Dr Chris Chambers BSc PhD CPsychol FBPsS

Overview

Research Summary

My principal research interests include the use of transcranial magnetic stimulation (TMS) and brain imaging techniques (fMRI, DTI, MRS, MEG) to understand neural mechanisms of selective attention, awareness and cognitive control in the human brain. My group is also pursuing the simultaneous combination of TMS, MRI and electroencephalography (EEG), as well as technical advances in TMS methods to improve the precision and reliability of cortical stimulation.

Teaching Summary

Academic Teaching

Level 1 Psychology: ‘Magnetic stimulation of the human brain in psychology and neuroscience’ (2009-)

Level 3 Psychology: ‘Methods and applications of transcranial magnetic stimulation’ (2010-)

MSc in Neuroimaging Methods and Applications (2011-)

Professional Workshops

ARC Centre for Excellence, Macquarie University, Australia – ‘Workshop on basic research with transcranial magnetic stimulation (TMS)’ (2011)

MARCS Auditory Laboratories, University of Western Sydney, Australia – ‘Introduction to transcranial magnetic stimulation’ (2011)

Marie Curie FP7 Advanced Training Course, U.K., ‘Applications of transcranial magnetic stimulation in cognitive neuroscience’ (2010)

CUBRIC, Wales Institute of Cognitive Neuroscience (WICN) Summer School – ‘Introduction to TMS’ and two-day practical workshop (2009)

Psychology Department, University of California San Diego – ‘Introduction to theory and practice of TMS’ (2007)

Magstim TMS Summer School – ‘Practical Introduction to TMS’ (2007)

Dartmouth Summer Institute in Cognitive Neuroscience – ‘Introduction to TMS’ (2006)

Selected Publications (2008 onwards)

2013

Chambers, C. D., Allen, C. P. G., Maizey, L. and Williams, M. A. (2013). Is delayed foveal feedback critical for extra-foveal perception?. *Cortex*, 49(1), 327-335. (10.1016/j.cortex.2012.03.007) PDF

Chambers, C. D. (2013). Registered Reports: A new publishing initiative at Cortex [Editorial]. *Cortex*, 49(3), 609-610. (10.1016/j.cortex.2012.12.016) PDF

Maizey, L., Allen, C. P. G., Dervinis, M., Verbruggen, F., Varnava, A., Kozlov, M. D., Adams, R. C., Stokes, M., Klemen, J., Bungert, A., Hounsell, C. A. and Chambers, C. D. (2013). Comparative incidence rates of mild adverse effects to transcranial magnetic stimulation. *Clinical Neurophysiology*, 124(3), 536-544. (10.1016/j.clinph.2012.07.024) PDF

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Varnava, A., Dervinis, M. and Chambers, C. D. (2013). The predictive nature of pseudoneglect for visual neglect: Evidence from parietal theta burst stimulation. *Plos One*, 8(6) (10.1371/journal.pone.0065851) PDF

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Cai, W., George, J. S., Verbruggen, F., Chambers, C. D. and Aron, A. R. (2012). The role of the right pre-supplementary motor area in stopping action: two studies with event-related transcranial magnetic stimulation. *Journal of Neurophysiology*, 108(2), 380-389. (10.1152/jn.00132.2012)

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Publications

Online Publications

Online information about my publications can be obtained via Google Scholar or ResearcherID:

Full List of Publications

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Chambers, C. D., Bellgrove, M. A., Gould, I. C., English, T., Garavan, H., McNaught, E., Kamke, M. and Mattingley, J. B. (2007). Dissociable Mechanisms of Cognitive Control in Prefrontal and Premotor Cortex. *Journal of Neurophysiology*, 98(6), 3638-3647. (10.1152/jn.00685.2007)

Chambers, C. D., Payne, J. M. and Mattingley, J. B. (2007). Parietal disruption impairs reflexive spatial attention within and between sensory modalities. *Neuropsychologia*, 45(8), 1715-1724. (10.1016/j.neuropsychologia.2007.01.001)

