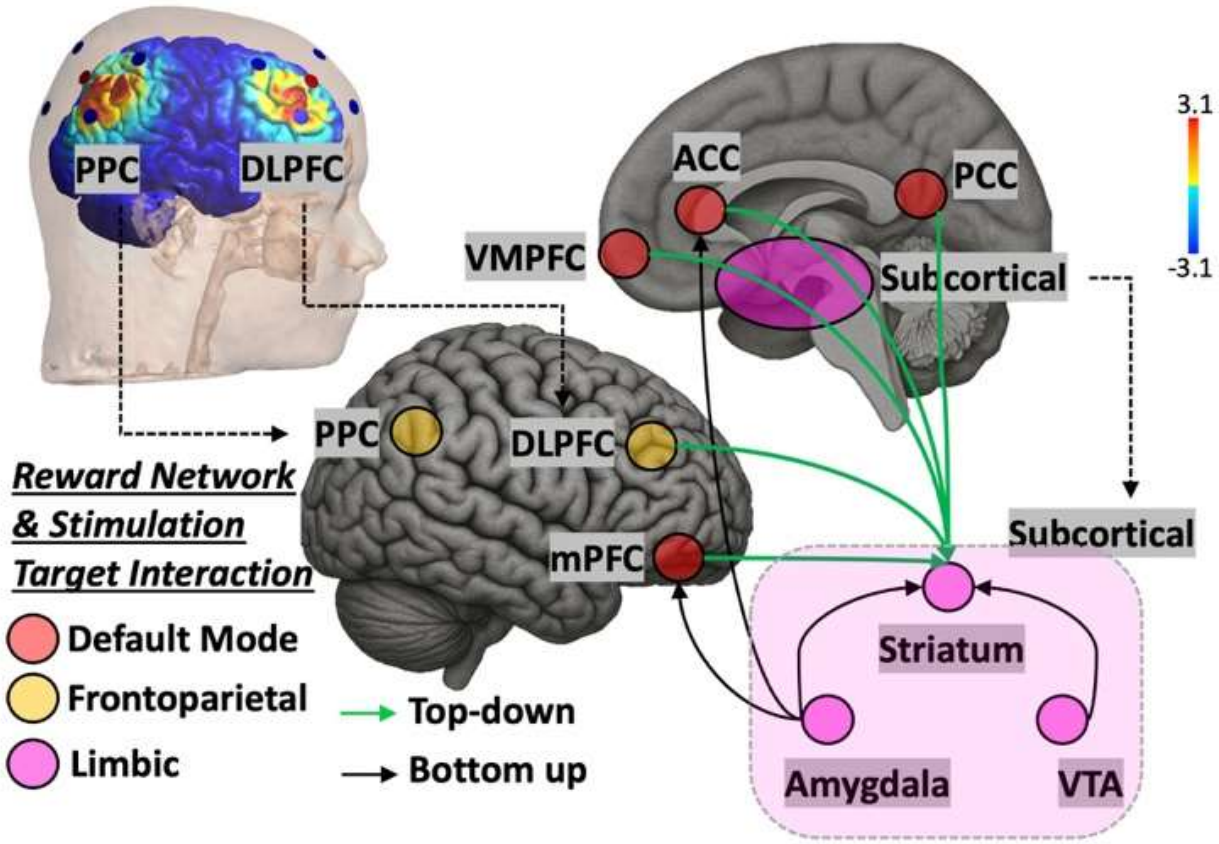
With Transcranial Alternating Current Stimulation (tACS)

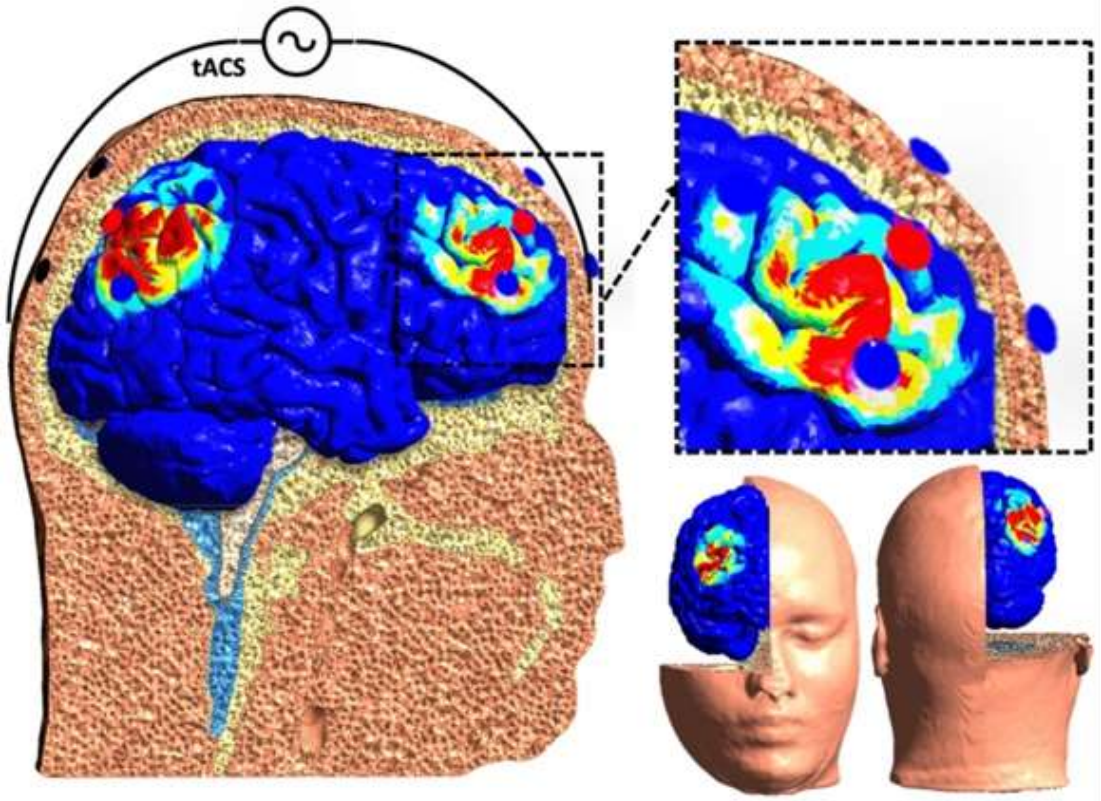




Frontoparietal Stimulation

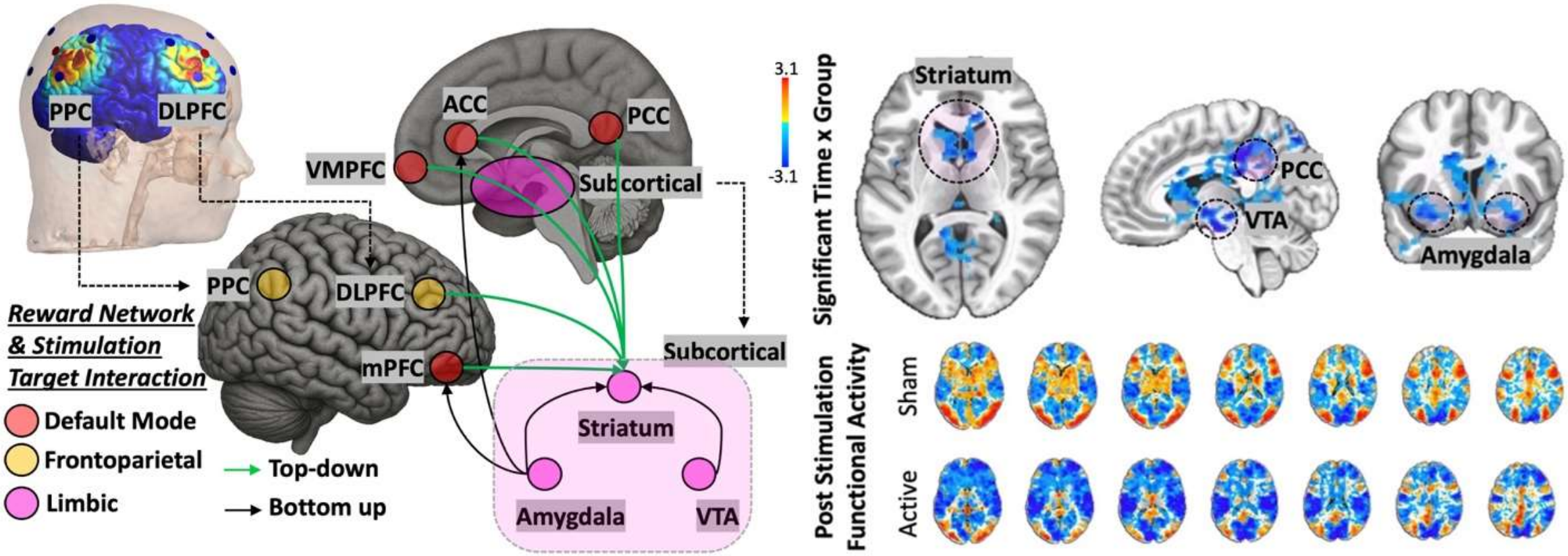
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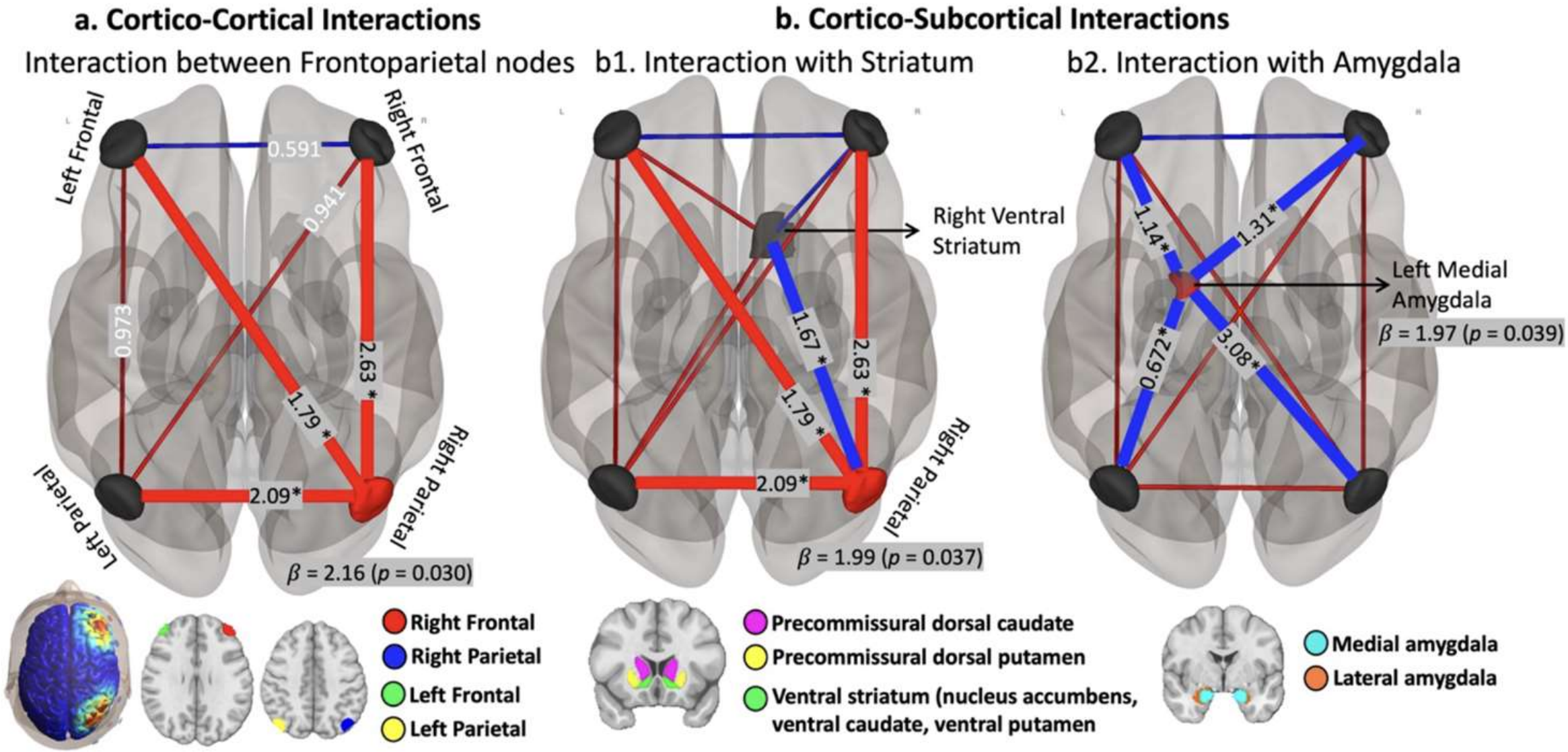


Frontoparietal Stimulation

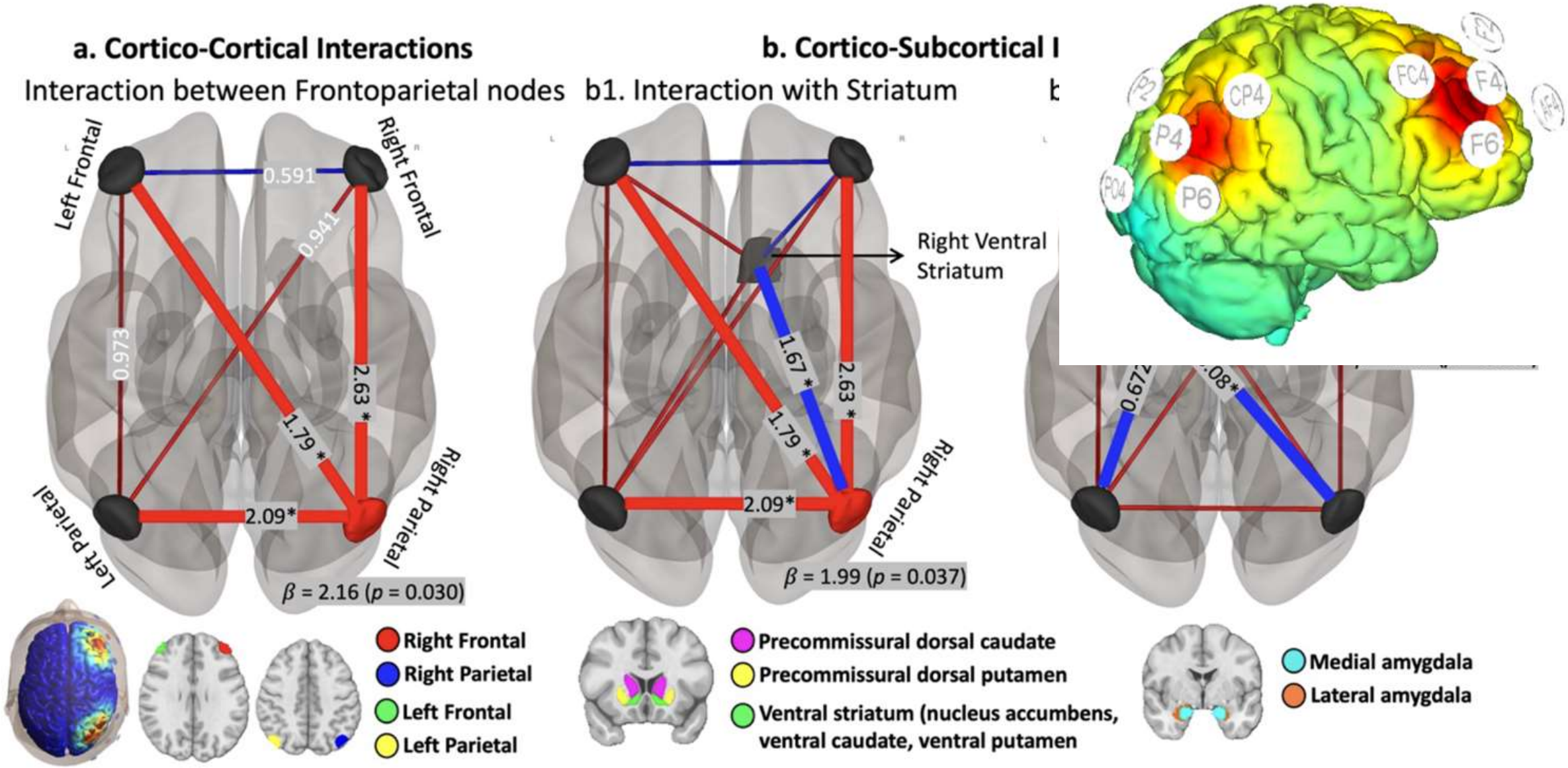
With Transcranial Alternating Current Stimulation (tACS)



Network Engagement and Top-Down Regulation



But no changes in subjective craving!



