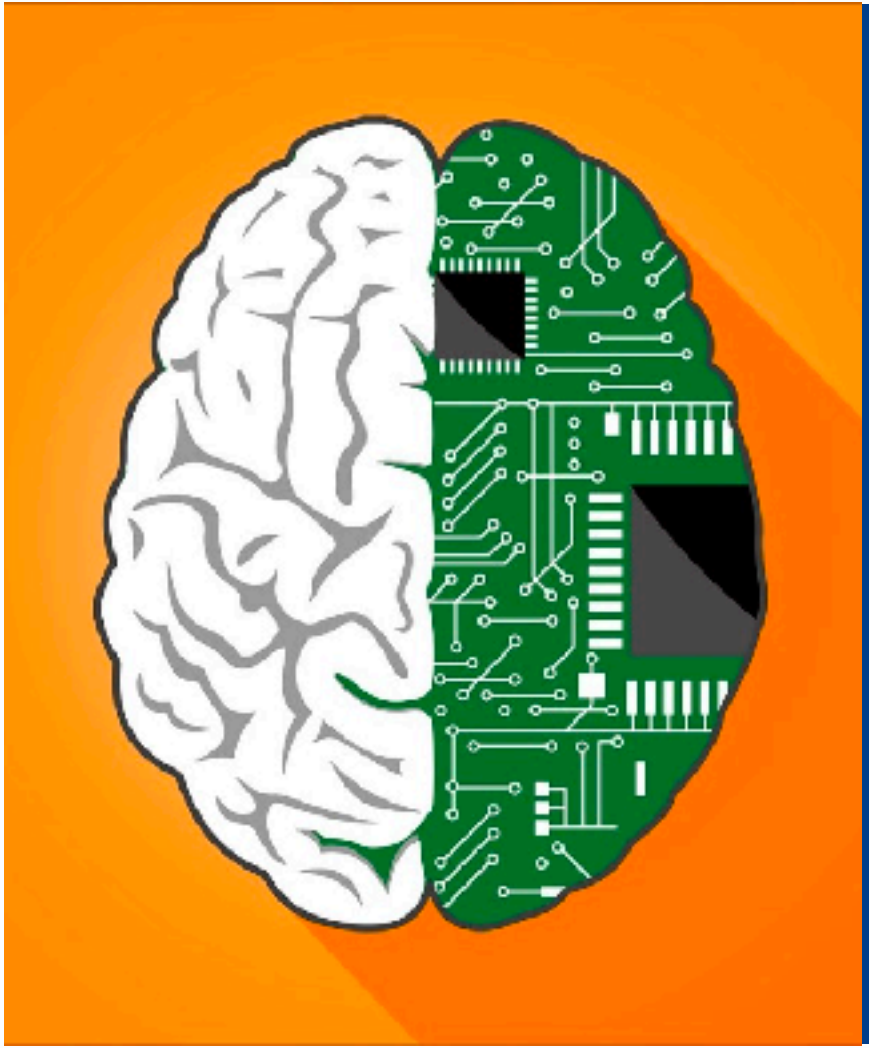
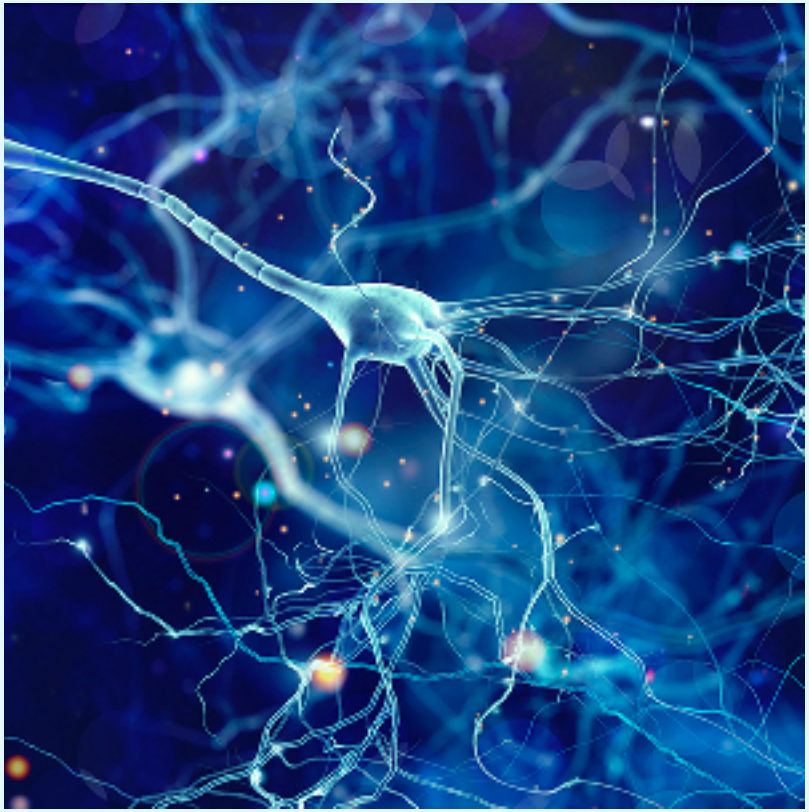