Morris, A. P., Chambers, C. D. and Mattingley, J. B. (2007). Parietal stimulation destabilizes spatial updating across saccadic eye movements. *Proceedings of the National Academy of Sciences*, 104(21), 9069-9074. (10.1073/pnas.0610508104)

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Chambers, C. D., Mattingley, J. B. and Moss, S. A. (2005). Does selective attention influence the octave illusion?. *Perception*, 34(2), 217-229. (10.1068/p5164)

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Chambers, C. D. (2005). Staring in the Eye of Auditory Neglect: Comments on 'Gaze Direction Modulates Auditory Spatial Deficits in Stroke Patients with Neglect'. *Cortex*, 41(2), 117-120. (10.1016/S0010-9452(08)70886-4)

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Morris, A. P., Kritikos, A., Berberovic, N., Pisella, L., Chambers, C. D. and Mattingley, J. B. (2004). Prism adaptation and spatial attention: A study of visual search in normals and patients with unilateral neglect. *Cortex*, 40(4-5), 703-721. (10.1016/S0010-9452(08)70166-7)

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Media

Media Activities

theguardian
5th Jun 2013

Trust in science would be improved by study pre-registration
Open letter: We must encourage scientific journals to accept studies before the results are in
Chris Chambers, Marcus Munafo and more than 70 signatories

theguardian NOTES&THEORIES
8th Apr. 2013

Susan Greenfield and the rise of the Facebook zombies
Which is more dangerous, technology changing our brains or scientists mutating into priests?

theguardian NOTES&THEORIES
8th Feb. 2013

Pseudoscience and stereotyping won't solve gender inequality in science
A parenting guide aimed at drawing more girls into science lacks evidence and promotes old-fashioned gender stereotypes

BBC radio wales Science Cafe
29th Jan. 2013

The Geek Manifesto
Should scientists be more involved in government? Adam Walton and guests discuss the Geek Manifesto, a campaign for the public and politicians to understand science better.
With Mark Henderson, Gabriela Jiga-Boy, Jane Davidson and Chris Chambers

theguardian NOTES&THEORIES
23rd Jan. 2013

Those who publish research behind paywalls are victims not perpetrators
Labelling scientists who publish in traditional journals as 'immoral' only hinders the cause of open access publishing

SpotOn
Science policy, outreach and tools online
SpotOn London 2012: Fixing the fraud: how do we safeguard science from misconduct?

presented by Spektrum in association with nature.com SciLogs

18th Oct. 2012

Tackling the F word – guest post by Chris Chambers

theguardian comment is free

14th Sept. 2012

Replication is the only solution to scientific fraud

If academia is to be cleaned up, the Research Excellence Framework must prize replication over politics and publishing.
Chris Chambers and **Petroc Sumner**.

theguardian NOTES&THEORIES DISPATCHES FROM THE SCIENCE DESK

11th Jul. 2012

Science journalism through the looking glass

Science has an uneasy relationship with journalism, so what can be done by both sides to improve coverage, ask **Chris Chambers** and **Petroc Sumner**

Scientists and journalists need different things from science: Presentation

Click on the image opposite to watch the video

Scientists and journalists need different things from science: Discussion

Click on the image opposite to watch the video

theguardian NOTES&THEORIES DISPATCHES FROM THE SCIENCE DESK

7th Mar. 2012

Nine ways scientists can help improve science journalism

Dr Chris Chambers, Dr Petroc Sumner, Dr Frédéric Boy and Prof Jacky Boivin
School of Psychology, Cardiff University

The Leveson Inquiry: LEVESON INQUIRY: CULTURE, PRACTICE AND ETHICS OF THE PRESS

How can we ensure a future of quality science reporting in the UK?

Chambers, C.D., Sumner, P. & Boy, F. (2011).