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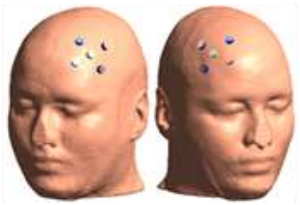
BRAIN STIMULATION

How structural and functional MRI can inform dual-site tACS parameters: A case study in a clinical population and its pragmatic implications

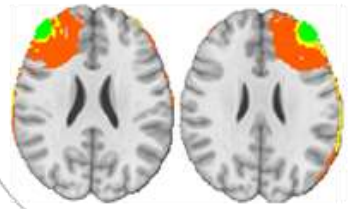
Ghazaleh Soleimani [b, c], Rayus Kupliki [a], Jerzy Bodurka [a], Martin P. Paulus [a], Hamed Ekhtiari [a]

Step 1: Determination of the first stimulation site and currently activated/connected regions

a. Creation of head models



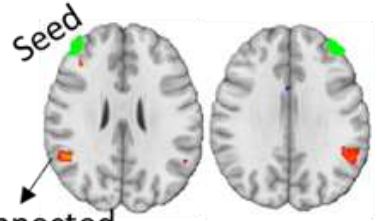
b. 10 mm sphere around max EF



c. fMRI data collection during drug cue reactivity

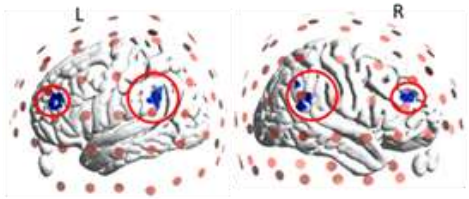


d. Seed to whole-brain connectivity

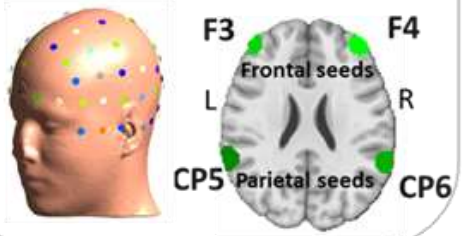


Step 2: Determination of the second stimulation site

e. Mapping active clusters over the cortex

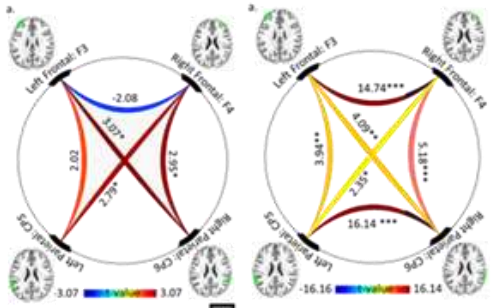


f. Finding nearest electrode locations in EEG cap

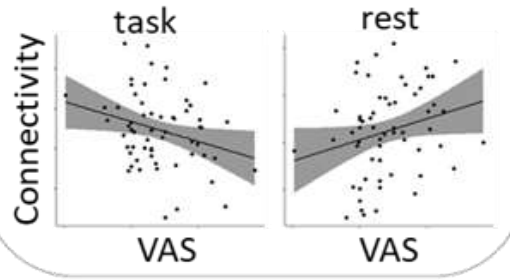


Step 3: Calculation of connectivity between seed and cluster

g. Task/rest connectivity

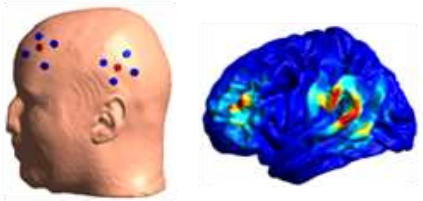


h. Correlation with behavior

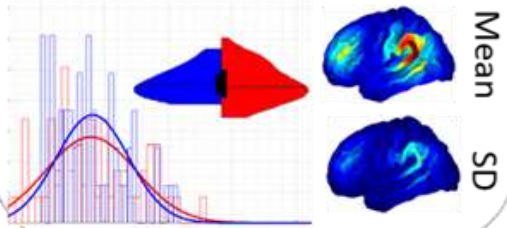


Step 4: Determination of balanced current intensity

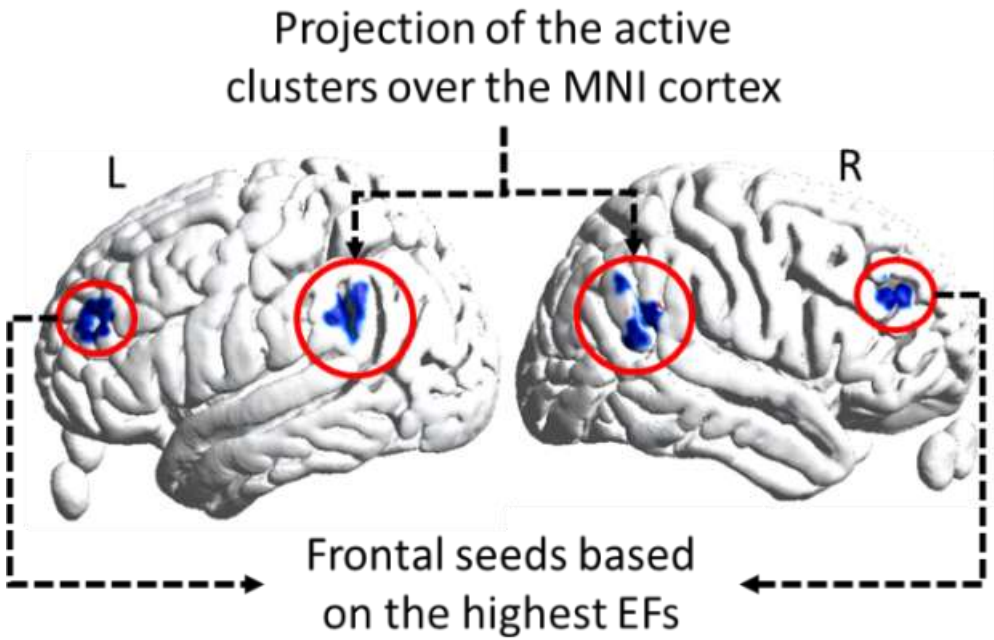
i. Placing electrodes over selected regions

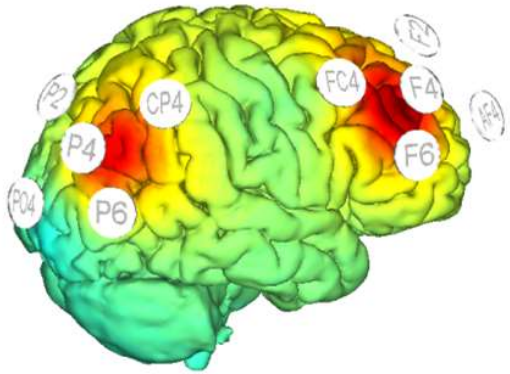


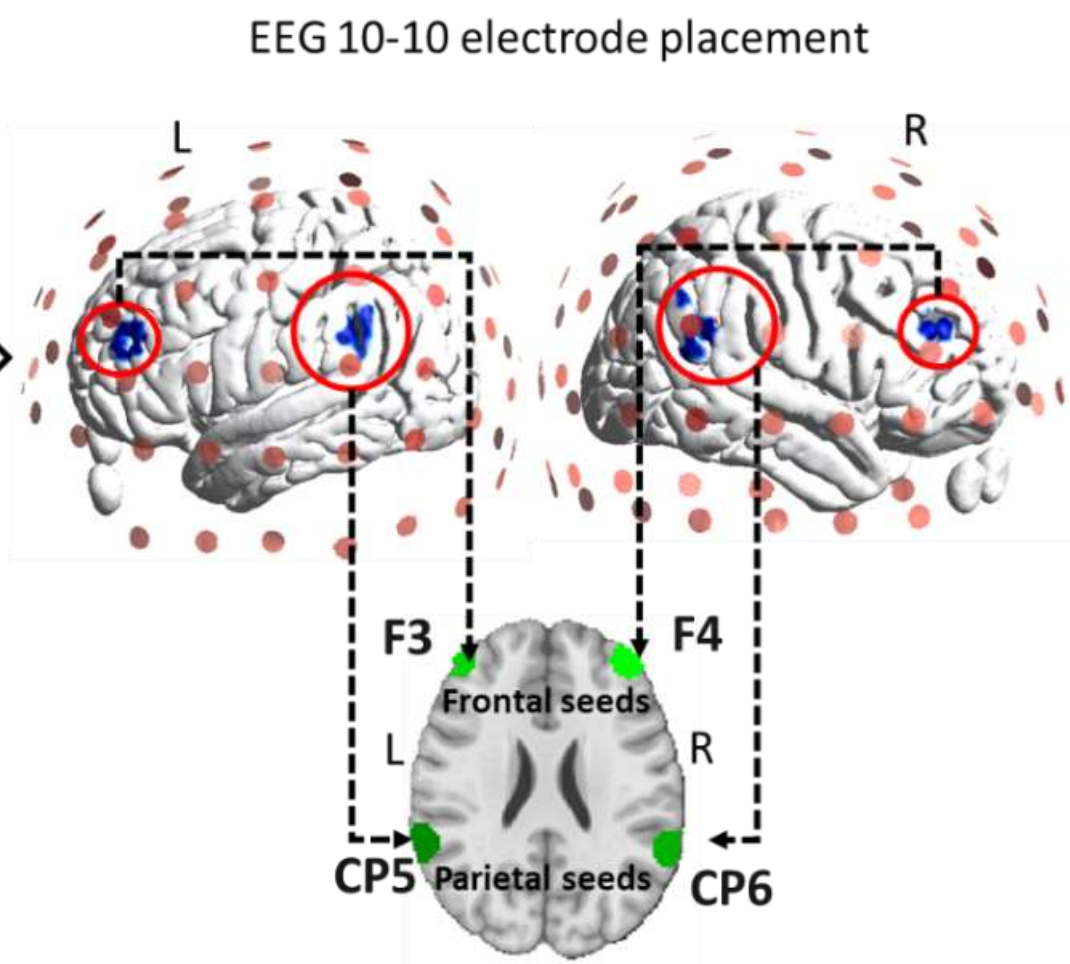
i. Considering similar EF distribution in both sites



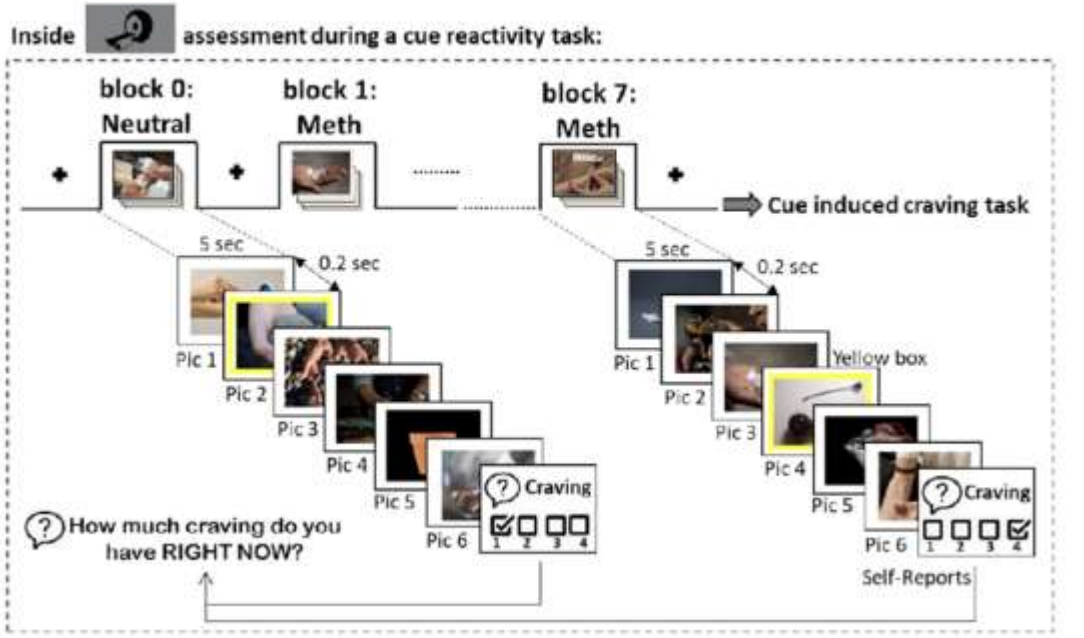
Electrode Placement for the Parietal Node







