Non-Invasive Brain Stimulation

Non-Medical and Investigational Uses

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Disclosures / COI
Nil

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Categorical

Transcranial *magnetic* and *electrical* stimulation can effectively activate the living human brain

Murky

How this can be leveraged for adaptive & durable neuromodulation
Evolution of NIBS societal cognizance

Brain stim \( \uparrow \) function (Research)

Mass media

Investment: financial & intellectual

Start-up companies, marketing

NIBS: Non-medical applications  D.J. Edwards
**NIBS methods snapshot**

**TMS**
- Very brief, high-intensity magnetic pulses (each < 0.005sec duration)

**TES**
- Constant very low-intensity electric current (10-30 mins duration)
Principal reason for escalating NIBS use

*putative benefit of enhancing human brain function & performance*

**Broad Categories of Use**

*Military Performance*

*Recreation & e-sports (gaming)*

*Athletic & Sports*

*School / Occupational*
Performance enhancement across the ability spectrum

% population

patient  normal adult  elite

LOW  Performance  HIGH
What is features of human performance to enhance?
Perception & learning: Military threats and VR

Clark et al, 2013
Clark et al, 2013
Perception & fatigue: Temporal cortex tDCS and maximal elite cycling performance

Okano et al, 2013
Figure 2  Heart rates at the different power outputs during the maximal incremental cycling test with either anodal or sham transcranial direct current stimulation. *p<0.05.

Okano et al, 2013
Okano et al, 2013
Outlook and recommendations

1. Define NIBS ✓

2. Describe scope of use:
   *Who is using it, where are they using it, how are they using it?*

3. Quality control:
   *User: training required or detailed instructions, remote monitoring/internet logging*
   *Device: safety requirements, servicing*

4. Which facet of NIBS use in the healthy population should IOM recommend to further investigate?