Le Monde.fr EN QUÊTE DE SCIENCES

15th Nov. 2011

Cerveau et maintien de l'ordre, comment améliorer l'information scientifique du grand public

Par Petroc Sumner, Frédéric Boy et Christopher Chambers, chercheurs en neurosciences cognitives, School of Psychology, Cardiff University

theguardian NOTES&THEORIES DISPATCHES FROM THE SCIENCE DESK

11th Oct. 2011

Scientist should be allowed to check stories on their work before publication

Dr Petroc Sumner, Dr Frédéric Boy and Dr Christopher Chambers are at the School of Psychology, Cardiff University

theguardian NOTES&THEORIES DISPATCHES FROM THE SCIENCE DESK

22nd Aug. 2011

Riot control: How can we stop newspapers distorting science?

Dr Petroc Sumner, Dr Frédéric Boy and Dr Christopher Chambers are at the School of Psychology, Cardiff University

theguardian NOTES&THEORIES DISPATCHES FROM THE SCIENCE DESK

16th Feb. 2011

'Thinking caps' are pseudoscience masquerading as neuroscience

Chris Chambers, Sven Bestmann and Elena Rusconi

The New York Times

11th Nov. 2007

Politics and the Brain

Adam Aron, David Badre, Matthew Brett, John Cacioppo, Chris Chambers, Roshan Cools, Steve Engel, Mark D'Esposito, Chris Frith, Eddie Harmon-Jones, John Jonides, Brian Knutson, Liz Phelps, Russell Poldrack, Tor Wager, Anthony Wagner, Piotr Winkielman

Research

Main Current Projects

1. Attention and Awareness

Current team members: *Chris Allen, Emma Cheetham, Lucy Morris, Sinead Morrison, Jemma Sedgmond*

Our sensory environment contains a vast quantity of information, only a fraction of which can guide behaviour. Brain mechanisms of attention are crucial for enhancing the processing of stimuli that are behaviourally relevant and for minimising distraction. Within the field of attention, our research focuses on the use of TMS and fMRI (including multivoxel pattern analysis methods) to understand the cognitive neuroscience of attentional control, within and between the sensory modalities of vision and touch. In particular, we are aiming to answer the following questions:

- How do regions in the frontal and parietal cortex modulate competitive interactions between stimuli in the visual cortex?
- Do the same mechanisms of top-down attentional control operate within and between sensory modalities? Is there a 'supramodal' attention system?
- Do different regions of the parietal (e.g. IPL, SPL) and frontal cortex (e.g. FEF) exhibit functional specificity for different aspects of attention?
- Which visual pathways and mechanisms are crucial for conscious awareness?
- Do cortical feedback mechanisms transfer information from the peripheral visual cortex to central (foveal) visual cortex?

- What is the relative contribution of the retinotectal and geniculostriate pathways to visual selection?
- Are frontal and parietal regions that are crucial for spatial attention also critical for mental representations of numbers?
- Is the top-down selection of spatial and feature-based visual information controlled by a single global mechanism or by a series of coordinated sub-systems?
- What is the genotypic basis of selective attention in humans?

Current collaborations in attention/awareness:
Dr Sven Bestmann (University College London)
Dr Mark Bellgrove (University of Queensland)
Dr Elena Rusconi (University of Trento)
Dr Christian Ruff (University of Zurich)
Dr Petroc Sumner (Cardiff University)
Dr Mark Williams (Macquarie University)

2. Cognitive Control

Current team members: *Rachel Adams, Chris Allen, Rory Cutler, Charles Hounsell, Leah Maizey, Sinead Morrison, Jemma Sedgmond, Solveiga Stonkute, Frederick Verbruggen*

Neural mechanisms of cognitive control enable us to coordinate, execute, and update behaviour. The prefrontal cortex has long been associated with cognitive control but the architecture of the prefrontal system is one of the great unsolved mysteries in cognitive neuroscience. Within the broad field of cognitive control (or 'executive functions'), our research focuses on understanding the neural basis of response inhibition, response selection, and the link between inhibition and risk-taking (including gambling), principally through the application of TMS. Specifically we aim to address the following questions:

- How do prefrontal and parietal cortex support cognitive control in the human brain?
- How do neural mechanisms of response inhibition interact with functionally related processes, such as response selection, attention, working memory, and risk-taking behaviour?
- Do regions of prefrontal cortex that control motor execution (such as the frontal eye field) also mediate perceptual decision-making?
- How do neural mechanisms of cognitive control and emotional regulation interact with one another?
- What is the balance between specialisation and adaptive coding in the human prefrontal cortex?