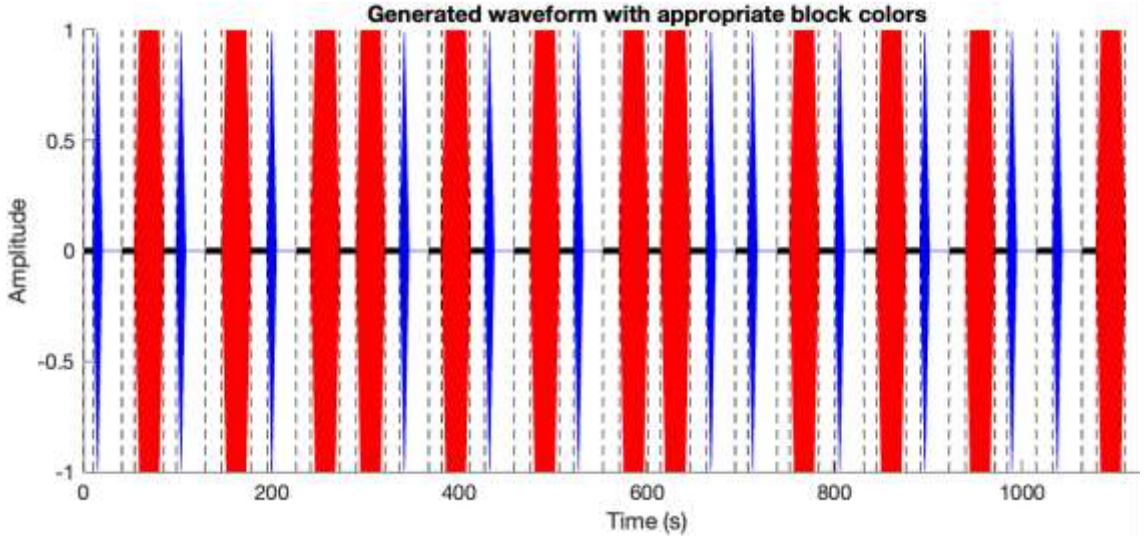
Concurrent tES and fMRI





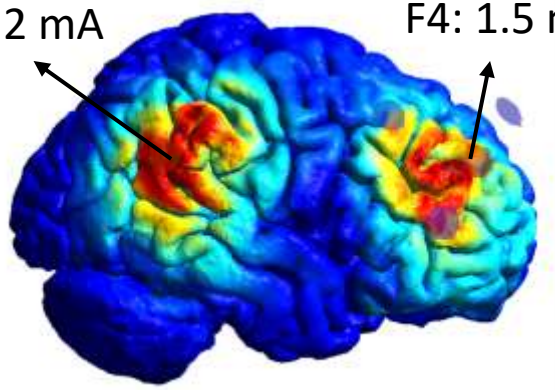
Active

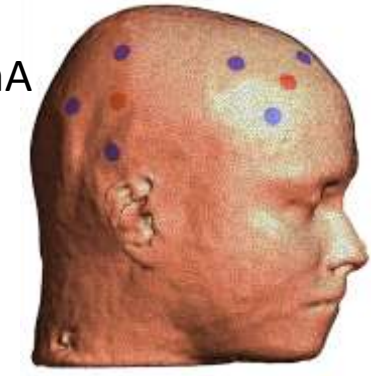
Sham



Cp6: 1.2 mA

F4: 1.5 mA

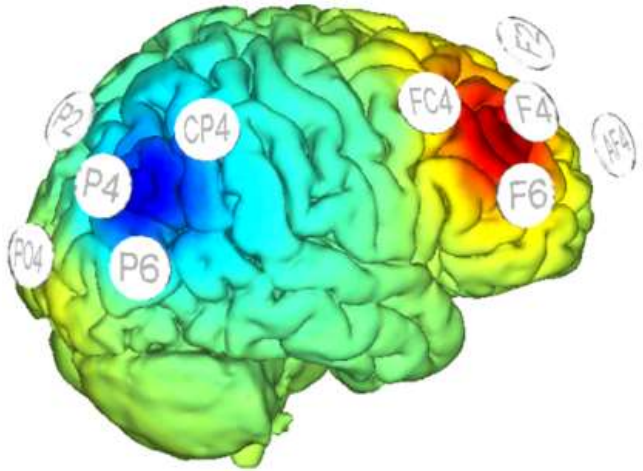


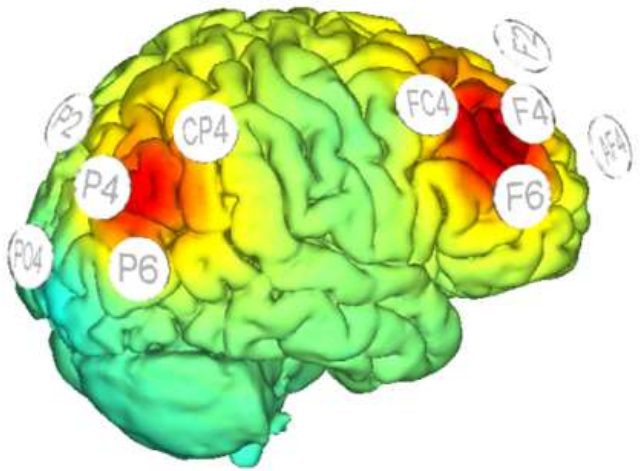


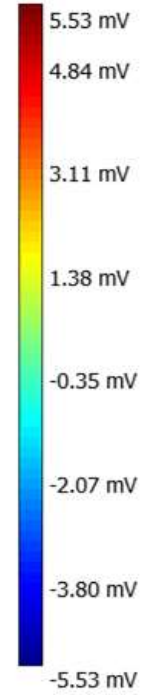
F4—F2, F6, Fc4
Cp6–P6, Cp4, Tp8

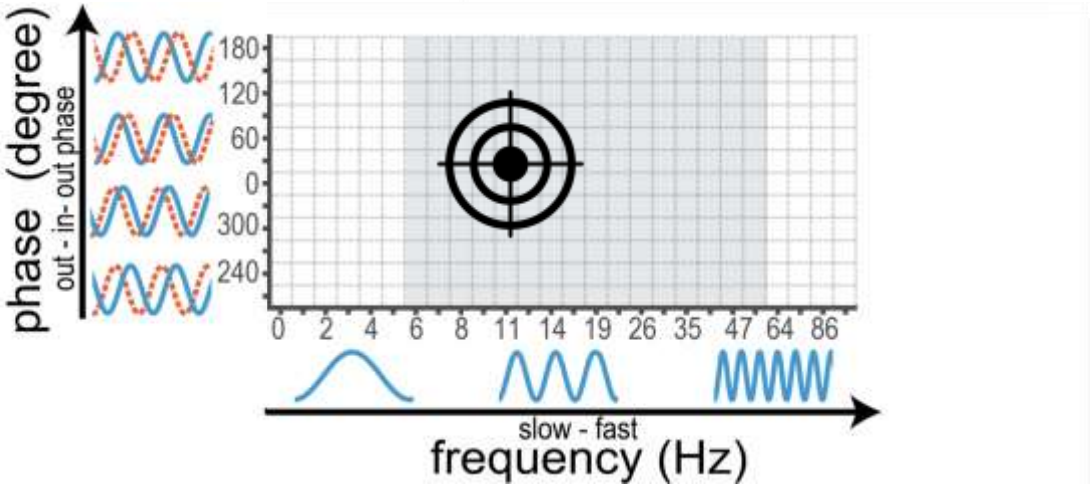
Closing the Loop between tES and fMRI



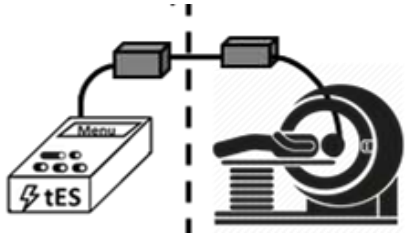


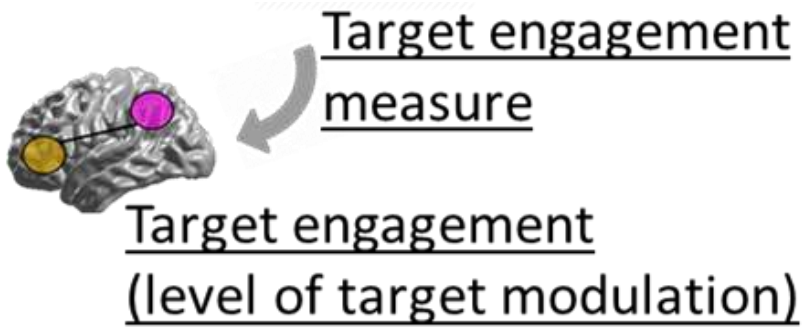




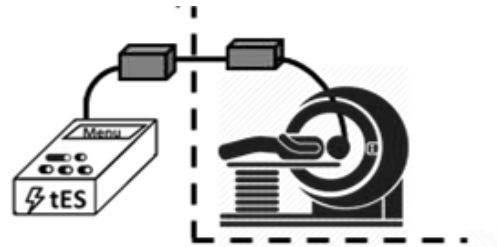


Closing the Loop between tES and fMRI

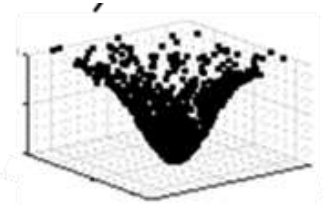




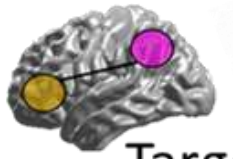
Closing the Loop between tES and fMRI



Parameter adjustment



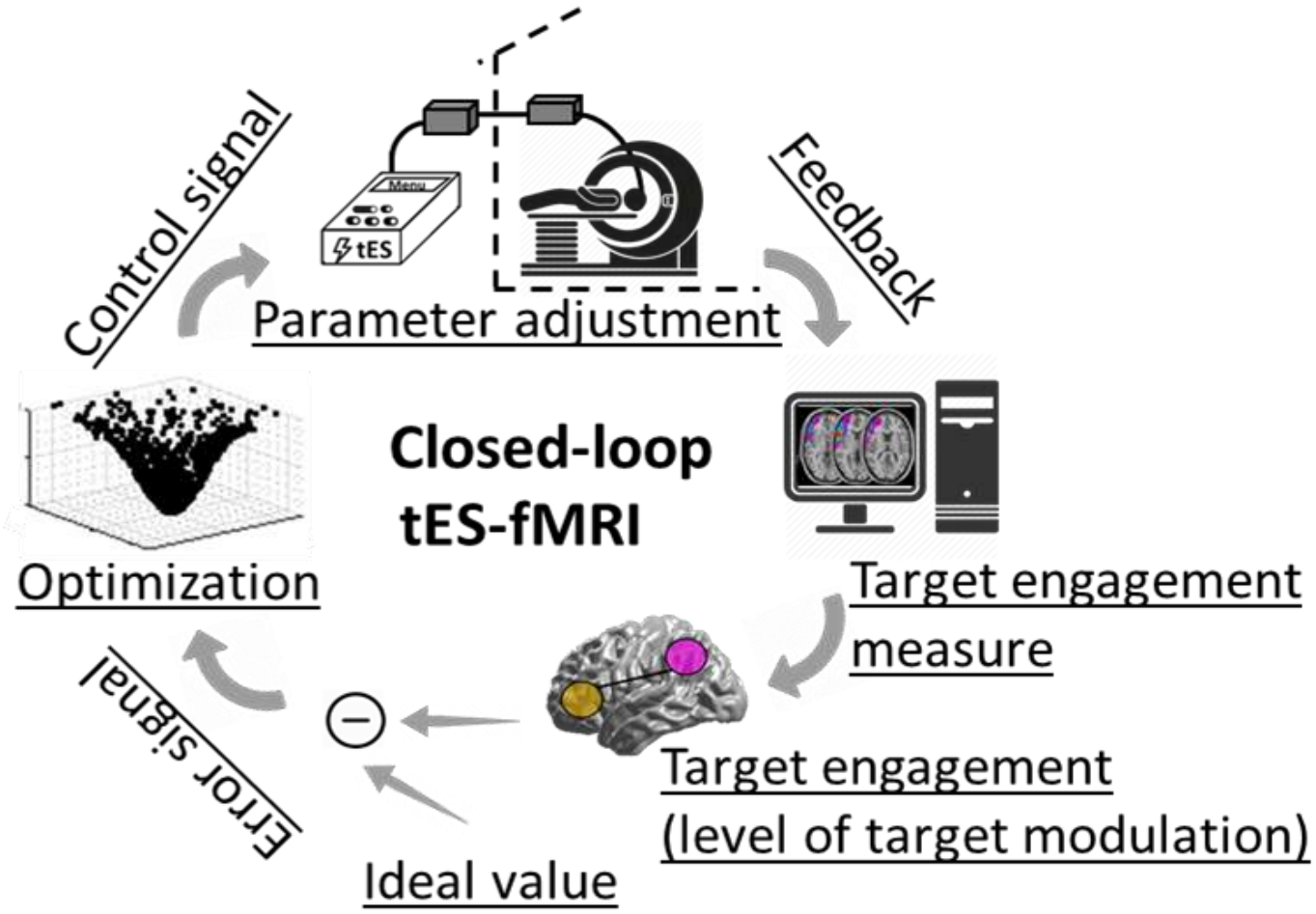
Optimization



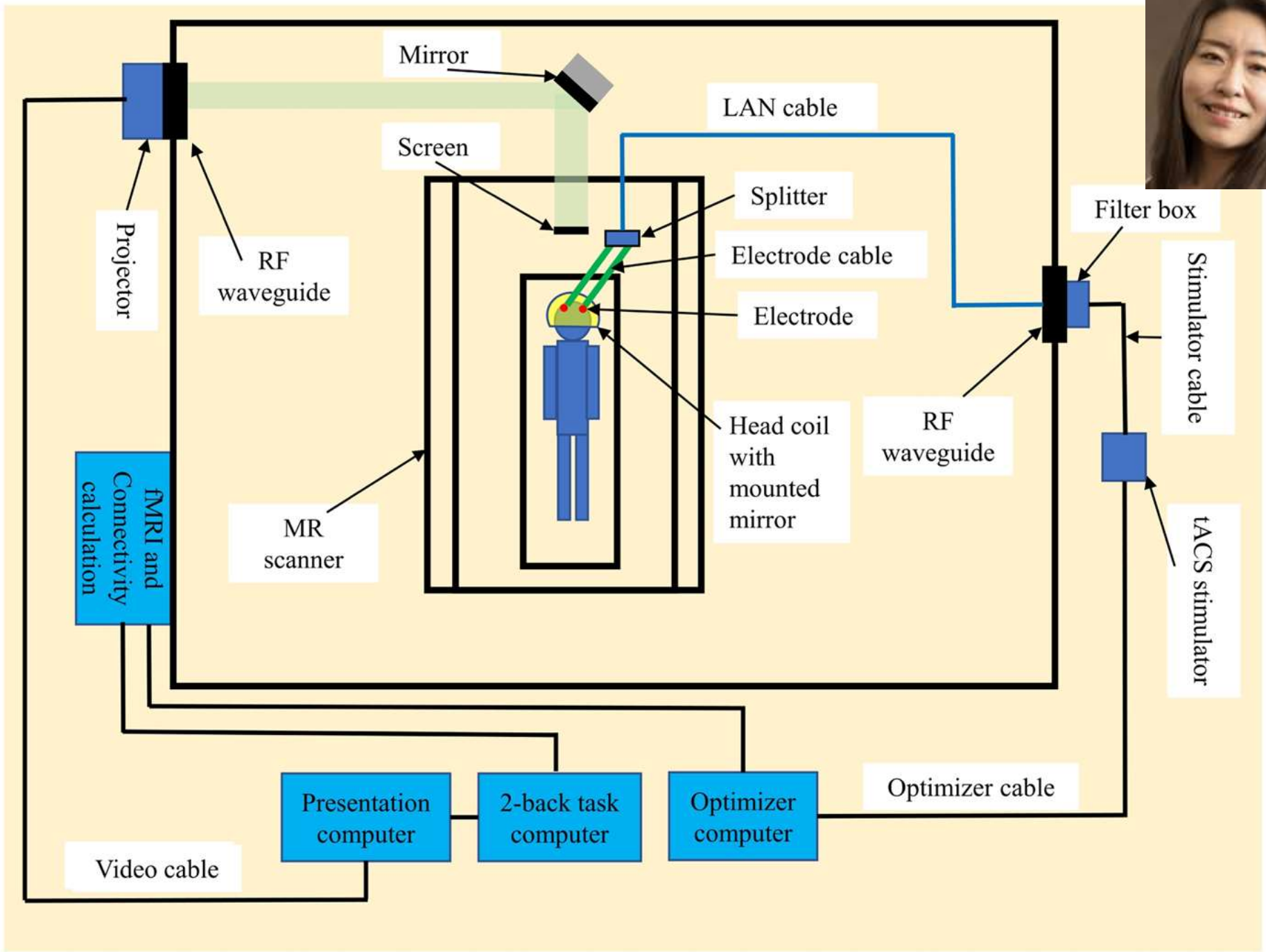
Target engagement measure

Target engagement (level of target modulation)

Closing the Loop between tES and fMRI

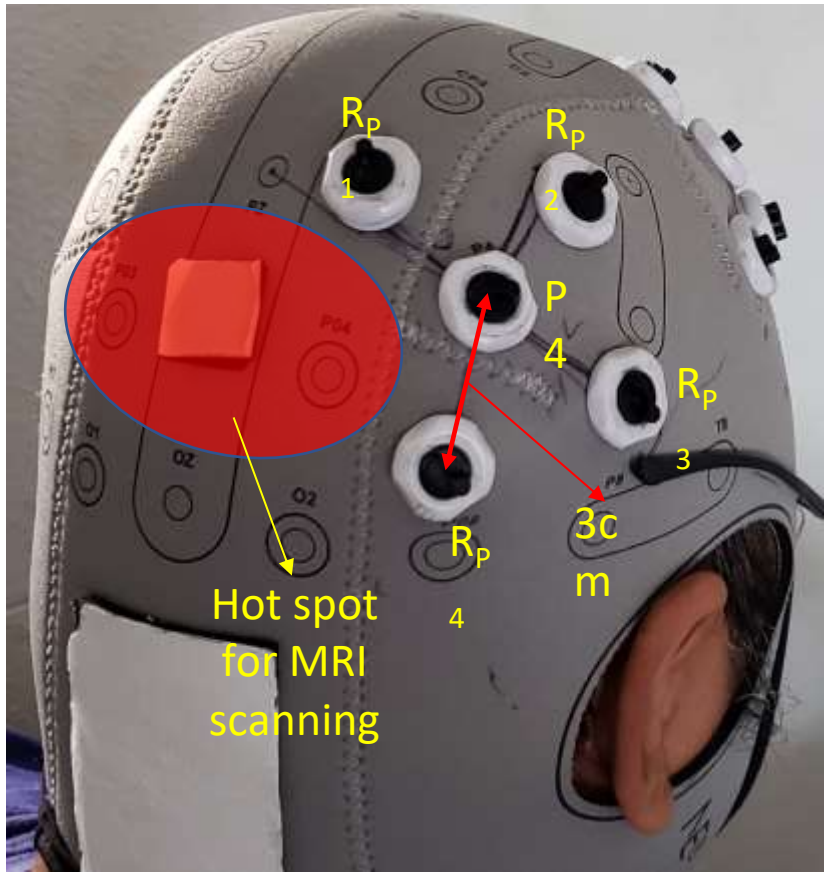


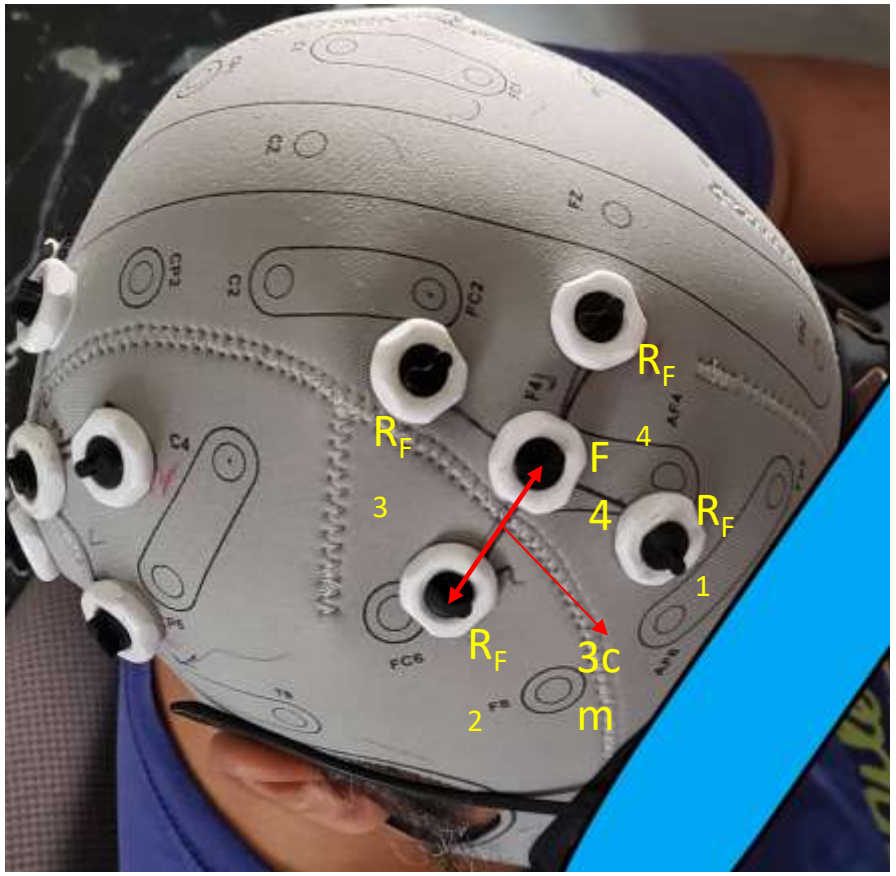
(Soleimani, et al., under preparation)

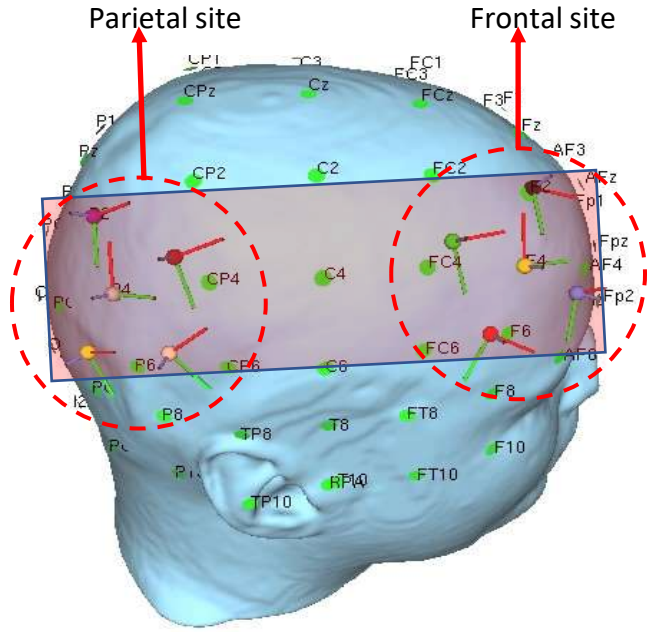

Mirror
LAN cable
Screen
Splitter
Filter box
Projector
RF
waveguide
Electrode cable
Stimulator cable
Electrode
RF
waveguide
Head coil
with
mounted
mirror
fMRI and
Connectivity
calculation
MR
scanner
tACS stimulator
Presentation
computer
2-back task
computer
Optimizer
computer
Optimizer cable
Video cable