UNIVERSITY OF CAMBRIDGE

NEUROBIOLOGICAL FOUNDATION OF PLASTICITY

# What does neurotechnology do to the brain?

Tamar Makin
MRC Cognition and Brain Sciences Unit



Neurotechnology refers to techniques and devices that:

interface with the nervous system to monitor, modulate, or augment its activity and function

GPT 5

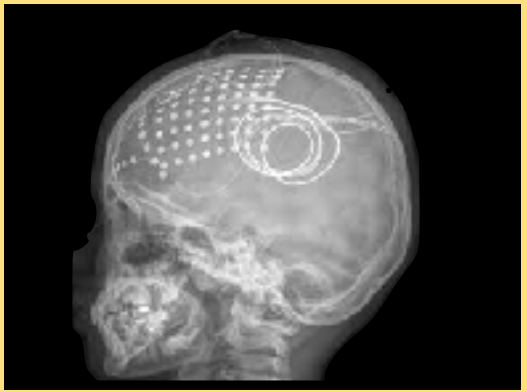
# Recording the brain?

**functional MRI**

blood oxigination rations

**EEG**

scalp voltage fluctuations



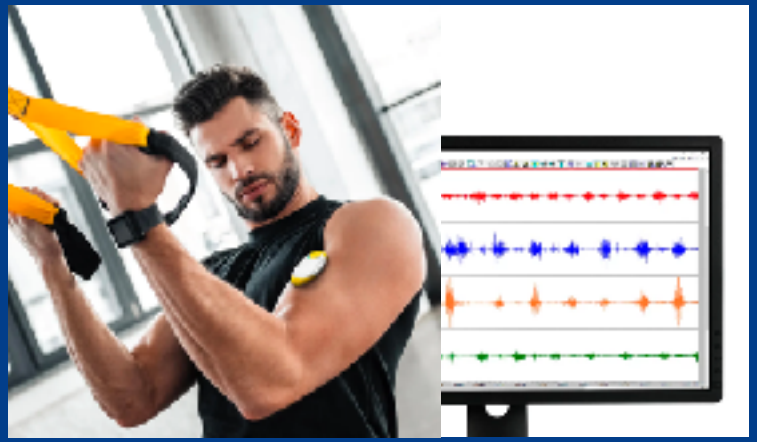
**eCOG**

Local field potentials

# Recording the brain?

01

EMG YES



02

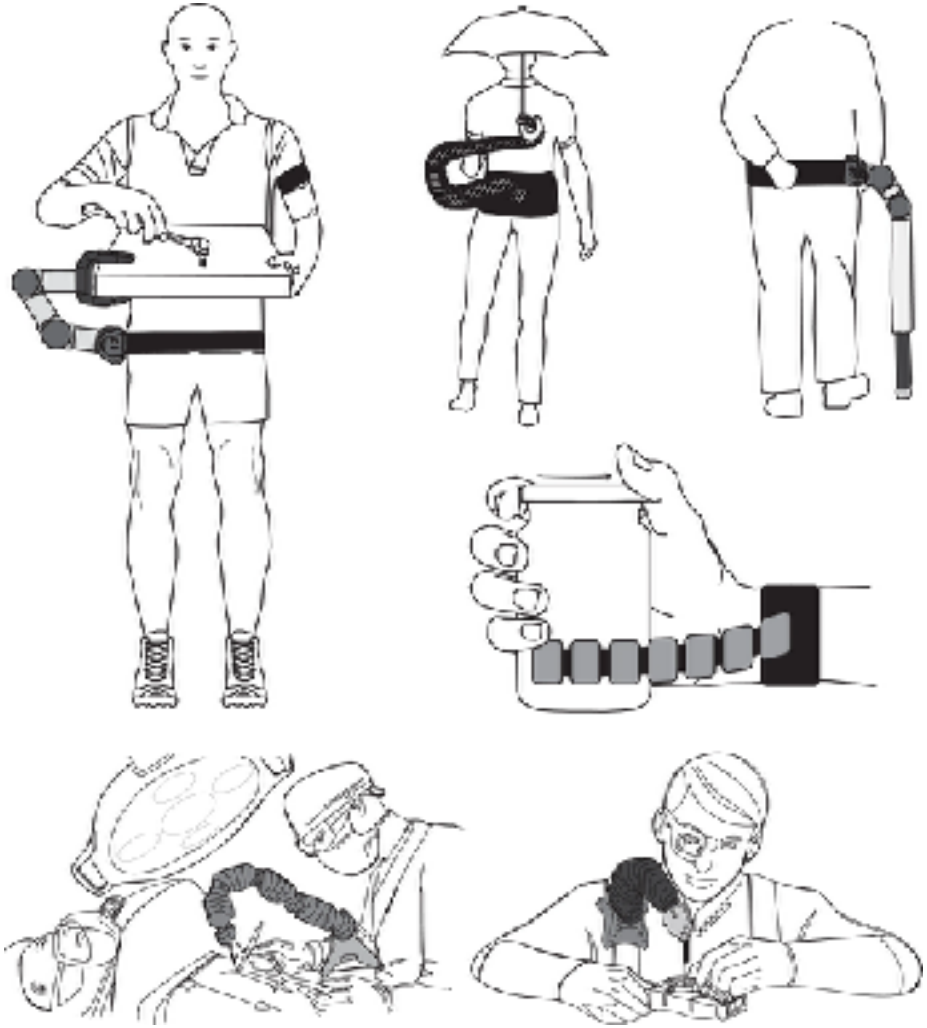
EYE MOVEMENTS NO

DANI CLODE DESIGN

# THE THIRD THUMB BY DANI CLODE

i: @dani_clode
w: daniclode.com

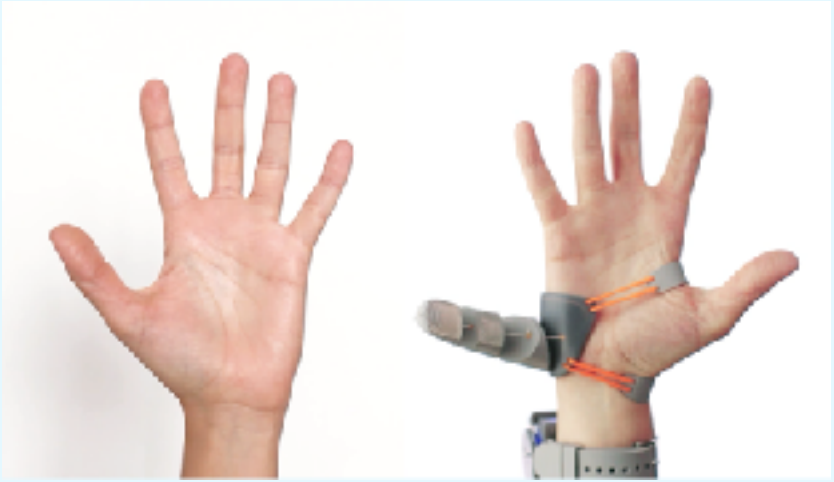
# THE FUTURE OF HAND AUGMENTATION

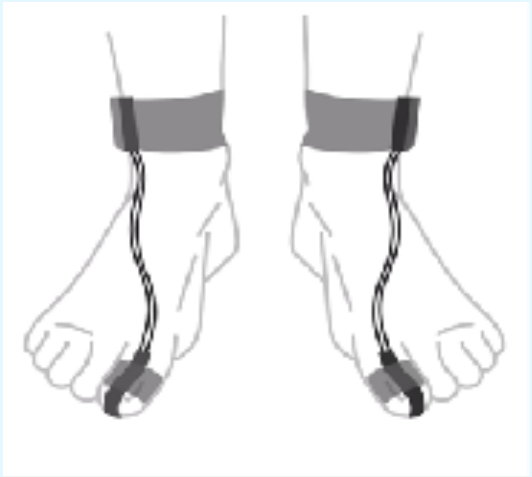