Current collaborations in cognitive control:
Dr Adam Aron (University of California, San Diego)
Dr Mark Bellgrove (University of Queensland)
Dr Xavier Caseras (Cardiff University)
Dr Natalia Lawrence (Cardiff University)
Dr Frederick Verbruggen (University of Exeter)

3. Concurrent TMS, MRI, and EEG

Current team members: *Chris Allen, Charles Hounsell, Leah Maizey, Jemma Sedgmond*

The combination of TMS and neuroimaging (MRI, EEG) provides a unique window on human brain function, with broad applications and implications across the cognitive and clinicial neurosciences. By applying TMS within the MRI scanner, we can directly observe the physiological consequences of stimulation both locally (at the site of stimulation) and in remote interconnected brain regions. The integration of TMS and different imaging techniques also holds great promise for revealing the mechanism by which TMS influences neurophysiology and neurovascular coupling.

We have recently established concurrent TMS-MRI at CUBRIC via the *Academic Expertise for Business (A4B)* grant programme, an initiative of the Welsh Assembly Government that funds links between academia and industry in Wales. Our industrial partners on this project are Welsh neuromedical companies *Magstim* and *Dymed*.

Current collaborations in TMS-MRI:
Dr Sven Bestmann (University College London)
Dr John Evans (Cardiff University)
Prof. Derek Jones (Cardiff University)
Prof. Krish Singh (Cardiff University)
Prof. Richard Wise (Cardiff University)
Industry: Robin Davies (Magstim) and Mike Polson (Dymed)

4. TMS Methods

The application of TMS in cognitive neuroscience carries a variety of technical and interpretative challenges. As a 'neurodisruption' method, one critical issue is the control of TMS intensity. What strength of TMS is sufficient to yield effective (but not excessive) stimulation of cortical tissue? We have found that the extent of cortical activity during TMS is steeply related to the distance between the scalp and cortex. Even a difference of 1mm in the scalp-cortex distance between different sites can have a measurable and reliable effect on TMS-evoked behaviour. We have therefore developed a linear scaling method for calibrating the intensity of TMS according to scalp-cortex distance, thus enabling more precise and comparable stimulation of different regions. We are also developing a new type of brain atlas for TMS that maps regional variation in scalp-cortex distance over a large sample of subjects.

Current collaborations in TMS methods:
Dr Mark Stokes (University of Oxford)

Funding

Current Major Grants

Chambers, C.D., Verbruggen, F.L.J., Boy, F., Dymond, S. & Lawrence, N. Wellcome Trust ISSF Seedcorn grant (U.K.), 'Can GABAergic brain stimulation promote risk aversion in gambling?', 2013-2014 (£33,572)

Chambers, C.D. & Verbruggen, F.L.J. BBSRC Project Grant (U.K.), 'Neural dynamics of response inhibition and gambling across the lifespan', 2013-2016 (£882,321)

Verbruggen F.L.J, Chambers, C.D., Lavric, A. & McLaren, I. Economic and Social Research Council (U.K.) 'Do executive motor-control mechanisms regulate monetary choice and gambling?', 2012-2015 (£546,626)

Bellgrove, M.A., Hester, R., Chambers, C.D., Garavan, H. & Hawi, Z. National Health and Medical Research Council project grant (Australia) 'Genetic and physiological mechanisms of executive control', 2011-2014 ($541,048)

Previous Major Grants

Chambers, C.D., Singh, K., Wise, R., Jones, D., Jiles, D, & Bestmann, S. Academic Expertise For Business grant (Welsh Assembly) 'The integrated brain imaging and stimulation project (IBIS)', 2010-2013 (£349,885)

Chambers, C.D. BBSRC David Phillips Fellowship (U.K.), 'Investigating the neural basis of selective attention in the human brain: A combined neurodisruption and neuroimaging study, 2006-2011 (£421,754)