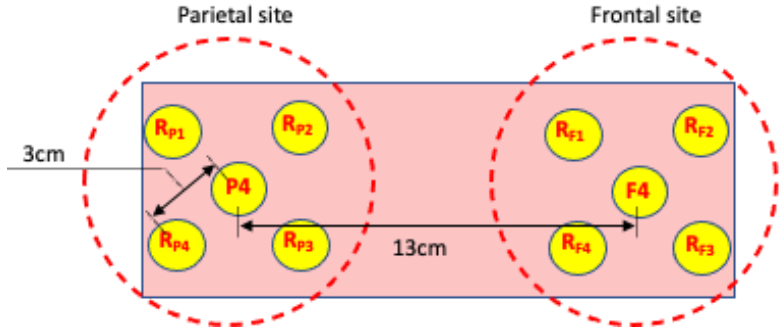


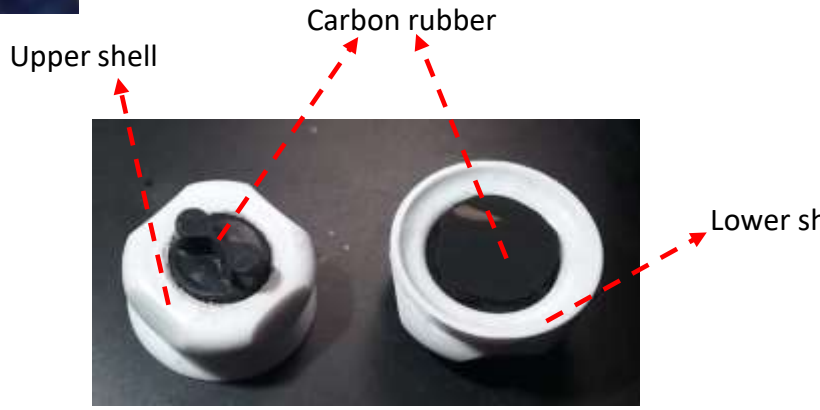
Electrode Placement Challenges











Closing the Loop between tES and fMRI

Received: 19 May 2021 | Revised: 29 April 2022 | Accepted: 22 May 2022

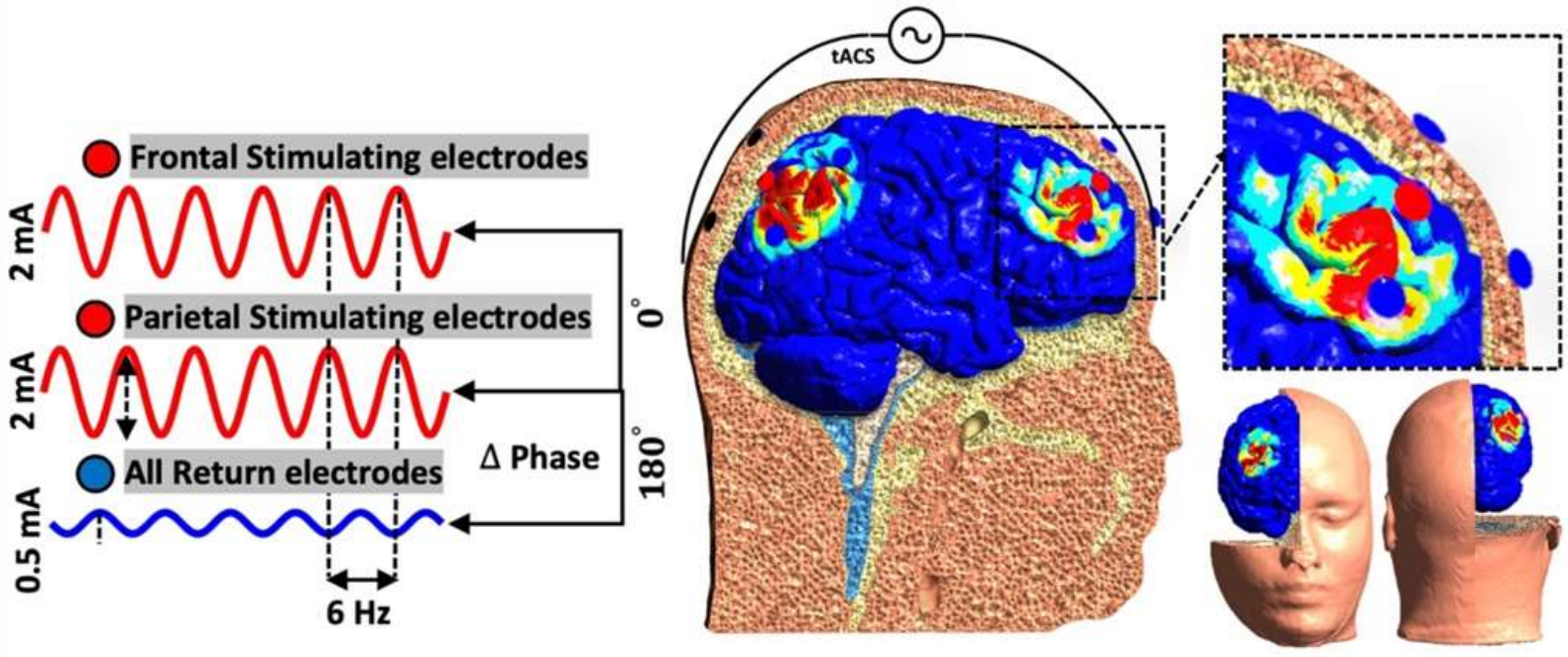
DOI: 10.1002/brb3.2667

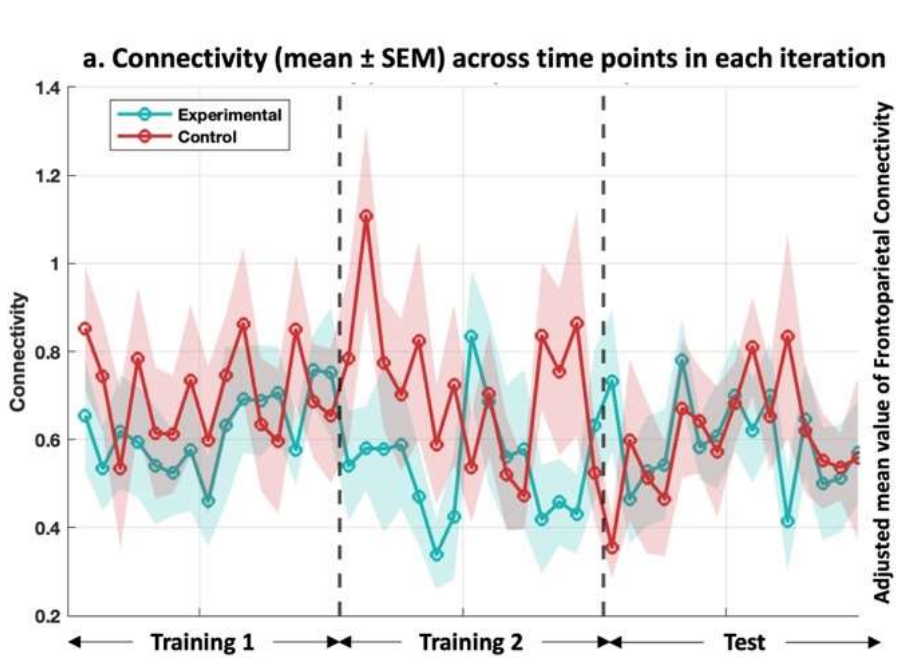
Brain and Behavior Open Access WILEY

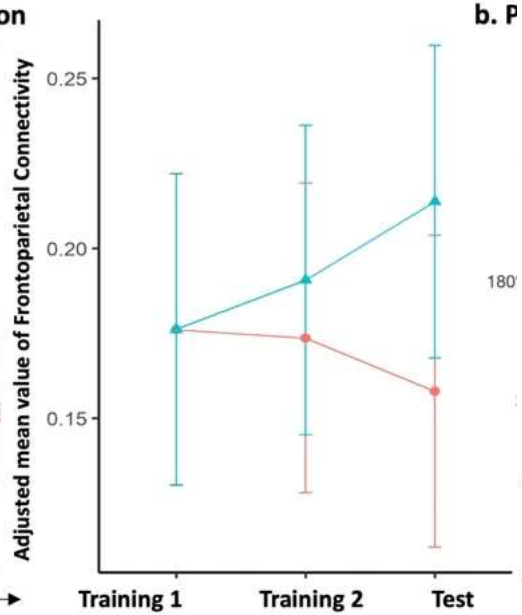
ORIGINAL ARTICLE

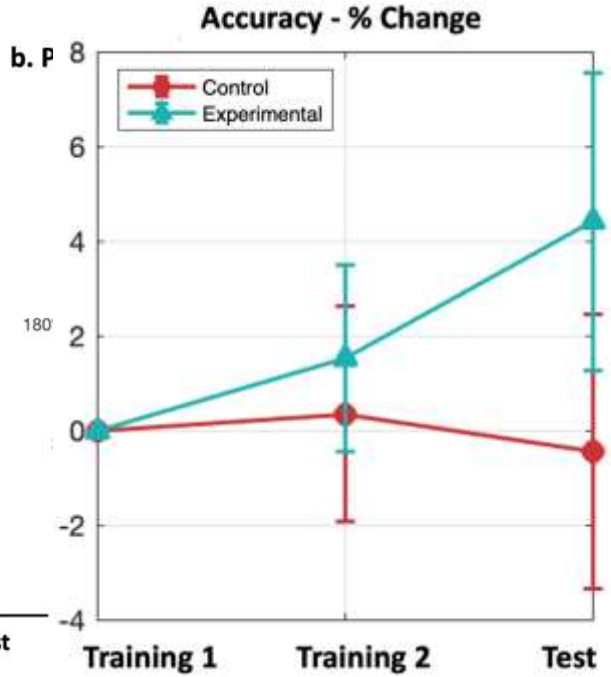
Online closed-loop real-time tES-fMRI for brain modulation: A technical report

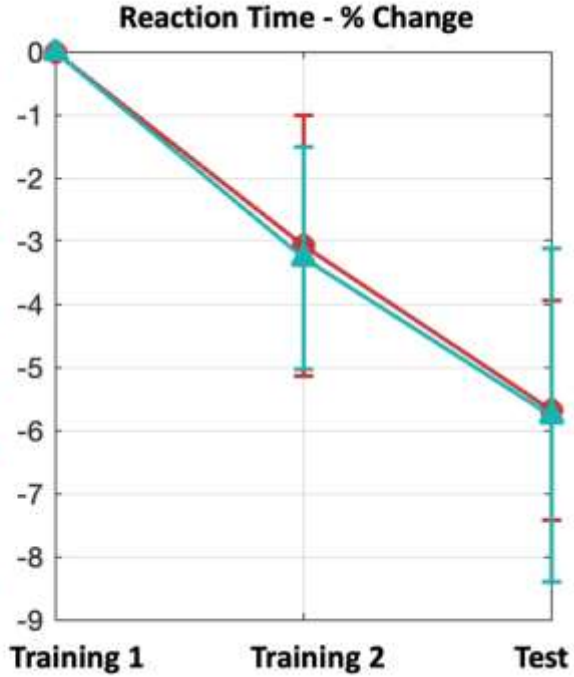
Beni Mulyana[1,2] | Aki Tsuchiyagaito[1] | Masaya Misaki[1] | Rayus Kuplicki[1] | Jared Smith[1] | Ghazaleh Soleimani[3,4] | Ashkan Rashedi[1] | Duke Shereen[5] | Til Ole Bergman[6,7] | Samuel Cheng[2] | Martin P. Paulus[1] | Jerzy Bodurka[1,8,†] | Hamed Ekhtiari[1,9]


Frontal Stimulating electrodes
2 mA
Parietal Stimulating electrodes
2 mA
All Return electrodes
0.5 mA
Δ Phase
0°
180°
6 Hz
tACS


a. Connectivity (mean ± SEM) across time points in each iteration
Experimental
Control
Connectivity
1.4
1.2
1
0.8
0.6
0.4
0.2
Training 1
Training 2
Test

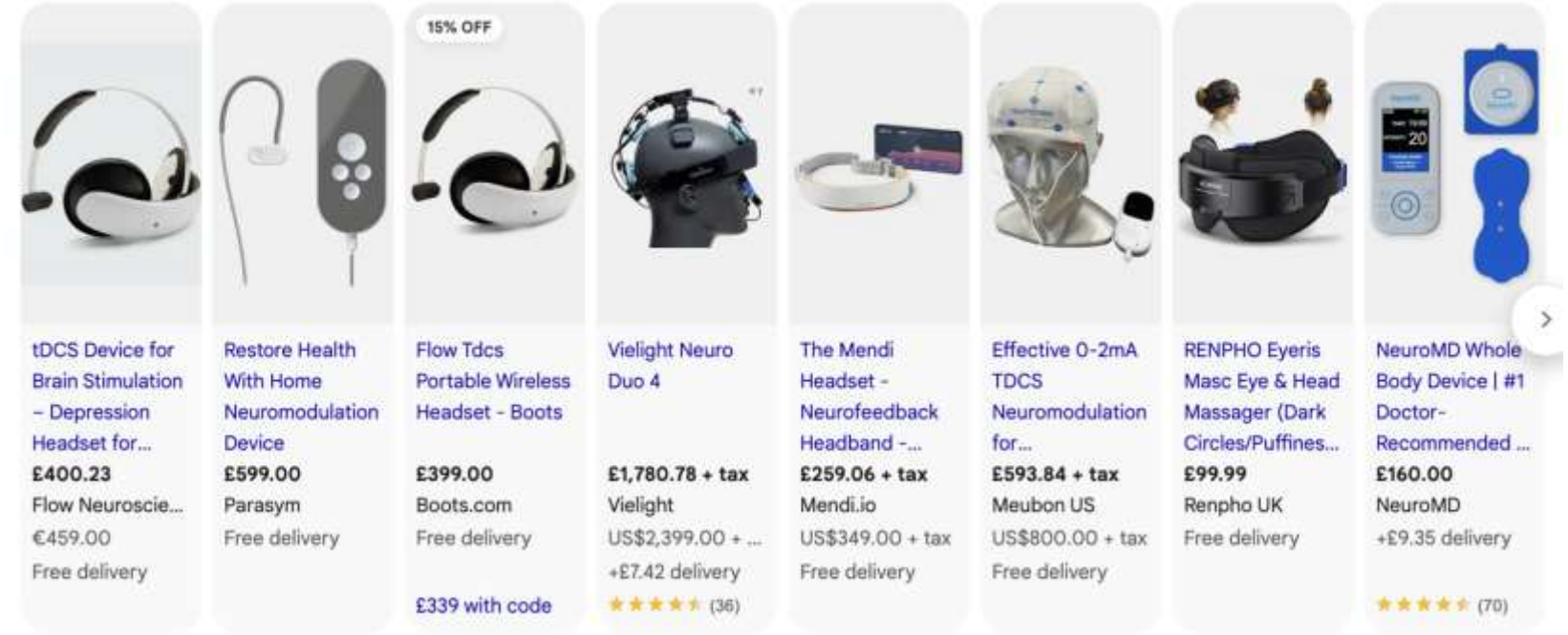

Adjusted mean value of Frontoparietal Connectivity
0.25
0.20
0.15
Training 1
Training 2
Test

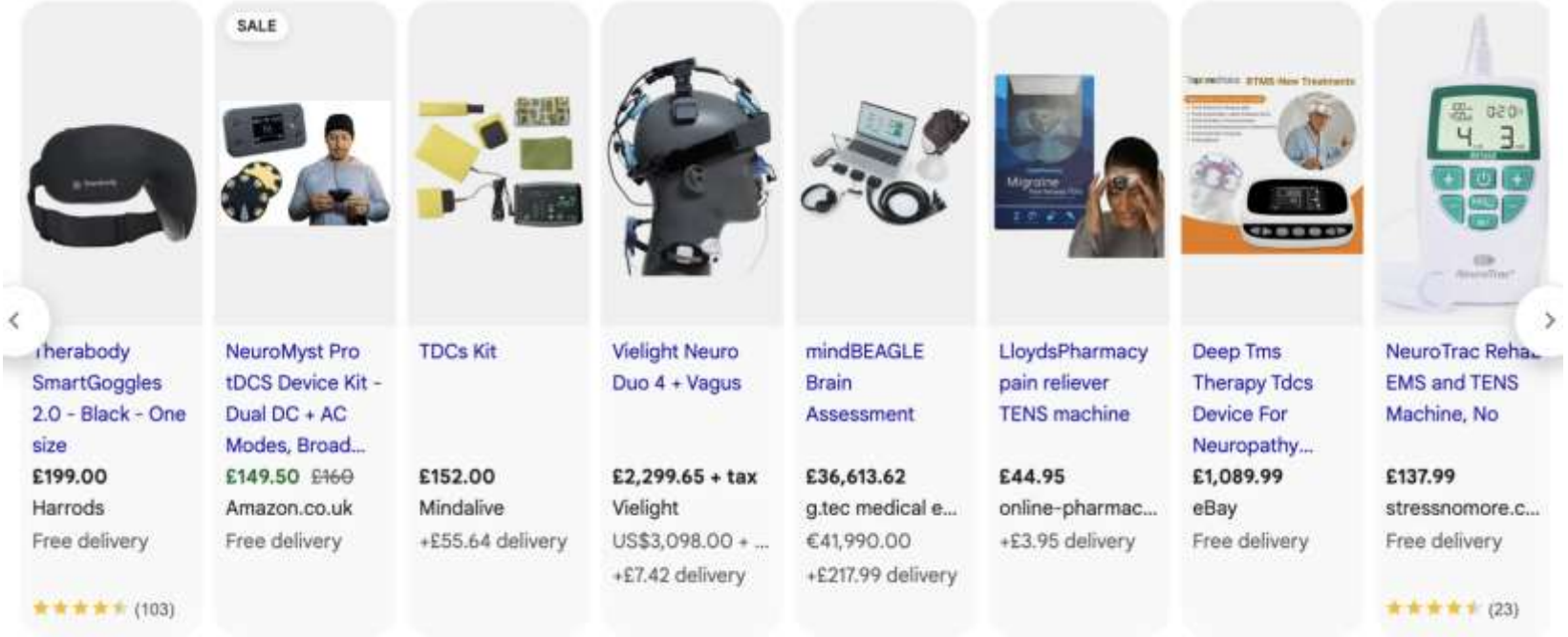

b. P
Accuracy - % Change
Control
Experimental
8
6
4
2
0
-2
-4
Training 1
Training 2
Test


Reaction Time - % Change
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
Training 1
Training 2
Test

Home-based Personalized tES







Personalized fMRI informed TMS Pipeline

a. Activate desired brain regions with a task

Behavioral change

Before

After

Structural MRI

+

Task-based fMRI

b. Find highly activated subcortical areas

Functional activity in response to the task

Desired task paradigm (e.g., drug cue reactivity)

c. Find cortico-subcortical circuit that modulate behavior

Defining cortical & subcortical seed

Physiological term: seed time series

Seed-to-whole brain PPI

Psychological term: task

PPI = seed time course x task

d. Find a significant cluster connected to the tolerable seed

Seed-to-whole brain PPI results

Negative Positive

Cortico-subcortical PPI connectivity

The most positive connectivity location for each person

Behavior

PPI strength

e. Optimization of the stimulation parameter

Location: based on a robust cluster

Orientation: based on maximal EF in individualized target

Intensity: based on harmonizing EF strength across the population

f. Comparing the simulation results with one-size-fits-all

Simulation results with optimized parameters

Simulation results with fixed parameters

Fp1

Fp2

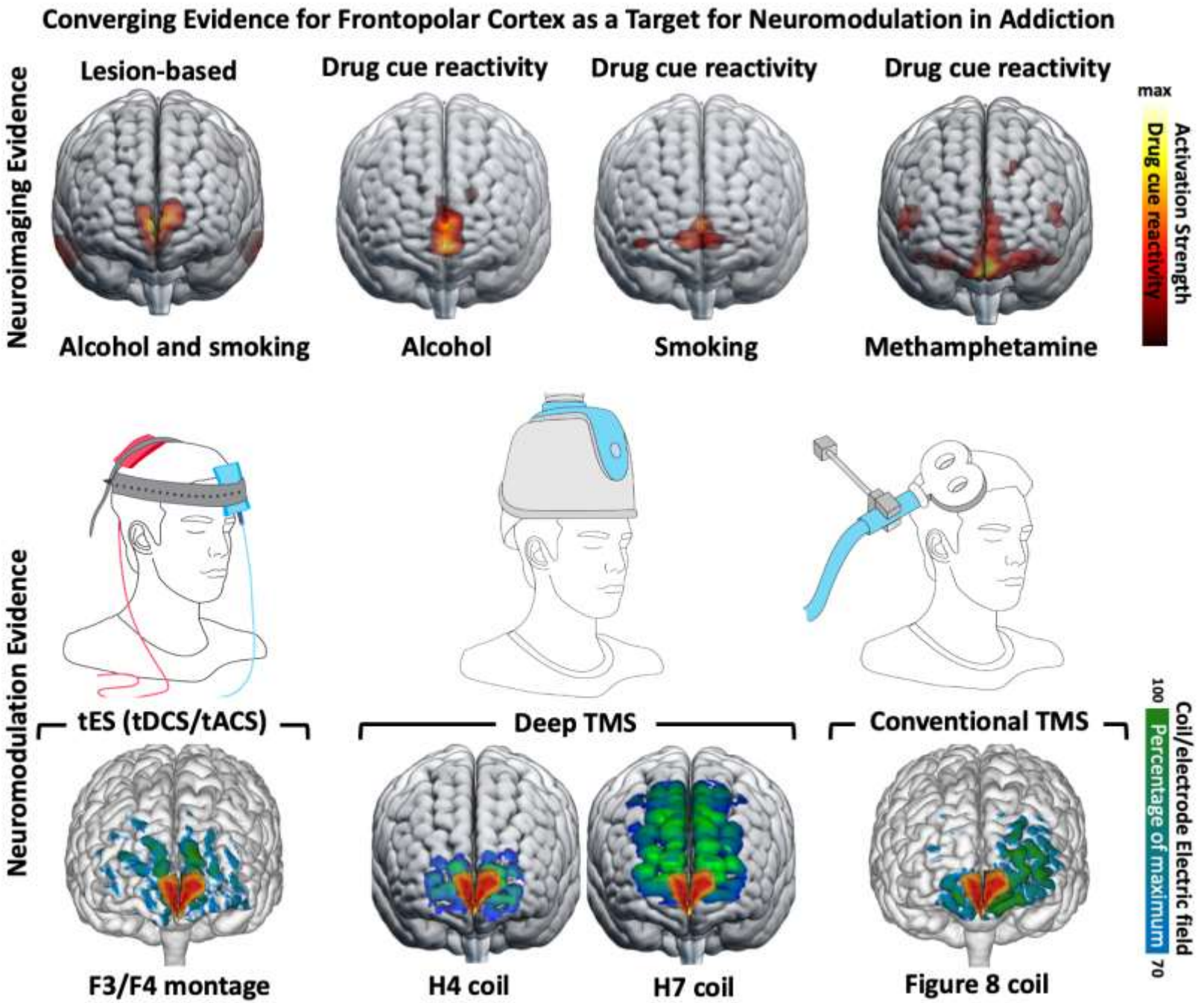
STIM-GUI

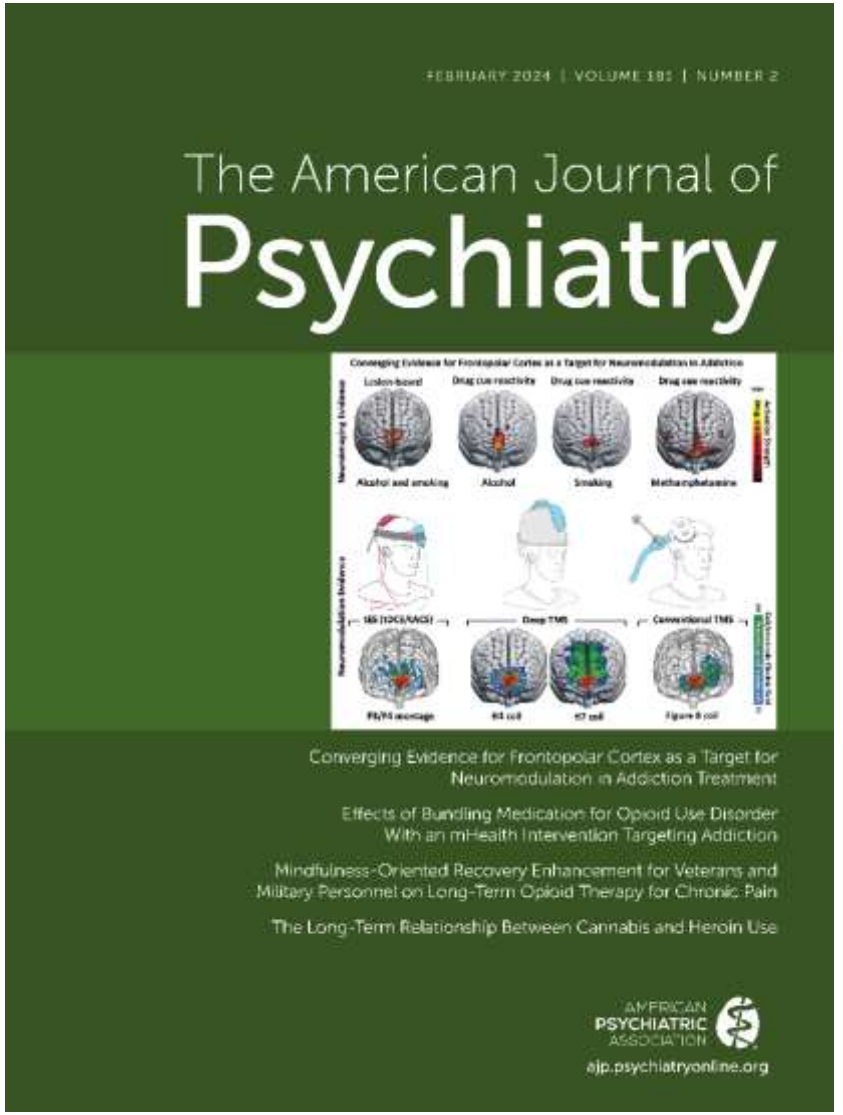




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https://github.com/SoleimaniGhazaleh/fmri-guided-TMS-GUI