Dominijanniet al., Nature Machine Intelligence, 2021

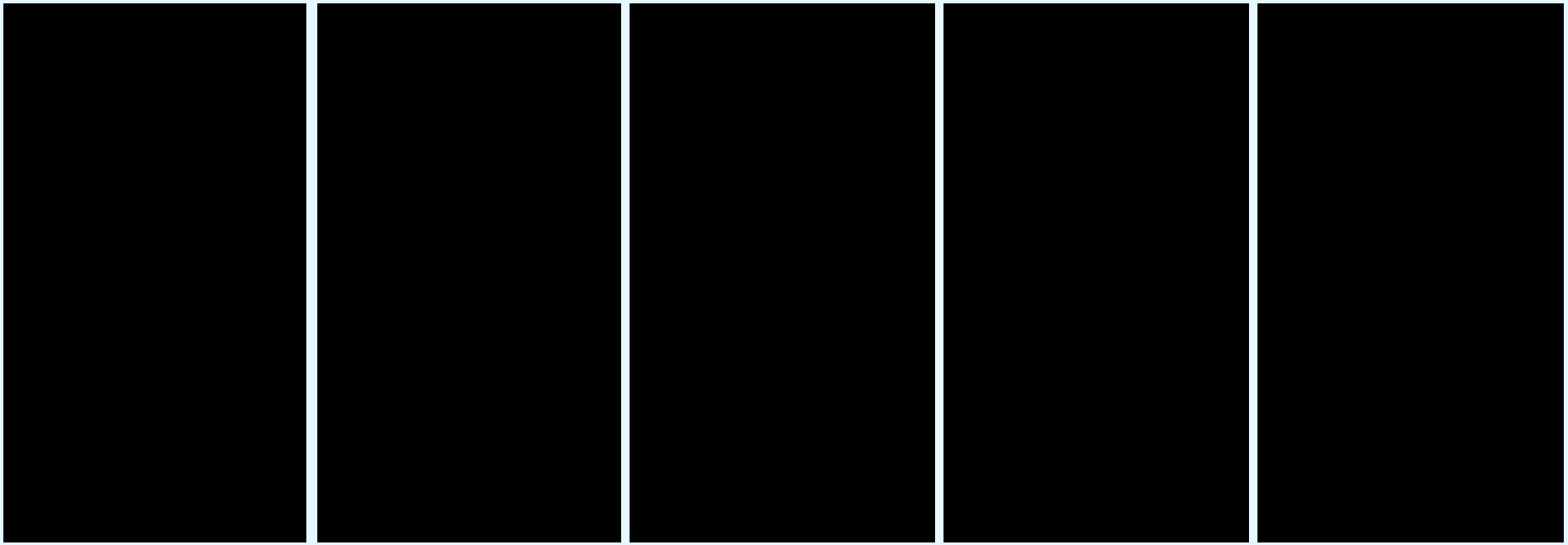
# TOE-CONTROLLED HAND FUNCTIONALITY

Dani Clode





## FIRST TIME EXPERIENCE USING THE THIRD THUMB (596 PARTICIPANTS)



Clode & Dowdall, et al., *Science Robotics, 2024*

## Toe control

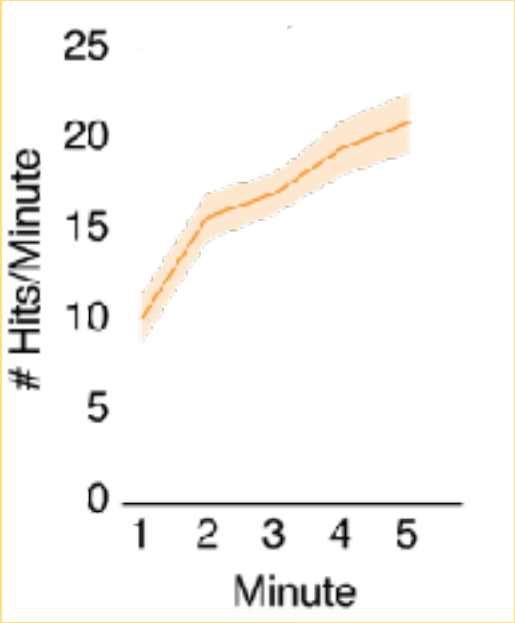
## Muscle control

Russ et al., *Biorxiv 2025*

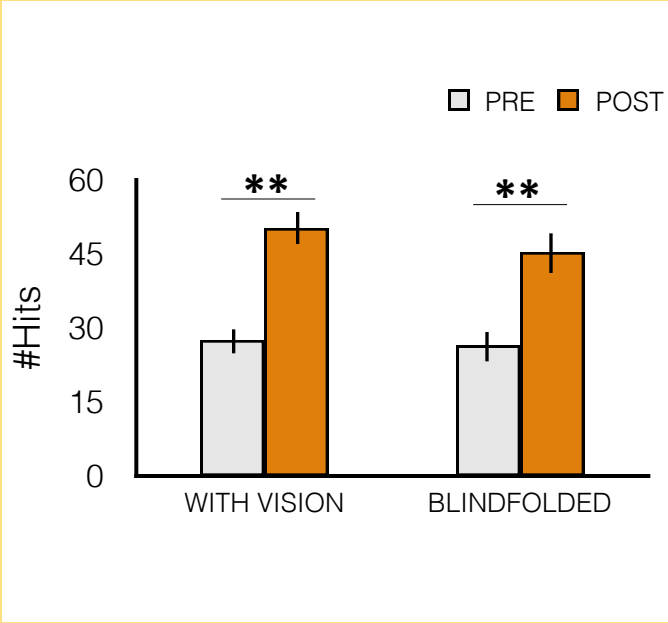
# Integrating the Third Thumb with your body