Chambers, C.D. & Driver, J. BBSRC Project Grant (U.K.), 'Multisensory dynamics of selective attention in the human brain: A combined neurodisruption and neuroimaging project', 2007-2011 (£403,884)

Bellgrove, M.A. & Chambers, C.D. ARC Project Grant (Australia), 'The cognitive neuroscience of executive control: behavioural, physiological and genetic mechanisms', 2007-2010 ($319,000)

Previous Minor Grants

Varnava, A., & Chambers, C.D. Wales Institute of Cognitive Neuroscience Project Grant (U.K.). 'The predictive nature of pseudoneglect for simulated visual neglect following unilateral parietal disruption using theta burst stimulation (TBS)', 2009-2011 (£16,216)

Zhang, W., Klemen, J. & Chambers, C.D. Wales Institute of Cognitive Neuroscience Project Grant (U.K.). 'The effect of crossmodal attentional load on sensory processing and the control of attentional resources', 2009-2011 (£4,500)

Kurniawan, V., Klemen, J. & Chambers, C.D. Wales Institute of Cognitive Neuroscience Project Grant (U.K.). 'Multisensory spatial and feature-based attention', 2009-2011 (£4,500)

Allen, C. & Chambers, C.D. Wales Institute of Cognitive Neuroscience Project Grant (U.K.). 'Probing the neural basis of visual awareness using transcranial magnetic stimulation (TMS)', 2009-2011 (£5,625)

Klemen, J., Jones, D., Menz, M. & Chambers, C.D. Wales Institute of Cognitive Neuroscience Project Grant (U.K.). 'Establishing anatomical connectivity of multisensory perception and attentional control using diffusion tensor imaging', 2009-2011 (£3,750)

Klemen, J. & Chambers, C.D. Wales Institute of Cognitive Neuroscience Project Grant (U.K.), 'Top-down control of crossmodal attention and its effects on sensory processing', 2008-2011 (£15,000)

Research Group

The TMS group is made up of staff and students from a wide range of backgrounds, including physics, neuroscience, and experimental psychology.

Lab head:
Dr Chris Chambers

Postdoctoral Research Fellows:
Chris Allen

Honourary Research Fellows:
Dr Frederick Verbruggen

Lab Manager:
Jemma Sedgmond

Research Assistants:
Sinead Morrison

Graduate Students:
Rachel Adams, PhD
Emma Cheetham, PhD
Rory Cutler (from Oct 2013)
Charles Hounsell, PhD
Leah Maizey, PhD
Solveiga Stonkute (from Oct 2013)

Current Undergraduate Students:
TBA

Interns:
TBA

Alumni:
Dr Andreas Bungert
Dr Jane Klemen
Veldri Kurniawan
Marcel Meyer
Dr Alice Varnava

Postgraduate Students

Postgraduate Research Interests

I am happy to discuss projects that fall within the scope of:

Psychological and neural mechanisms of selective attention and conscious awareness

Human cognitive control processes, including response inhibition, response selection, working memory, and decision making under risk

Concurrent TMS and brain imaging

Methodological advances in TMS

Current Students

Rachel Adams, PhD
Emma Cheetham, PhD
Charles Hounsell, PhD
Leah Maizey, PhD

Previous Students

Chris Allen
Veldri Kurniawan
Marcel Meyer
Bertram Schenkluhn, Diplomarbeit, 2006-2007, University College London
Adam Morris, PhD, 2003-2008, University of Melbourne
Jonathan Payne, DPsych, 2002-2005, University of Melbourne

Biography

Undergraduate Education

Bachelor of Science (Behavioural) with Honours (1st class), Monash University, 1998

Postgraduate Education

PhD in Experimental Psychology, Monash University, 2002
Chartered Psychologist (CPsychol), British Psychological Society, 2011

Fellowships & Awards

Fellow of the British Psychological Society (FBPsS), 2011
Spearman Medal, British Psychological Society, 2007
BBSRC David Phillips Fellowship, 2006-2011
Australian Academy of Science, European Travelling Fellowship, 2004