Converging Evidence for Frontopolar Cortex as a Target for Neuromodulation in Addiction
Neuroimaging Evidence
Lesion-based
Drug cue reactivity
Drug cue reactivity
Drug cue reactivity
Alcohol and smoking
Alcohol
Smoking
Methamphetamine
max
Activation Strength
Drug cue reactivity
Neuromodulation Evidence
tES (tDCS/tACS)
Deep TMS
Conventional TMS
F3/F4 montage
H4 coil
H7 coil
Figure 8 coil
100
Coil/electrode Electric field
Percentage of maximum
70


FEBRUARY 2024 | VOLUME 181 | NUMBER 2
The American Journal of
Psychiatry
Converging Evidence for Frontopolar Cortex as a Target for Neuromodulation in Addiction Treatment
Effects of Bundling Medication for Opioid Use Disorder With an mHealth Intervention Targeting Addiction
Mindfulness-Oriented Recovery Enhancement for Veterans and Military Personnel on Long-Term Opioid Therapy for Chronic Pain
The Long-Term Relationship Between Cannabis and Heroin Use
AMERICAN PSYCHIATRIC ASSOCIATION
ajp.psychiatryonline.org

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Examples in the Field of Addiction Medicine

- **Discovery**:
  - Neuroscientists identified the **executive control network (ECN)** in the brain and its role in regulating drug craving.
- **Creativity**:
  - **Researchers proposed** that enhancing ECN connectivity might help people resist cravings when vulnerable.
- **Invention**:
  - Engineers developed **transcranial electrical stimulation (tES) devices** designed to boost ECN connectivity.
- **Innovation**:
  - **Clinicians implemented portable tES devices** for use during moments of craving when therapists are unavailable, helping prevent relapse or overdose in real-world settings.

Potential Fields of Innovative Solutions in Addiction Medicine

1. Biotechnology and Neuroscience Innovations

(Neurostimulation Devices), (Neurofeedback),
(Genetic & Epigenetic Predictive Tools)

Potential Fields of Innovative Solutions in Addiction Medicine

1. Biotechnology and Neuroscience Innovations
(Neurostimulation Devices), (Neurofeedback), (Genetic & Epigenetic Predictive Tools)

2. Pharmacological and Pharmaceutical Innovations
(Long-acting Medications), (Drug Delivery Systems), (Novel Withdrawal Management Medications), (Take-home Naloxone), (Personalized Pharmacotherapy)

3. Digital Health and Telemedicine
(Teletherapy & Telemedicine), (Apps for Recovery Support), (Wearable Technology), (AI-driven Chatbots)

4. Behavioral and Psychosocial Innovation
(CBT integration with AI), (Mindfulness & Meditation Apps), (Virtual Peer-support Networks)

5. Virtual Reality (VR) & Augmented Reality (AR)
(VR Exposure Therapy), (VR-based CBT), (AR for Skill Training)

6. Blockchain for Patient Data
(Secure Medical Records), (Smart Contracts for Treatment Compliance), (Blockchain for Addiction Recovery)

7. Cultural and Social Innovation
(Localized Recovery Models), (Community-Based Recovery), (Occupational Skills Training based on Market Needs), (Selecting Preventive Interventions)

8. Behavioral Economics & Incentive-Based Treatment
(Contingency Management Programs), (Cryptocurrency-Based Rewards)

9. Integrated Care Models
(Collaborative Care Platforms), (Incarceration Integrated Care), (Promoting Referrals for Addiction Treatment)

10. Workforce and Training Innovations
(Virtual Training for Healthcare Providers), (Interactive Certification and Education Platforms)





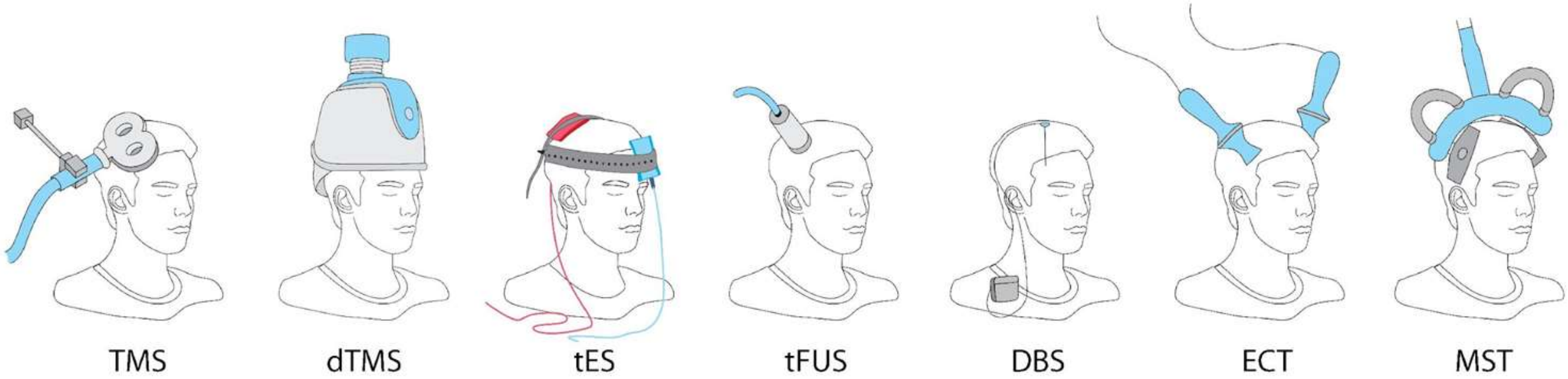
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Anton Basenko

(International Network of People Who Use Drugs (INPUD))

Role of People with Lived Experience in Driving Addiction Treatment Innovation

Community and Neuromodulation







One Flew Over the Cuckoo's Nest



“Nothing about us without us”



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Anton Basenko

(International Network of People Who Use Drugs (INPUD))
Role of People with Lived Experience in Driving Addiction Treatment Innovation



MIREN

Minnesota's Innovations in Recovery Network

A network of communities, caregivers, and neuroscience researchers working together to create and implement innovative roads to successful, sustained recovery

SCAN ME

Combatting Substance Use Disorders in Minnesota

Substance use disorders are a significant public health issue impacting millions across the U.S. According to the Minnesota Department of Human Services, approximately 290,000 Minnesotans are currently in need of treatment. Addressing this crisis requires innovative solutions to reduce its impact and to save lives. The Medical Discovery Team on Addiction (MDTA) at University of Minnesota brings together many resources in academia for Innovations in addiction therapeutics. With the launch of MiReN, MDTA is fostering collaboration between academia and communities throughout Minnesota, ensuring that voices of affected communities are front and center in developing new therapies. Our goal is to bring forces together from academia and community to form and accelerate the co-development and co-implementation of effective tools and technologies for assessing and treating addiction and its related conditions. By establishing a productive collaboration between addiction scientists, clinicians and researchers with community members, we aim to advance the development of new assessment methods, therapies, and interventions that are specifically designed to meet the unique needs and expectations of community members here in Minnesota.

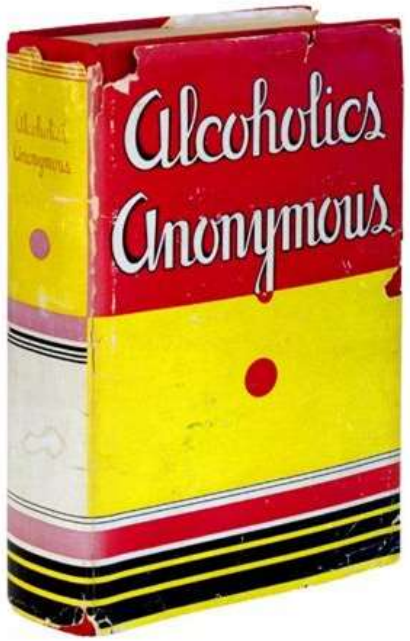
MINNESOTA'S INNOVATIONS IN RECOVERY NETWORK

MIREN

Network of Recovery Programs in Minnesota Partnering for Innovations in Addiction Therapeutics

INNOVATIONS • RECOVERY • COLLABORATION

Treatment Packages in Recovery Centers



- **Peer-support classic manuals (1930s–1950s)**
  - *Alcoholics Anonymous* (“Big Book”, first published 1939).
- **Behavioral/recovery models (1970s–1990s)**
  - Community Reinforcement / CRAFT (late 1970s).
  - Relapse Prevention / Marlatt model (1980s)
  - Motivational Interviewing (introduced 1983; first book 1991)
- **Manualized, evidence-based treatment manuals (1990s–2010s)**
  - *Seeking Safety* (manual for co-occurring PTSD and substance use), main manual published 2002.
  - *Matrix Model* (treatment for stimulant use) (2006).
- **Some manuals have newer editions, adaptations, or implementation packages.**

DEPARTMENT OF HUMAN SERVICES

Minnesota Department of Human Services:

Approximately 290,000 Minnesotans are currently in need of treatment for substance use disorders

In Minnesota, in 403 substance abuse treatment facilities, a total of 20,779 clients received substance abuse treatment in 2019

Needs define the “why”,
while discovery, creativity, invention, and innovation describe the “how” of moving knowledge into real-world solutions.

Major Areas of Needs for Innovative Solutions in Addiction Medicine

1. Early Identification & Preventive Screening
(Catch substance use risk factors and emerging problems early to prevent progression.)

2. Withdrawal Management & Craving Control
(Safe and effective tools (medications and devices) to help patients through detox and reduce cravings, preventing relapse.

3. Access to Comprehensive Treatment
(Easy, affordable, and timely access to services, including medication and device-based therapies.

4. Overdose Prevention & Harm Reduction
(Community strategies to reduce drug-induced toxicity, promote harm reduction and overdose deaths.

5. Integrated Mental Health & Addiction Care
(Address co-occurring psychiatric and substance use disorders together.)

6. Continuity of Care & Relapse Prevention
(Ongoing support after initial treatment to prevent relapse and support social reintegration.)

7. Stigma Reduction & Recovery-Friendly Communities
(Overcome stigma that prevents care-seeking and reintegration in various levels, i.e., patients, caregivers and treatment providers)

8. Family & Caregiver Support
(Families need education, resources, and coping strategies.)

9. Workforce & Training Enhancement
(More providers skilled in both psychosocial care and use of new medications/devices.)

10. Equity, Cultural, and Social Needs
(Care tailored to diverse populations and structural barriers while considering occupational skills training)

Co-Development of Brain Empowerment for Addiction Treatment (BEAT) Program with Recovery Communitie

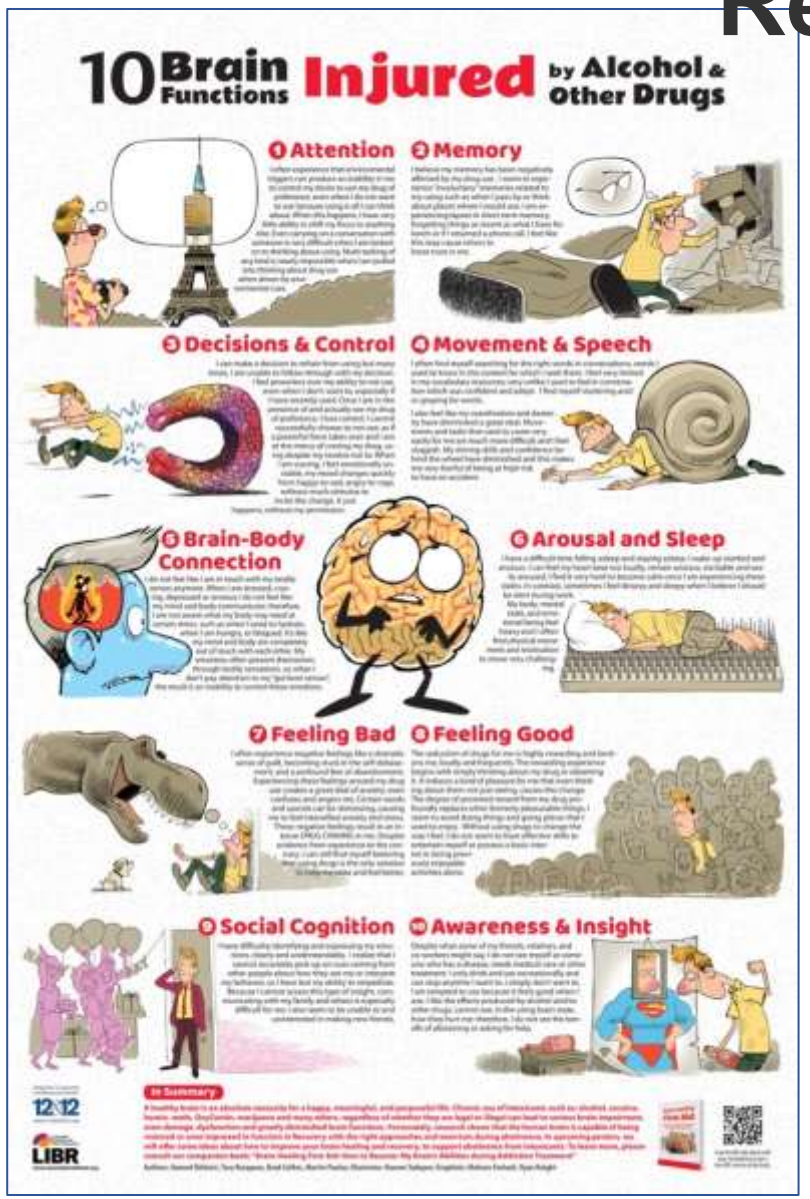
"Nothing about us without us"

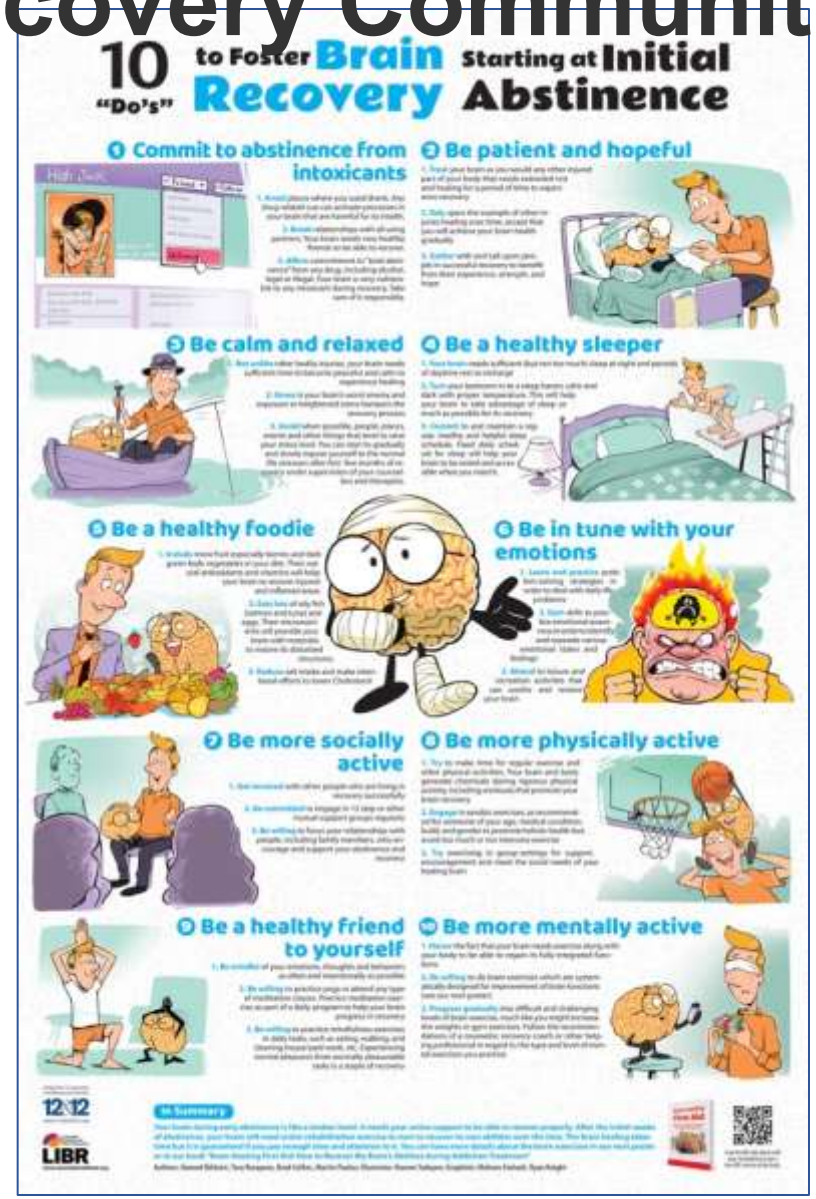


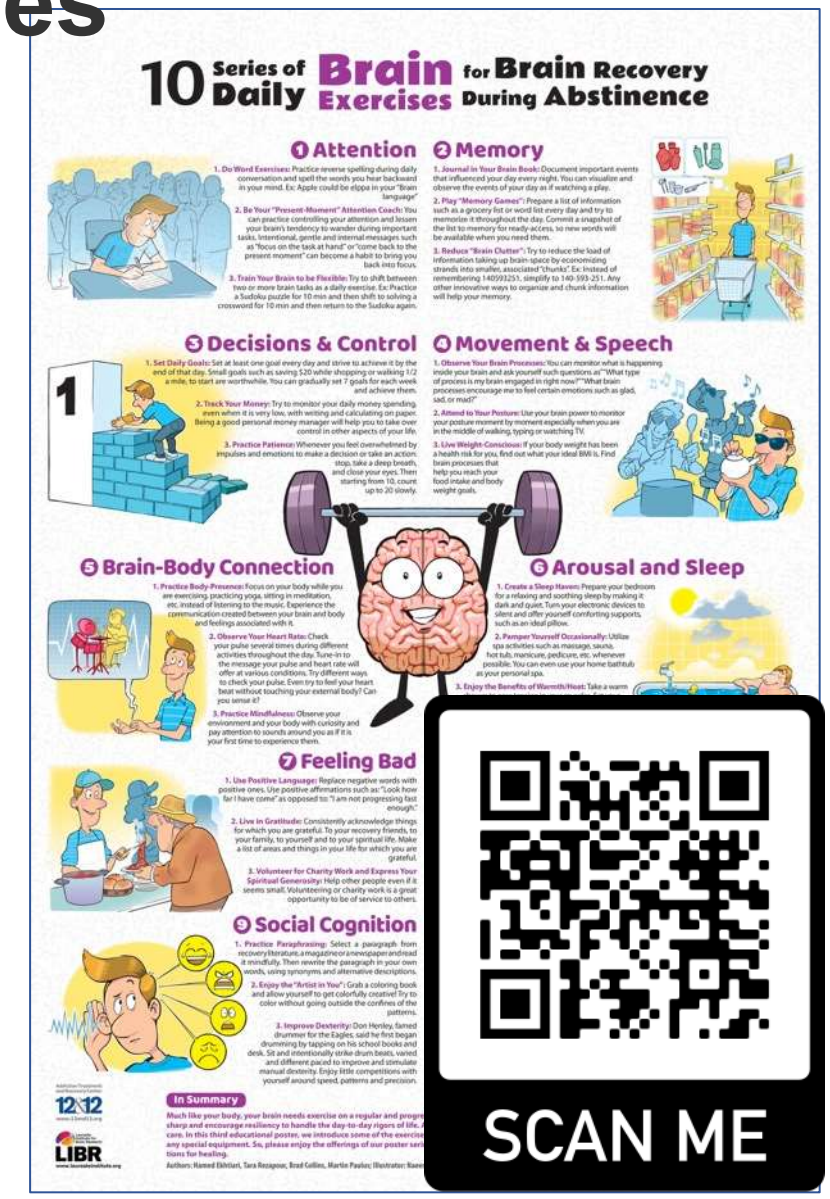
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Anton Basenko
(International Network of People Who Use Drugs (INPUD))
Role of People with Lived Experience in Driving Addiction Treatment Innovation