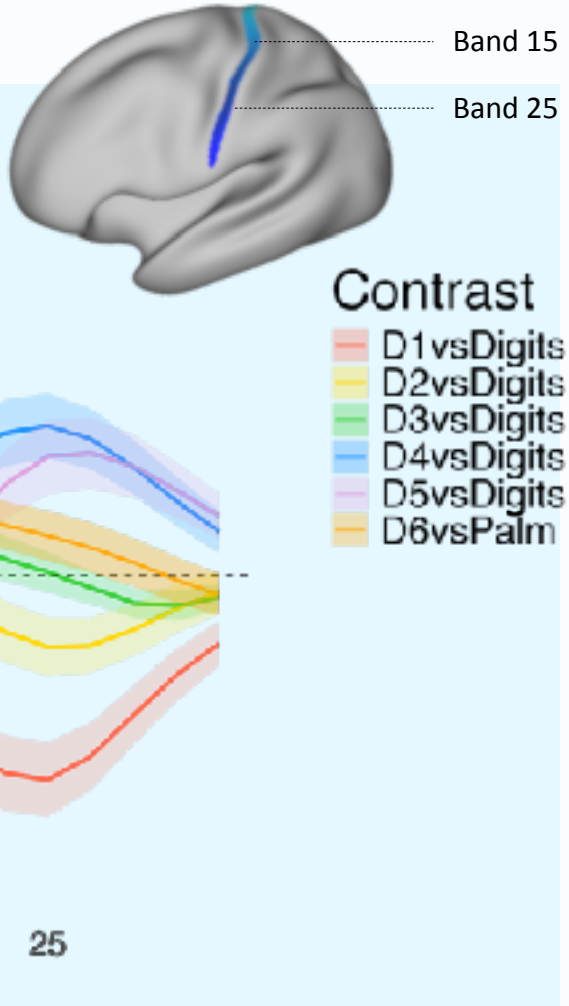
## Learning to find your fingers

## Early experience



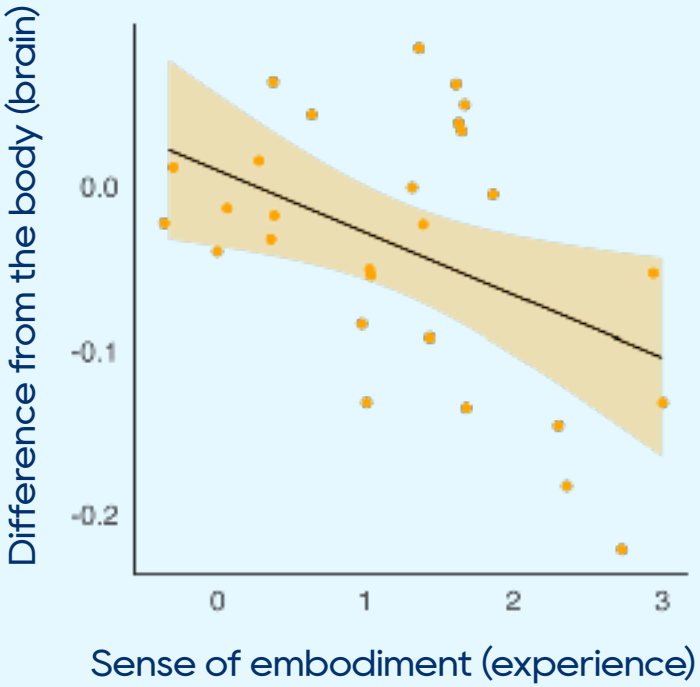

## Before and after learning



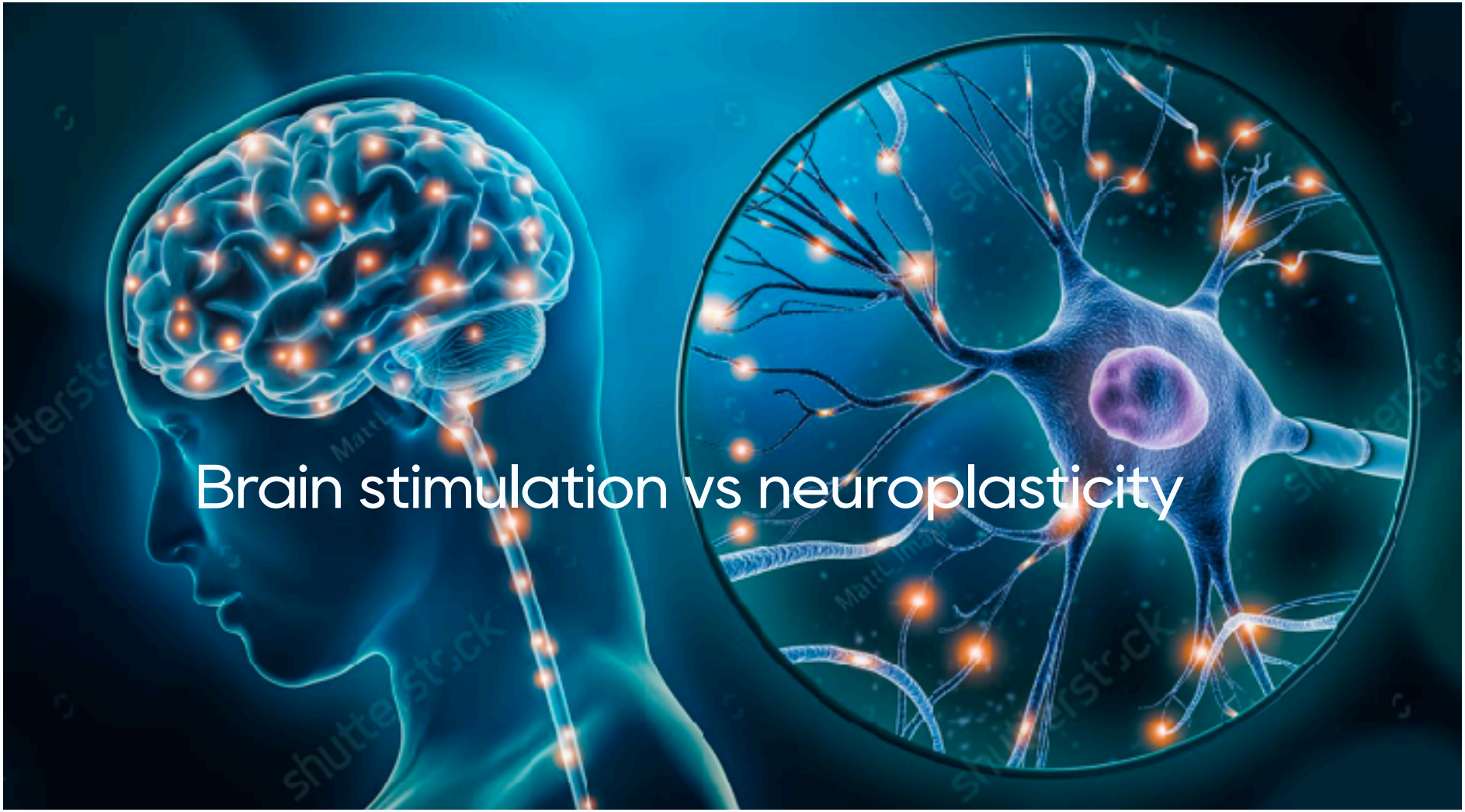



Kieliba et al., *Science Robotics, 2021;* Dowdall, et al., *Biorxiv 2025*

# INTEGRATING THE THIRD THUMB WITH YOUR BRAIN




Kieliba et al., *Science Robotics, 2021;* Dowdall, et al., *Biorxiv 2025*


