Sean Cavanagh, PhD

Profile

I am a highly conscientious, self-motivated and dedicated neuroscience researcher, with a strong desire to achieve and a sincere commitment to caring for and helping to improve the lives of others. I have a passion for computational neuroscience, along with extensive experience in neurophysiological research and statistical analysis. Addressing large audiences has developed in me a confident and competent approach to public speaking, resulting in excellent communication skills. I have effective leadership skills and work well with others.

Research Overview

My research has addressed the neural mechanisms of decision-making and working memory. To gain insight to these mechanisms, I have trained animals to performed complex cognitive tasks and analysed the activity of single neurons. I then use mathematical models to relate the behavioural and neural data.

Current Position

2019 -   **Honorary Research Associate, University College London**

2018 - 2019   **Research Assistant, University College London**

Education

2015 -   **MBPhD Programme, University College London**

Examination Results: First clinical year (92%); Second clinical year (81%); Final clinical year (85%)

2015 - 2019   **PhD in Neuroscience, University College London**

"Neural computations for working memory and decision making" supervised by Dr SW Kennerley, Dr S Farmer and Dr LT Hunt.

2012 - 2015   **BSc (Hons) Medical Sciences with Neuroscience, University College London - 1st Class**

Dissertation (80%): "Differential modulation of the excitability of inputs to corticospinal neurones during action preparation for choice reaction time" supervised by Professor JC Rothwell.

Examination Results: First year (86%); Second year (88%); Final year (77%).

Skills

- Data analysis:
    - Neural encoding and decoding analyses (regression, SVMs, LDA, PCA)
    - Behavioural psychophysics (logistic regression, fitting connectionist models)

- Software:
    - Analysis: Matlab (>5 years experience), Python (1 year experience)
    - Visualisation: Adobe illustrator (4 years experience)

- Experimental:
    - Training of animals to perform complex cognitive tasks

- o Administration of pharmacological agents
- o Transcranial magnetic stimulation (TMS) and electromyography (EMG)

Selected Awards and Media Coverage

2022: Atchison Prize (fifth prize for overall performance in MBBS final exams)
2021: Distinction in medical school examinations
2020: Foulkes Foundation fellowship (£6,000)
2020: Media coverage of Cavanagh et al. 2020 (eLife) – including Naked Scientists Podcast
2019: Media coverage of Cavanagh et al. 2019 (PNAS) in Medical Xpress
2019: Jon Driver Prize (£500).
2017: Art of Neuroscience Competition Winner (€1,000). Media coverage in Scientific American and Atlas Obscura
2016: Brain travel award to attend Society for Neuroscience meeting, USA (£800)
2015: PhD studentship funding from Middlesex Hospital Medical School General Charitable Trust (£77,076)
2015: Dean's List, Faculty of Life Sciences
2014: Wolfson Foundation Intercalated Degree Fellowship (£5,000)
2013: The Kaye, Carter, Cayley and Keene Prize (fourth prize for overall performance)

Invited Talks

2019: Jon Driver prize talk: The role of neuronal timescales in cognition. UCL Neuroscience Symposium (Video).
2019: Swartz program in theoretical neuroscience seminar. Yale University, USA.
2018: Circuit mechanisms of working memory and decision-making. Oxford Centre for Human Brain Activity, University of Oxford.
2018: Reconciling persistent and dynamic hypotheses of working memory coding in prefrontal cortex. Society for Neuroscience Meeting, San Diego, USA.
2018: Circuit mechanisms of working memory and decision-making. Max Planck UCL Centre for Computational Psychiatry and Ageing.

Publications

Cavanagh, S.E., Hunt, L.T. & Kennerley, S.W. (2020) A Diversity of Intrinsic Timescales Underlie Neural Computations. *Front Neural Circuits*, **14**, 615626.

Cavanagh, S.E., Lam, N.H., Murray, J.D., Hunt, L.T. & Kennerley, S.W. (2020) A circuit mechanism for decision-making biases and NMDA receptor hypofunction. Elife, 9.

Cavanagh, S. E., Malalasekera, W. M. N., Miranda, B., Hunt, L. T., & Kennerley, S. W. (2019). Visual fixation patterns during economic choice reflect covert valuation processes that emerge with learning. *Proceedings of the National Academy of Sciences*, 201906662.

Cavanagh, S. E., Towers, J. P., Wallis, J. D., Hunt, L. T., & Kennerley, S. W. (2018). Reconciling persistent and dynamic hypotheses of working memory coding in prefrontal cortex. *Nature Communications*, *9*(1).

Hannah, R., **Cavanagh, S. E**., Tremblay, S., Simeoni, S., & Rothwell, J. C. (2018). Selective suppression of local interneuron circuits in human motor cortex contributes to movement preparation. *Journal of Neuroscience*, *38*(5), 1264–1276.

Hannah, R., Sommer, M., **Cavanagh, S.,** Jerjian, S., & Rothwell, J. C. (2017). Motor outcomes of repetitive transcranial magnetic stimulation are dependent on the specific interneuron circuit targeted. In *Biosystems and Biorobotics* (Vol. 15, pp. 3–7).

Cavanagh, S. E., Wallis, J. D., Kennerley, S. W., & Hunt, L. T. (2016). Autocorrelation structure at rest predicts value correlates of single neurons during reward-guided choice. *ELife*.

Cavanagh, S., Malalasekera, N., & Kennerley, S. (2015). In the blink of an eye: Value and novelty drive saccades. *Annals of Medicine and Surgery*, *4*(3), 319–320.

Positions of Responsibility

2016 – 2019   **MSc student Dissertation supervisor**
- I supervised three project students, and one literature review student.

2016 – Present   **UCL Uni-Link Tutor**
- Uni-link is a widening participation scheme aimed at students from groups under-represented at university. I provide academic lectures and workshops.