TMS@40 Hackathon Briefing

One main aim of TMS@40 is to write a paper. The provisional title of this paper is:

"The experimental psychology of transcranial magnetic stimulation: A consensus paper"

Why do we need a consensus paper on the experimental psychology of TMS?

- There are many existing consensus & guidance papers on TMS. Most are from scientists with neurology, neurophysiology & medical backgrounds

- The main journals that specialise in TMS – *Clinical Neurophysiology & Brain Stimulation* – again, tend to be edited by & publish work from medical researchers

- By contrast, experimental psychology has had relatively little input or influence on how TMS studies are conducted (but see e.g., Bergmann & Hartwigsen, 2021)

- Since TMS is mostly done on awake, behaving participants(!) experimental psychology has much to offer

What is experimental psychology?

Experimental, laboratory-based methods have long been used to understand the relationships between stimuli, psychological processes, and responses. Arguably, this began with Weber & Fechner's psychophysics in the mid-1800s. Experimental psychology has developed methods to study sensation, perception, attention, memory, decision-making, response conflict, and more. It has been an extremely successful paradigm.

TM<u>S</u> is a stimulus like any other, so it makes sense that the methodological rigour of experimental psychology can be brought to bear on understanding how TMS affects the brain & behaviour. Stimulus timing, intensity & location may significantly affect responses.

How can experimental psychology inform TMS research?

Well, that is what you need to decide, and write about! You should use any and all of your training so far, whether it is in psychology, physiology, neuroscience, biology, statistics or other allied disciplines. Below are some general examples of what you might discuss. You will be given a more specific briefing for each of the four hackathon topics.

Experimental design: How should TMS experiments be designed to minimise bias, remove confounds, ensure counterbalancing & randomisation, prevent order- & learning-effects?

Analysis: How should data from TMS experiments be analysed to minimise bias & confounds, ensure all relevant variance is modelled, & account for individual differences?

Reproducibility: After ~175 years of experimental psychology, what methods work & what don't? What lessons can be applied to the more recent history of TMS research?