Co-Development of Brain Empowerment for Addiction Treatment (BEAT) Program with Recovery Communities







Co-Development of Brain Empowerment for Addiction Treatment (BEAT) Program with Recovery Communities







Co-Development of Brain Empowerment for Addiction Treatment (BEAT) Program with Recovery Communities

Arabic	Bulgarian	Chinese	Dutch
English	French	German	Hebrew
Hindi	Hungarian	Italian	Japanese
Kannada	Korean	Malay	Mongolian
Persian	Portuguese	Russian	Spanish

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Have you heard these terms?

- Machine learning
- Deep Learning
- ANN: Artificial Neural Networks
- LLM: Large Language Models
- Foundation Models
- Digital Twin Brains
- ChatGPT

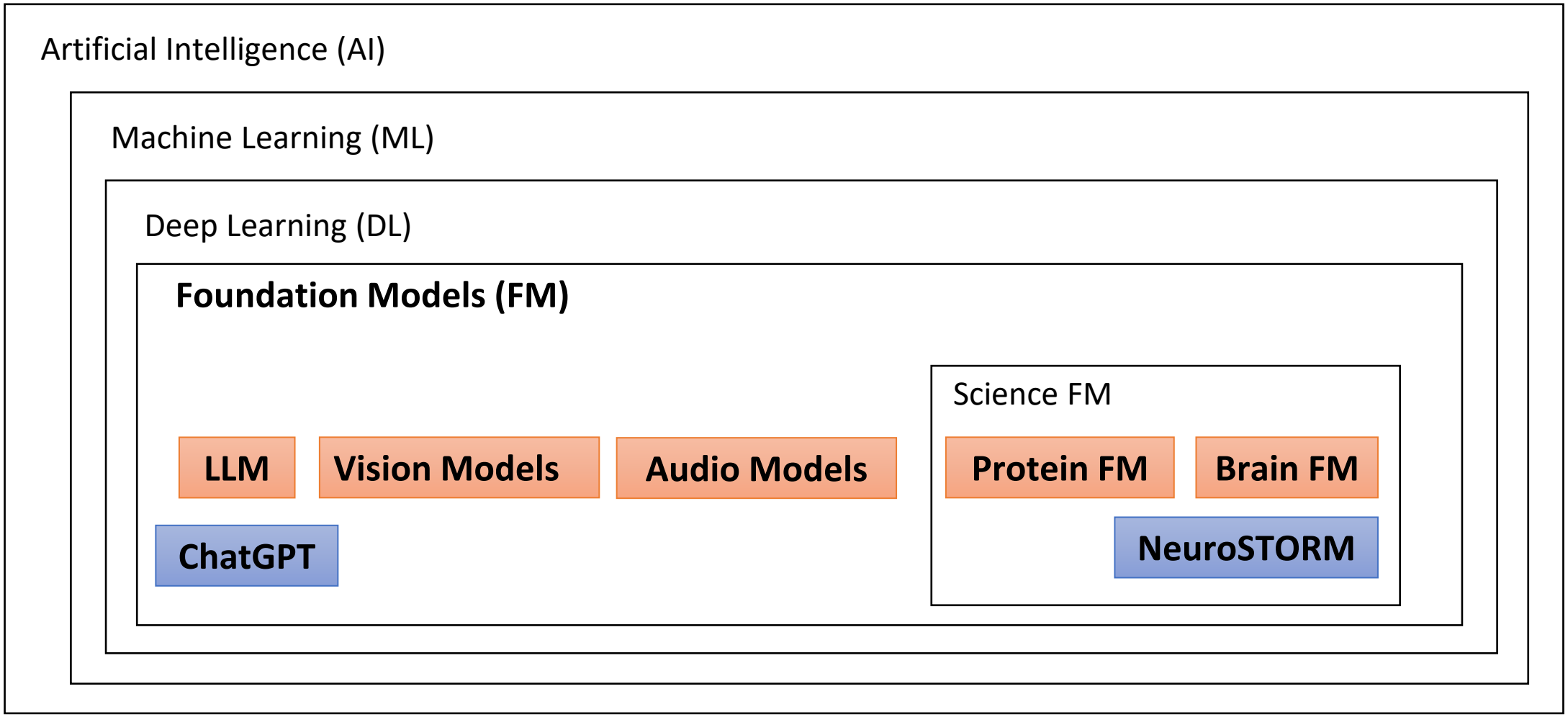


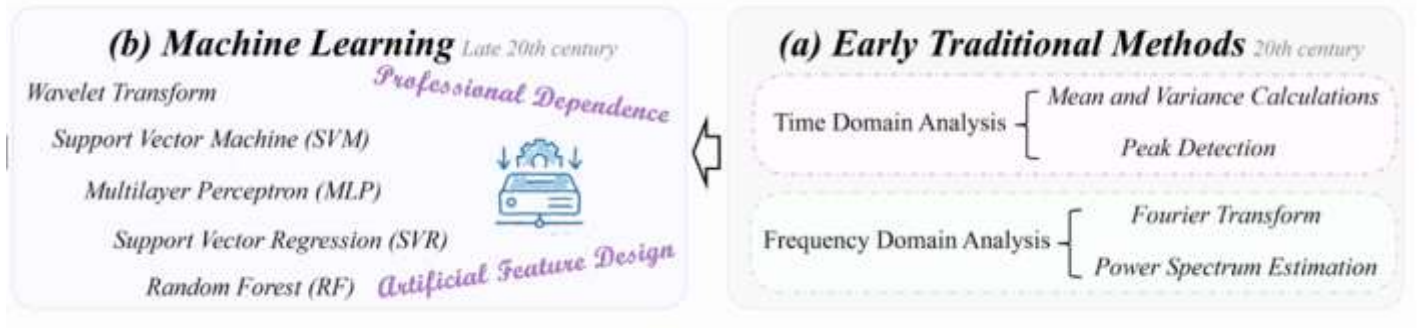
How these advances in AI will change the way we use Neuroimaging in Addiction Treatment?

Have you heard these terms?

Artificial Intelligence (AI)

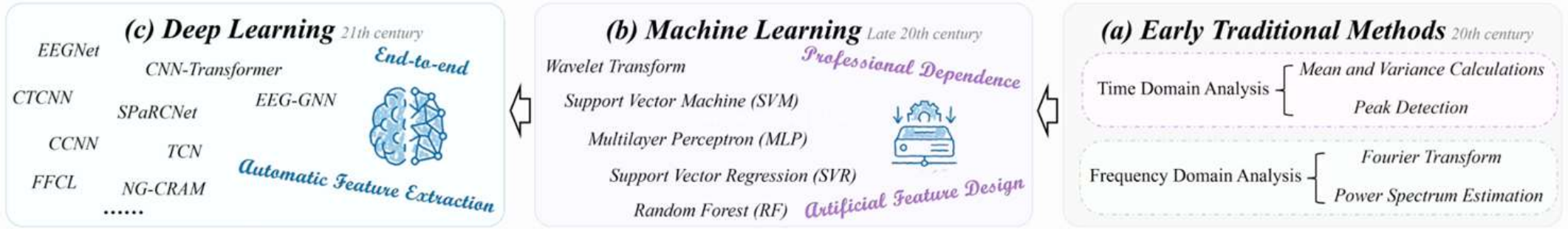
Have you heard these terms?





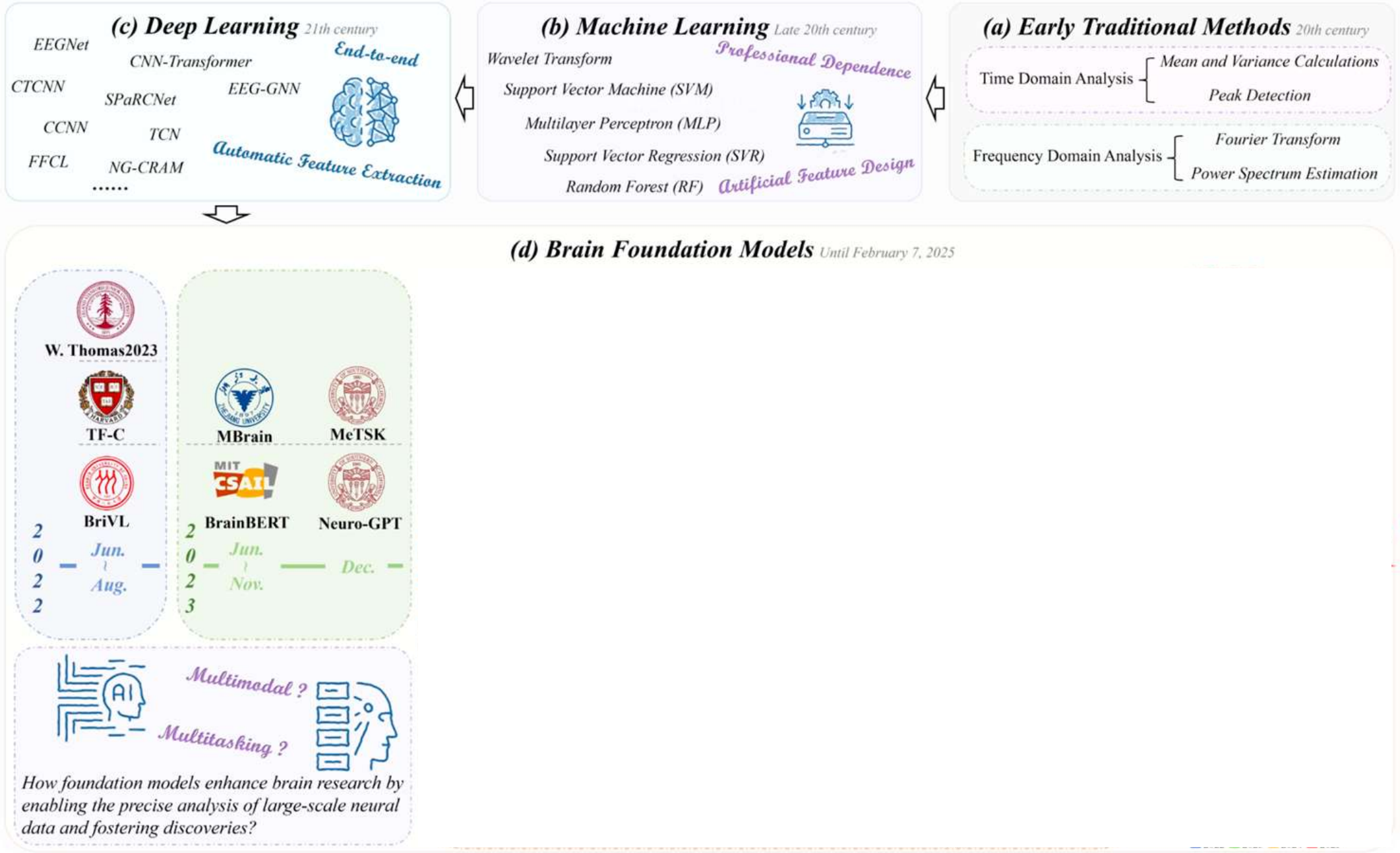
https://arxiv.org/abs/2503.00580

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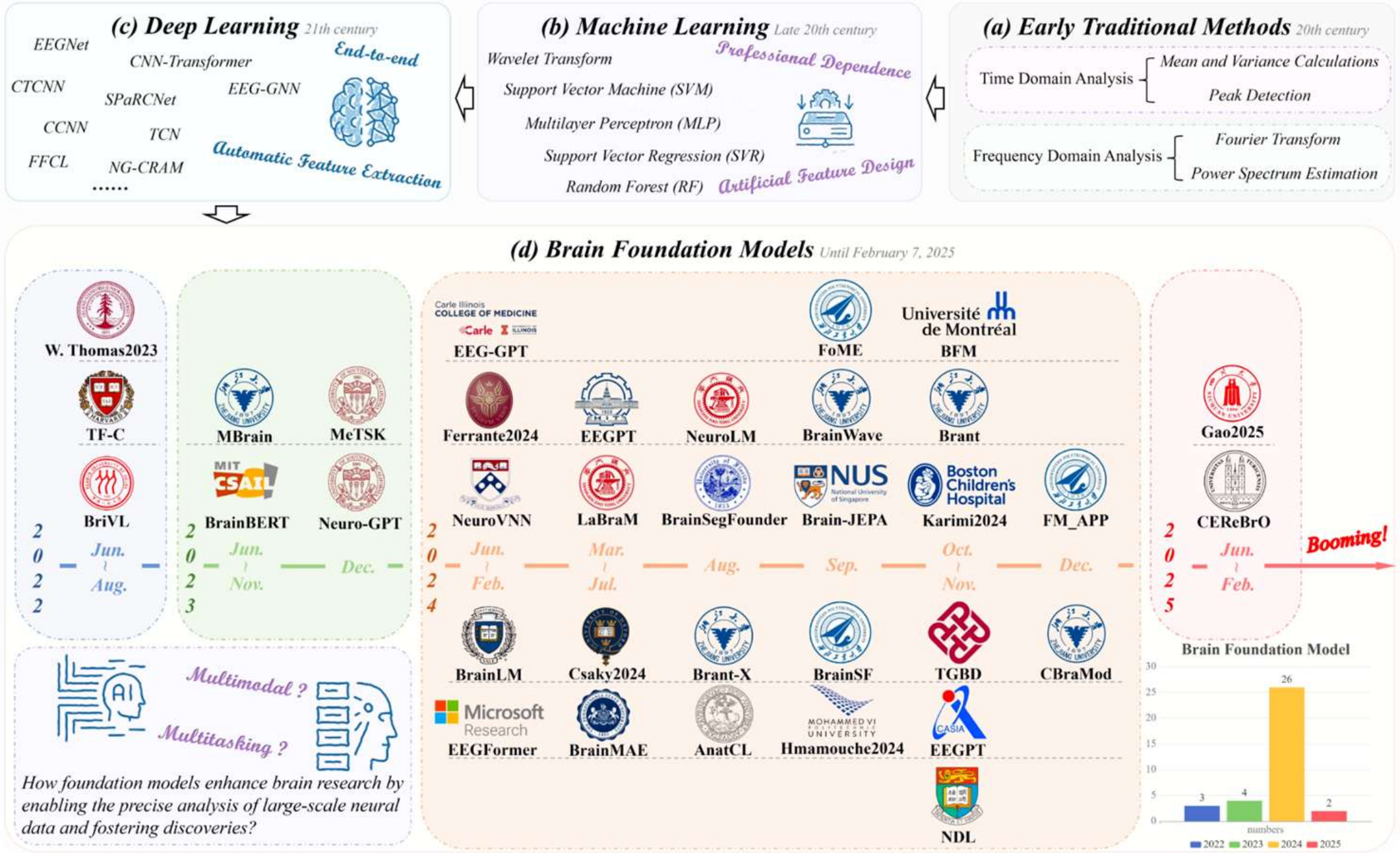
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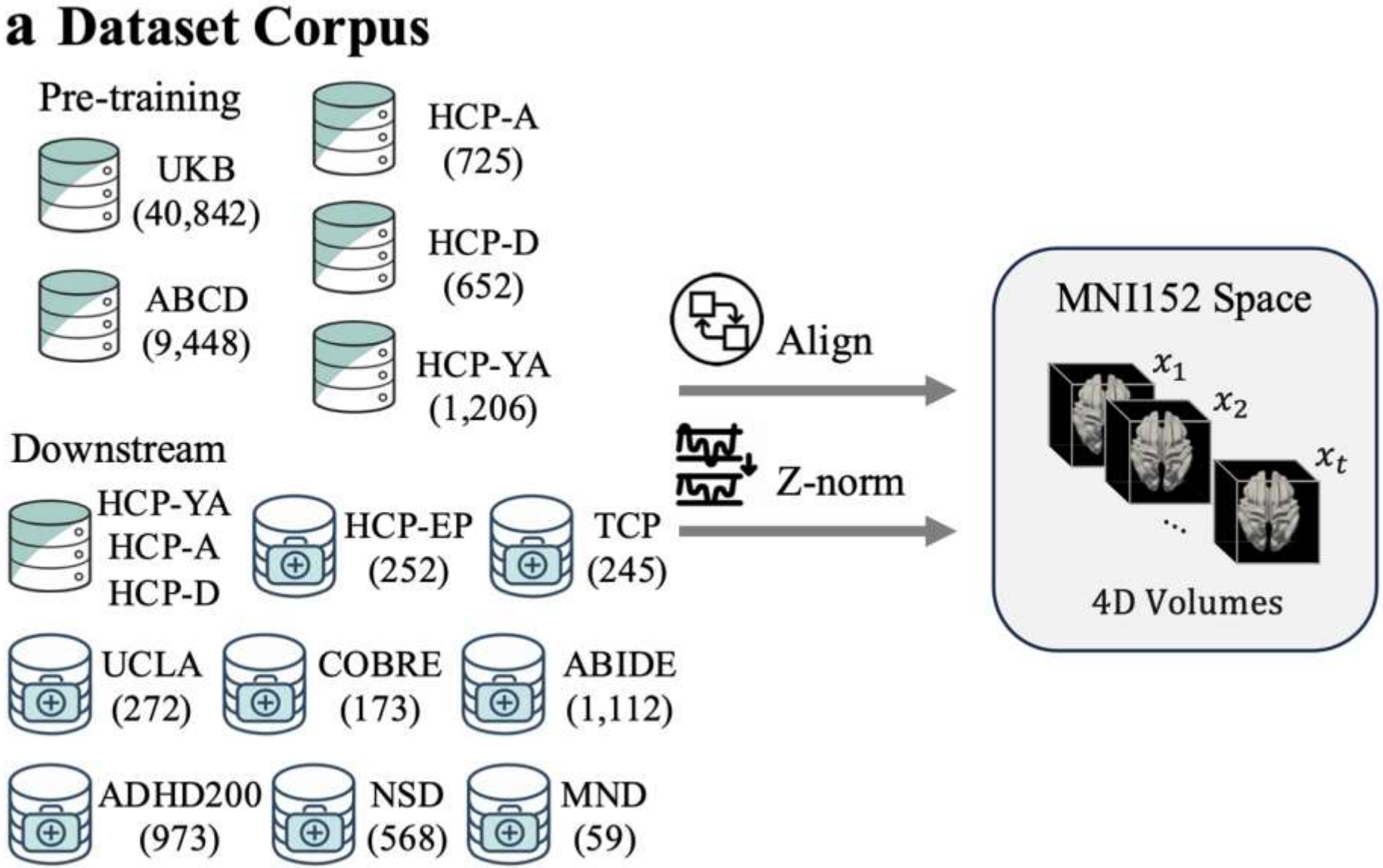