Current Appointments

Senior Research Fellow
Head of the CUBRIC Transcranial Magnetic Stimulation (TMS) Group

Previous Appointments

BBSRC David Phillips Fellow, School of Psychology, Cardiff University (2008-2011)
BBSRC David Phillips Fellow, Institute of Cognitive Neuroscience, University College London (2006-2008)
NHMRC Senior Postdoctoral Research Fellow, University of Melbourne, Australia (2004-2006)
NHMRC Postdoctoral Research Fellow, University of Melbourne, Australia (2002-2004)

Memberships

Chartered Member, British Psychological Society
Society for Neuroscience
Association of British Science Writers (ABSW)

Journal Editorships

Section Editor, Cortex
Academic Editor, PLOS ONE

Manuscript reviewing activities

Annals of the New York Academy of Sciences
Behavior Research Methods, Instruments and Computers
Biological Psychiatry
Brain Research
Brain Stimulation
Brain Structure and Function
Cerebral Cortex
Cognition
Cognitive Brain Research
Cortex
Current Biology
European Journal of Neurology
Experimental Brain Research
Experimental Psychology
Human Brain Mapping
Journal of Cognitive Neuroscience
Journal of Experimental Psychology: General
Journal of Experimental Psychology: Human Perception and Performance
Journal of Neurophysiology
Journal of Neuroscience
Journal of the International Neuropsychological Society
Nature
Neuroimage
Neuropsychologia
Neuropsychology
Neuroscience
Neuroscience Letters
Open Biology
Perception & Psychophysics
PLOS ONE
Psychiatry Research
Psychological Research
Psychological Science
Psychonomic Bulletin & Review
Trends in Cognitive Sciences

Grant reviewing activities

Biotechnology and Biological Sciences Research Council (BBSRC)
Economic and Social Research Council (ESRC)
Leverhulme Trust
Medical Research Council (MRC)
National Science Foundation
Netherlands Organisation for Scientific Research (NOW)
Neurological Foundation of New Zealand
Wellcome Trust

Invited Talks (2006 onwards)

School of Experimental Psychology, University of Bristol 2013
Japan Neuroscience Society Meeting, Kyoto 2013
School of Psychology, University of Sussex 2013
Department of Experimental Psychology, University of Oxford 2013
Division of Psychology, University of Abertay Dundee 2013
National Assembly for Wales, Cross-party Group on Science and Technology, Cardiff 2013
Royal Institution, London 2012
School of Psychology, University of Exeter 2012
CASE Europe Conference, Birmingham 2012
Department of Psychiatry, CHU Brugmann, Brussels, Belgium, 2011
Macquarie Centre for Cognitive Science, Macquarie University, Australia, 2011
MARCS Auditory Labs, University of Western Sydney, Australia, 2011
Department of Psychology, Royal Holloway, 2010
Centre for Mind/Brain Sciences, University of Trento, Italy, 2009
Welsh Branch of the British Psychological Society, Cardiff, 2009
Queensland Brain Institute, University of Queensland, Australia, 2009
Macquarie Centre for Cognitive Science, Macquarie University, Australia, 2009
Queensland Brain Institute, University of Queensland, Australia, 2009
Themed speaker, Young Neuroscientist Day, Cardiff University, 2008
Spearman Medal Lecture, BPS Annual Conference, Dublin, 2008
Department of Psychology, Trinity College Dublin, 2008
FMRIB Centre, University of Oxford, 2007
Psychology Department, University of California San Diego, 2007
School of Psychology, Cardiff University, 2007
School of Psychology, University of Queensland, Australia, 2007
Moss Rehabilitation Research Institute, Philadelphia, 2006
Chaucer Club Presentation, MRC CBU, University of Cambridge, 2006
Cognitive Neuroscience Research Unit, University of Durham, 2006
Institute of Cognitive Neuroscience, University College London, 2006
School of Psychology, University of Birmingham, 2006
Department of Psychology, University College London, 2006