Brain stimulation vs neuroplasticity

Building a user-centred definition of neurotech

What are the most precious elements at the interface between humanism and technology that we need to articulate and protect?

# User Considerations


**SAFETY**

Protecting data and information

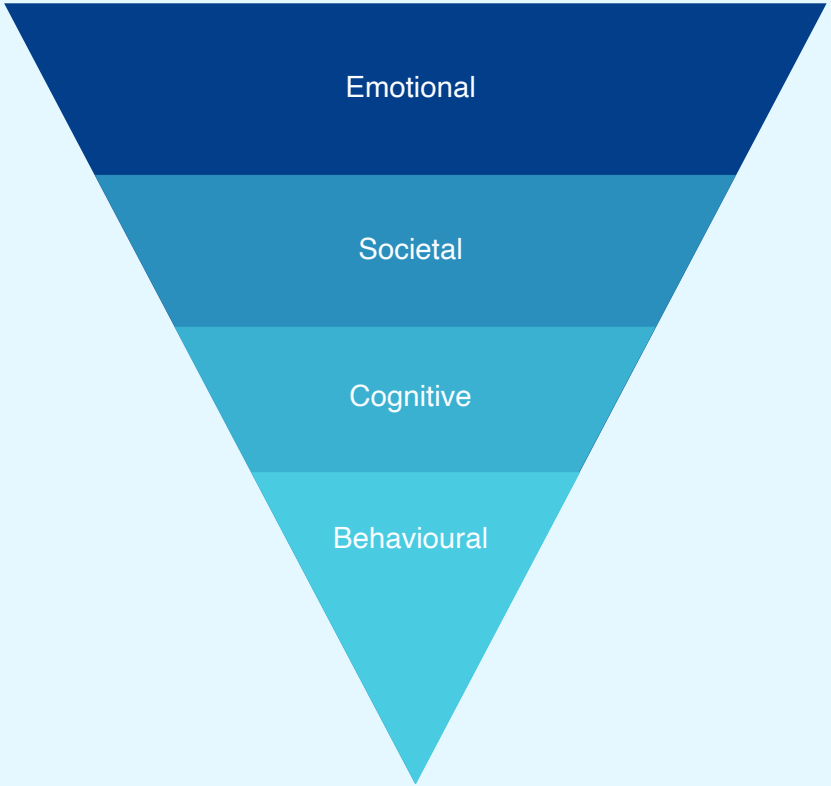
**WEARABILITY**

Combining style and functionality

**INVASIVENESS**

Minimizing impact on users

# Navigating the delicate balance between transparency and individuality



UNDERSTANDING USER AND SOCIETAL NEEDS

# Patient and Public Involvement

Guemes et al., J. Neural Eng., 2025

MRC Cognition and Brain Sciences Unit

UNIVERSITY OF CAMBRIDGE

wellcome

erc

UKRI Engineering and Physical Sciences Research Council

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