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NeuroSTORM

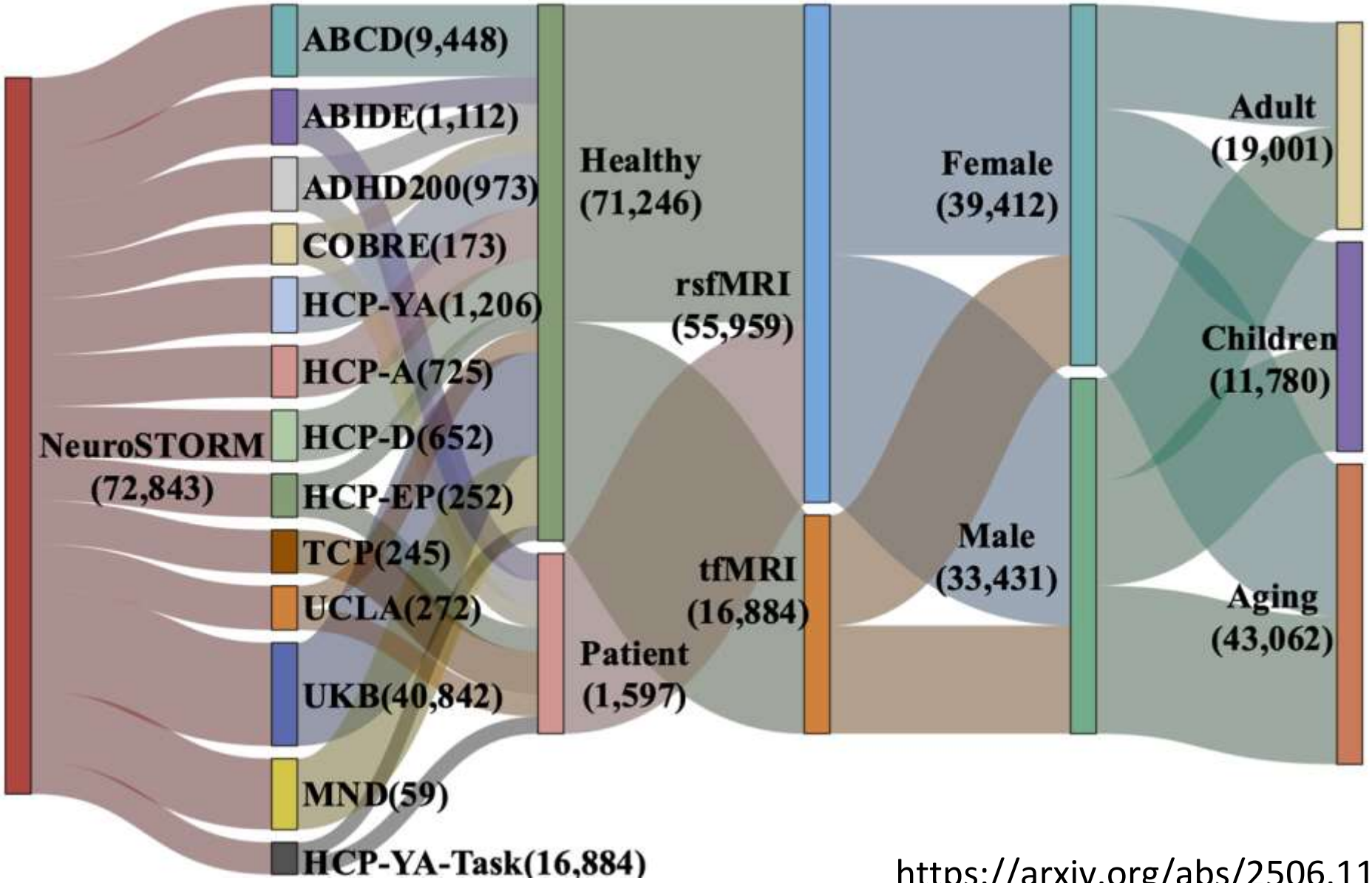
Neuroimaging Foundation Model with Spatial-Temporal Optimized and Rpresentation Modeling



https://arxiv.org/abs/2506.11167

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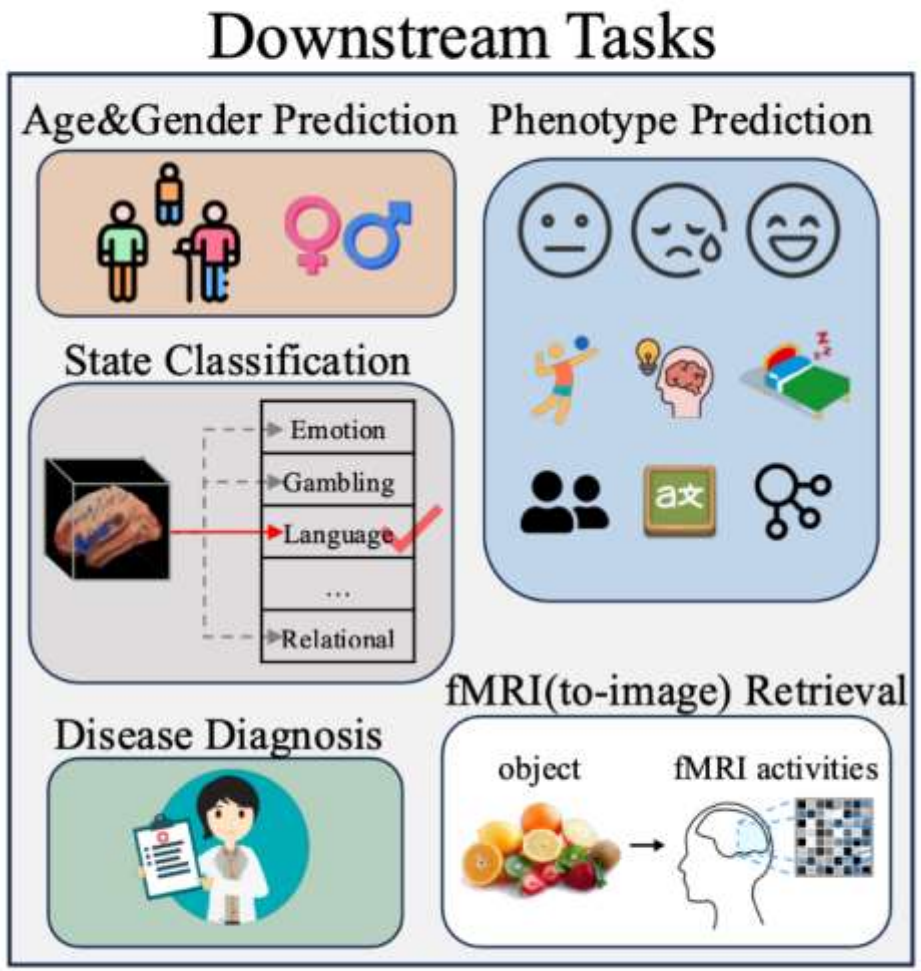
NeuroSTORM: Neuroimaging Foundation Model with Spatial-Temporal Optimized and Representation Modeling



https://arxiv.org/abs/2506.11167

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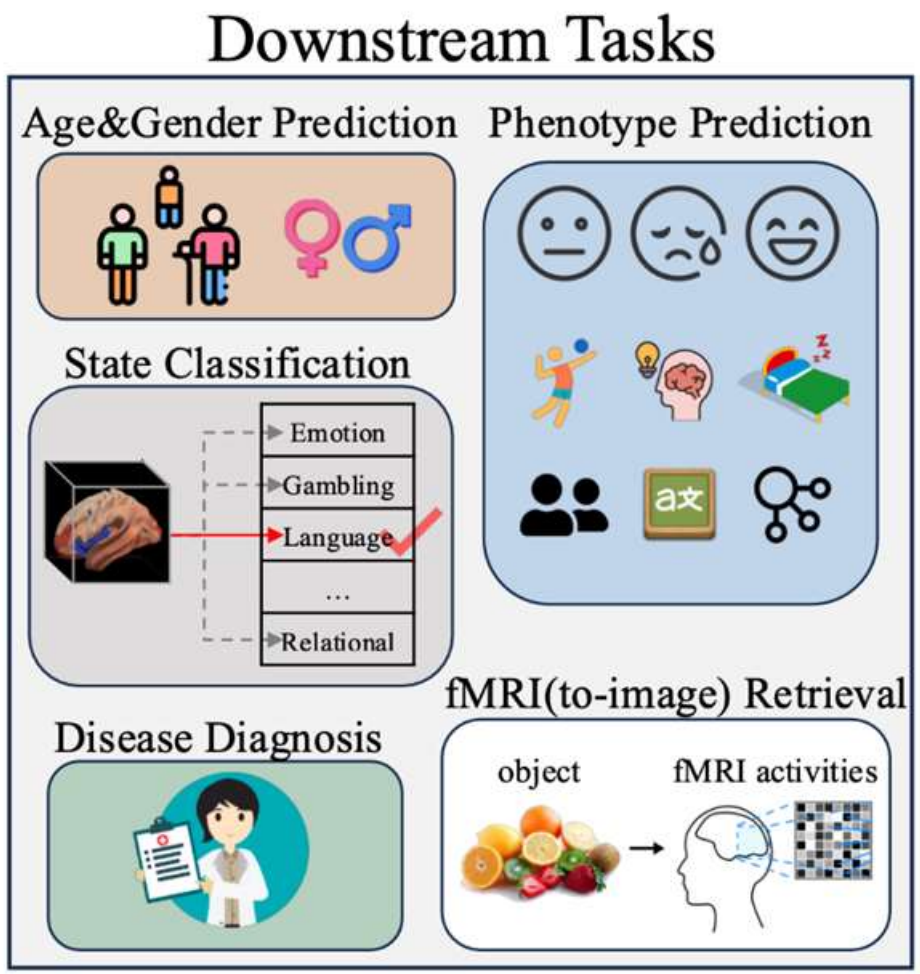
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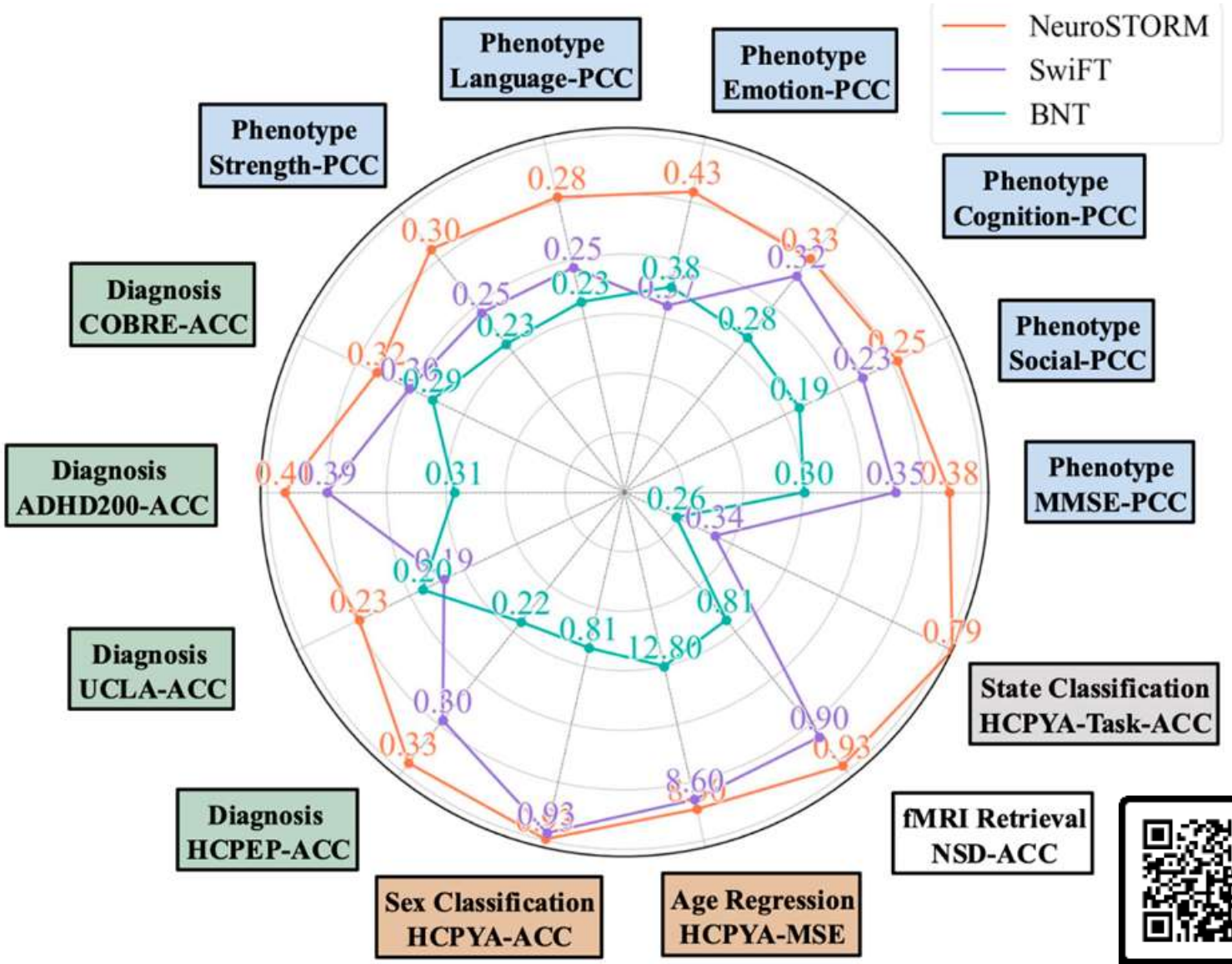


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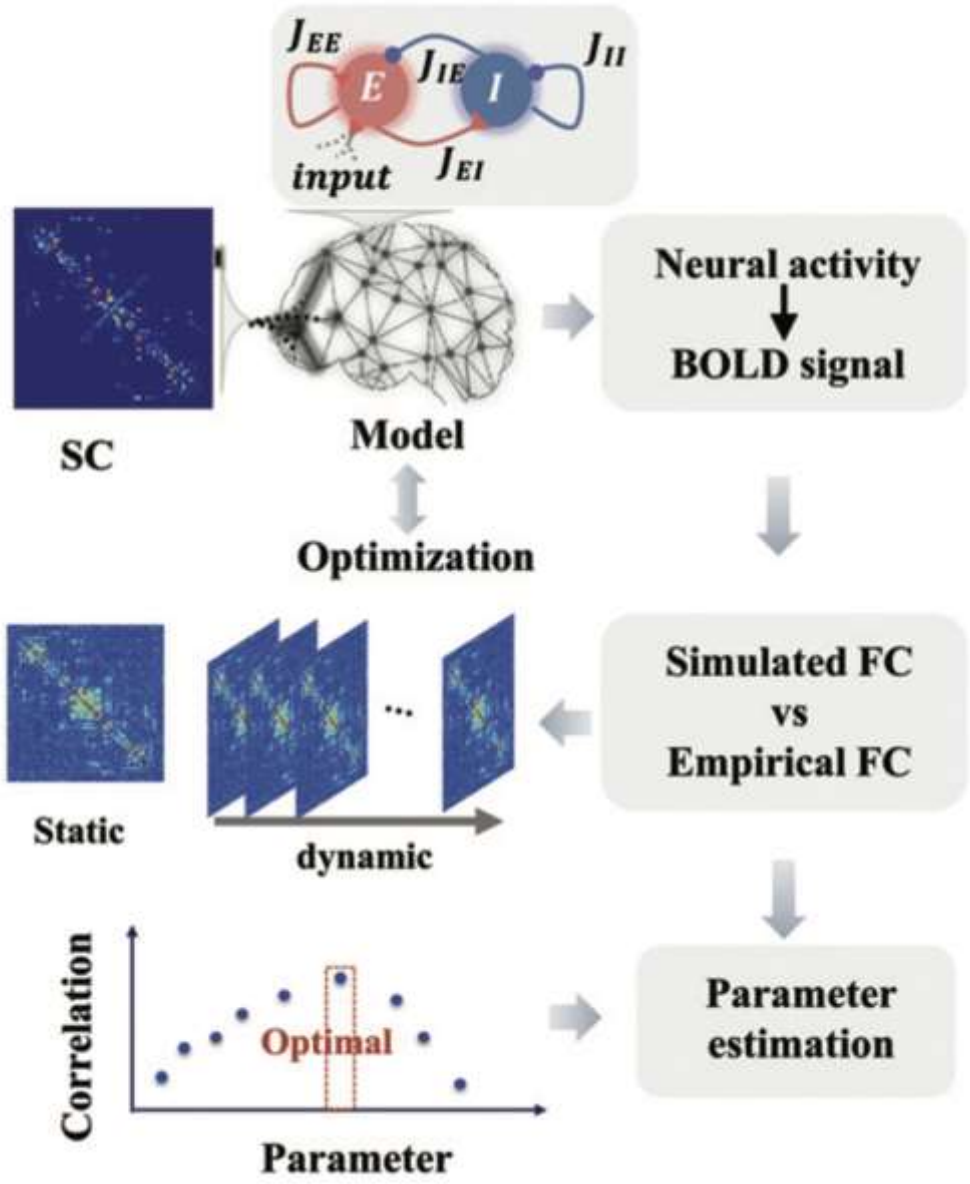
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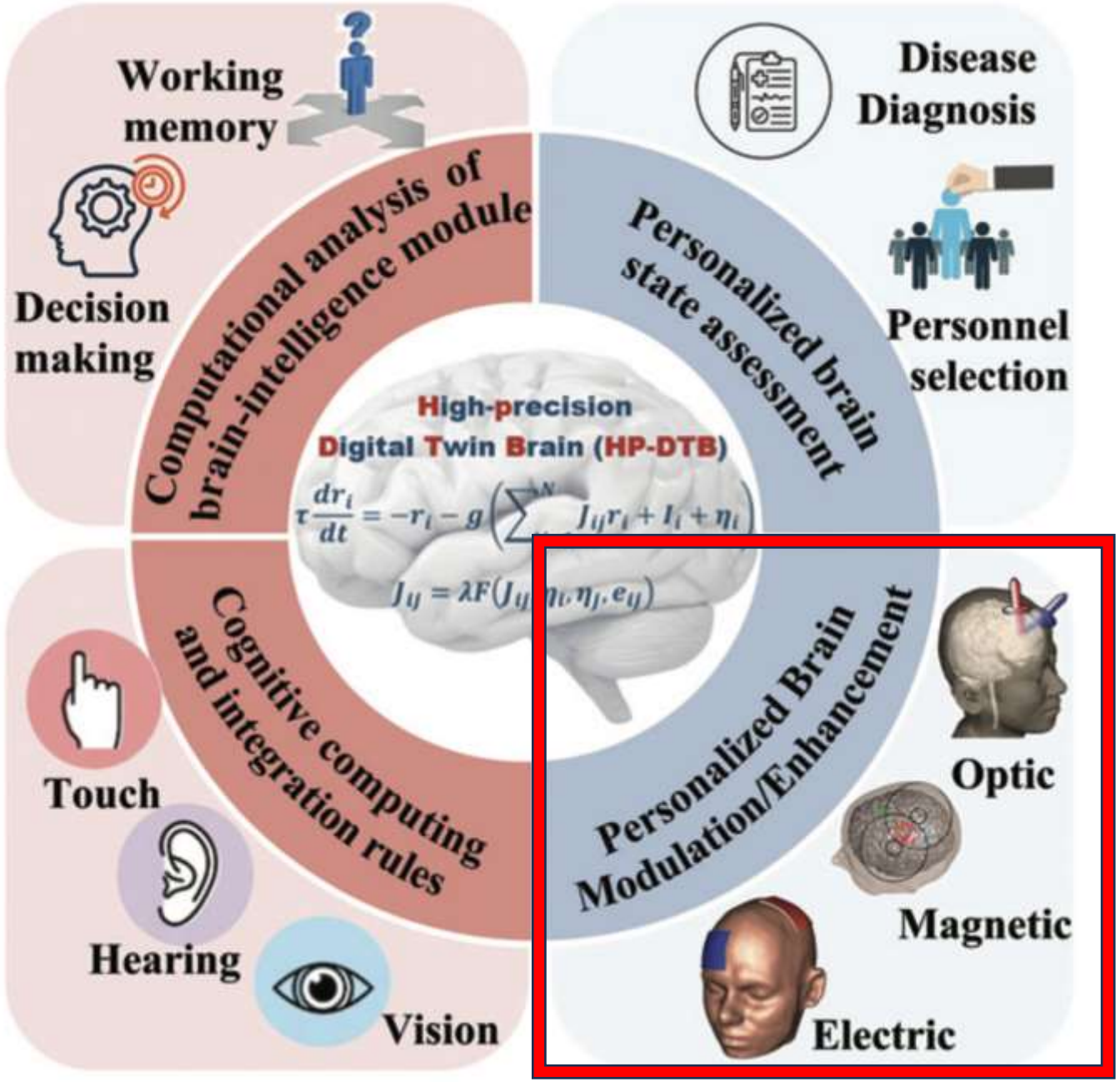
NeuroSTORM: Neuroimaging Foundation Model with Spatial-Temporal Optimized and Representation Modeling





Multi Level Data Fusion





(Guo, et al, 2025)

REVIEW ARTICLE Provisionally accepted The full-text will be published soon. Notify me

Front. Psychiatry | doi: 10.3389/fpsyt.2019.00877

A Roadmap for Integrating Neuroscience into Addiction Treatment: A Consensus of the Neuroscience Interest Group of the International Society of Addiction Medicine

 Antonio Verdejo-García[1*], Valentina Lorenzetti[2], Victoria Manning[3, 4], Hugh Piercy[3, 4],  Raimondo Bruno[5], Robert Hester[6], David Pennington[7],  Serenella Tolomeo[8], Shalini Arunogiri[3, 4],  Marsha E. Bates[9], Henrietta Bowden-Jones[10],  Salvatore Campanella[11], Stacey Daughters[12],  Christos Kouimtsidis[13], Dan I. Lubman[3],  Dieter J. Meyerhoff[14], Annaketurah Ralph[15],  Tara Rezapour[16], Hosna Tavakoli[16, 17], Mehran Zare-Bidoky[17, 18], Anna Zilverstand[19], J D. Steele[20],  Scott J. Moeller[21],  Alexander M. Baldacchino[8],  Martin P. Paulus[22] and  Hamed Ekhtiari[22]

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AUTHORS

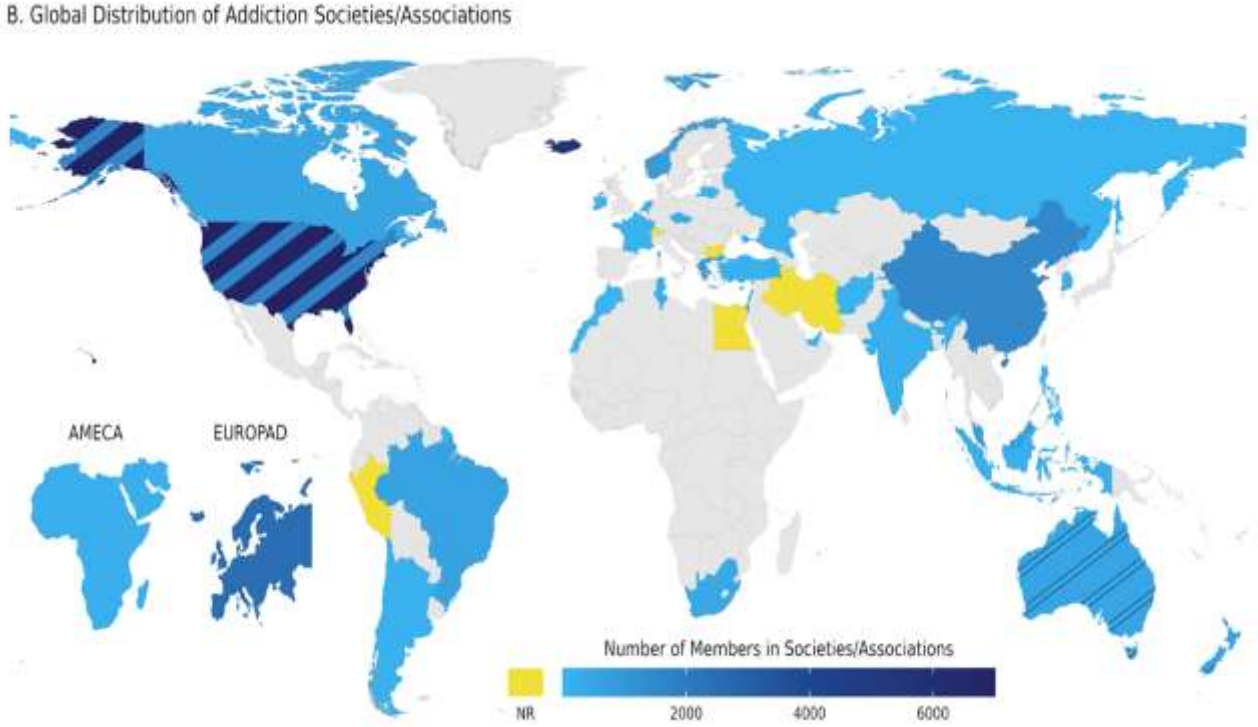
Hamed Ekhtiari, Arash Khojasteh Zonoozi, Parnian Rafei, Fateme Sadat Abolghasemi, Daniel Pemstein, Tarek A Gawad, Sophia Achab, Hamad Al Ghaferi, Mustafa Al'Absi, Michaël Bisch, Aldo A
Roshan Bhad, Kathleen Brady, Gregory Bunt, Anja Busse, Jenna Butner, Ahmad Danesh, Joseph El-Khoury, Fatima El Omari, Darius Jokūbonis, Cornelis De Jong, Geert Dom, Mohsen Ebrahimi,
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AUTHOR ASSERTIONS

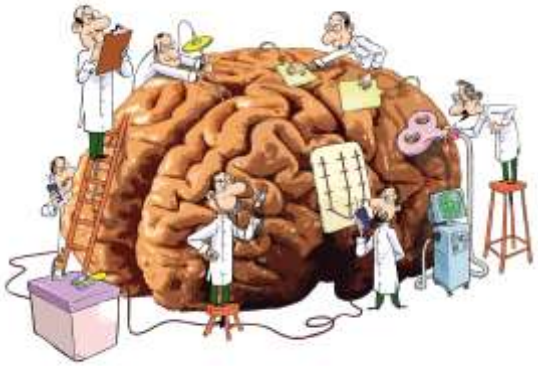
Conflict of Interest: No ▾ Public Data: Not applicable ▾ Preregistration: Not applicable ▾

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Take Home Notes



1. **Discovery–creativity–invention–innovation** chain
2. **Addiction Neuroscience** in discovery–creativity–invention–innovation
3. Gaps and **Needs** to start Innovations
4. **Needs define the “why”**
5. Discovery, creativity, invention, and innovation describe the “how”
6. Huge gaps and needs in addiction medicine
7. Voices to be heard: Talk to Stakeholders
8. People with Lived or Living Experience: *“Nothing about us without us”*
9. Co-Innovation and Co-Development
10. Great Opportunities to Make Impacts

My Slides

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My Slides

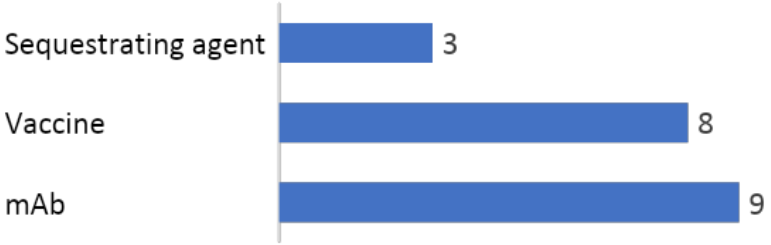
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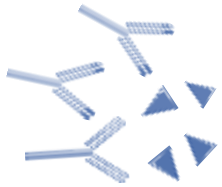
Needs define the "why",
while discovery, creativity, invention, and innovation describe the "how" of moving knowledge into real-world solutions.

- **Community needs are the anchor and driver**: They identify the *real problems* people face (e.g., relapse risk when craving is high but no therapist is available).
- **Discovery** can be guided by these needs (scientists may explore brain networks precisely because addiction is such a burden), but sometimes discovery happens first and the need later "pulls" it into relevance.
- **Creativity** translates the gap between what's known (discovery) and what's needed (problem in the community) into potential ideas.
- **Invention** responds to the need by turning those ideas into tangible solutions (e.g., tES devices).
- **Innovation** ensures those solutions are *implemented in the community* in ways that actually reduce harm, improve access, or change outcomes.

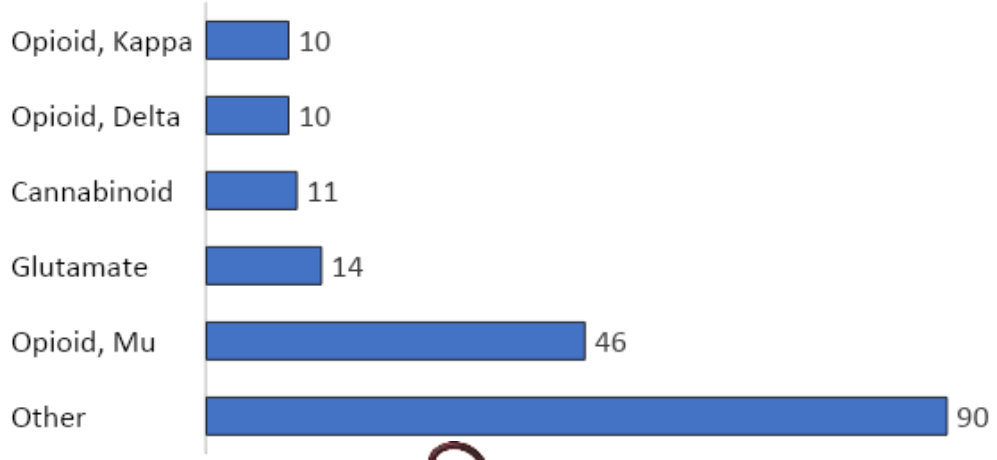
Innovative Molecular Targets for Opioid Use Disorder

1. Substance Targeting Agents

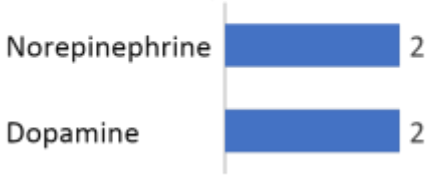




2. Receptors



3. Transporters



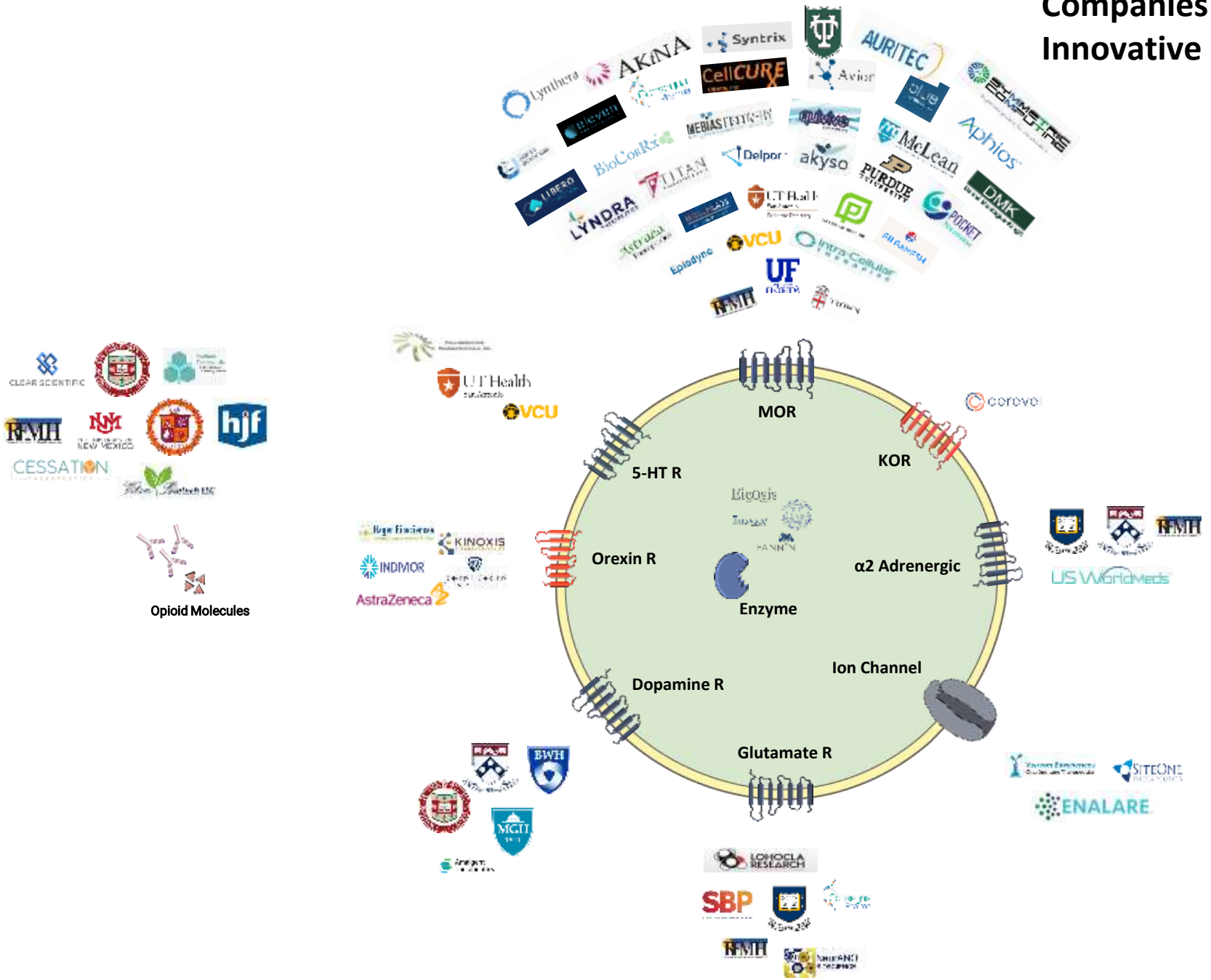
4. Channels



5. Enzymes

Enzyme

Companies Involved with Innovative Molecular Targets for Opioid Use Disord




ISAM Global ADDICTION THERAPEUTICS
INNOVATION DAY 2026
September 30th, 2026
ROTTERDAM, THE NETHERLANDS
Featuring INNOVATION AWARD
(The Golden Brain) for the most innovative idea
in Addiction Medicine Therapeutics and Diagnostics
Award applications will start in 1 March 2026
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ISAM Global ADDICTION THERAPEUTICS INNOVATION DAY
Innovation Day for Addiction Therapeutics
25 May 2025
Hamburg, Germany
Keynote Speakers
Hamad Al Ghafri (ISAM President)
Anja Busse (WHO)
Alta DeRoo (Hazelden Betty Ford Foundation)
Hamed Ekhtiari (University of Minnesota)
Mehdi Farrokhnia (NIDA)
Marica Ferri (EUDA)
Andrew Huhn (Johns Hopkins University)
Erinn Melville (Office for Life Sciences, UK)
Supriya Munshaw (Johns Hopkins University)
Marco Pravetoni (University of Washington)
Shekar Shetty (Clear Scientific)
Sanita Suhartono (UNODC)
Antonio Verdejo-Garcia (Monash University)
Valerie Voon (University of Cambridge)
Min Zhao (Shanghai Jiao Tong University)
Sponsors:
SceneRay
INDIVIOR
Ethypharm
Salofa
SPARK BIOMEDICAL
Co-organizers:
EUDA EUROPEAN UNION DRUGS AGENCY
UK Office for Life Sciences
UNIVERSITY OF MINNESOTA
Medical Discovery Team on Addiction

The Agenda Outline

ISAM Global ADDICTION THERAPEUTICS INNOVATION **DAY**

PANEL 1	PANEL 2	INDUSRY TALKS	PANEL 3	INNOVATION AWARD	PANEL 4
>>>	>>>	>>>	>>>	>>>	
08:15-09:45	10:15-11:30	11:30-12:30	13:30-15:00	15:00-16:00	16:30-17:45
		SceneRay INDIVIOR Ethypharm SPARK BIOMEDICAL Salofa			
Global Needs For Innovation	**Innovations in Molecular Targets**		**Innovations in Circuit & Behavioral Targets**		**Industry-Academia Partnership in the Global Level**