Linden Parkes, Ph.D.

K99/R00 Postdoctoral Research Fellow, University of Pennsylvania

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Research Interests

I am a **computational neuroscientist** seeking to uncover the pathways that track the emergence of psychopathology. I approach this goal from a neurobiological perspective by studying how complex neural systems shape behavior and cognition, and how dysfunction in these systems predicts psychopathology.

Academic Positions

Postdoctoral Research Fellow — **Philadelphia, PA**
University of Pennsylvania, Department of Bioengineering — *July 2019 - present*
- Advisors: Prof. Dani S. Bassett, Associate Prof. Theodore D. Satterthwaite

Visiting Scholar — **Nijmegen, The Netherlands**
Donders Institute for Brain, Cognition and Behaviour — *Sept. 2018 - Oct. 2018*
- Advisors: Prof. Christian Beckmann, Dr. Andre Marquand

Education

Doctor of Philosophy, Neuroscience & Psychiatry — **Melbourne, Australia**
Monash University — *March 2014 - June 2019*
- Thesis: Mapping brain networks in health and mental disorder with structural and functional Magnetic Resonance Imaging
- Advisors: Prof. Murat Yucel, Prof. Alex Fornito, Dr. Ben Fulcher

Bachelor of Science (with Honors), Psychology/Psychophysiology — **Melbourne, Australia**
Swinburne University of Technology — *2009 - 2013*
- Thesis: Mapping language processes using Magnetoencephalography.
- Advisor: Associate Prof. Conrad Perry
- Honors: First Class. Dux

Funding

Career Transition Awards

K99/R00 Pathway to Independence Award — *Sept. 2021 - 2026*
National Institute of Mental Health (NIMH)
- Project: Developing prognostic neuroimaging biomarkers of the psychosis spectrum using network control theory
- $1,424,194 USD

Fellowships & Scholarships

Young Investigator Award — *Jan. 2021 - Jan. 2023*
Brain & Behavior Research Foundation
- Project: Hybrid neurodevelopmental normative models for psychosis
- $70,000 USD

Monash University Postgraduade Publication Award — *2018*
Monash University
- $6,300 AUD

Monash University Graduate Research Scholarship — *2014 - 2018*
Monash University
- $20,000 AUD

Australian Postgraduate Award Research Scholarship — *2014 - 2018*
Australian Government
- $91,000 AUD

Grants

Innovations Connections Grant — *2016 - 2017*
Department of Industry, Innovation and Science, Australia

- $50,000 AUD
- Associate investigator

Travel Awards

Domestic Travel Fellowship Award *2022*
Society of Biological Psychiatry
- $2,000 USD

Abstract Merit Award *2021*
Organization for Human Brain Mapping
- virtual, no monetary component

Abstract Merit Award *2020*
Organization for Human Brain Mapping
- $3,000 USD

Donders-Monash Erasmus Travel Award *2018*
Donders Institute for Brain, Cognition and Behaviour | Monash University
- $3,200 AUD

Future Leaders Travel Award *2015*
Monash Institute of Cognitive and Clinical Neurosciences
- $5,000 AUD

Publications

First author

Parkes L, Kim JZ, Stiso J, Calkins ME, Cieslak M, Gur RE, Gur RC, Moore TM, Ouellet M, Roalf DR, Shinohara RT, Wolf DH, Satterthwaite TD, & Bassett DS (2022). Asymmetric signaling across the hierarchy of cytoarchitecture within the human connectome. *Science Advances*, 8 (50).

Parkes L, Moore TM, Calkins ME, Cieslak M, Roalf DR, Wolf DH, Gur RC, Gur RE, Satterthwaite TD & Bassett DS (2021). Network controllability in transmodal cortex predicts positive psychosis spectrum symptoms. *Biological Psychiatry*, 90 (6), 409-418.

Parkes L, Moore TM, Calkins ME, Cook PA, Cieslak M, Roalf DR, Wolf DH, Gur RC, Gur RE, Satterthwaite TD & Bassett DS (2021). Transdiagnostic dimensions of psychopathology explain individuals' unique deviations from normative neurodevelopment in brain structure. *Translational Psychiatry*, 11 (1), 1-13.

Parkes L, Satterthwaite TD & Bassett DS (2020). Towards precise resting-state fMRI biomarkers in psychiatry: synthesizing developments in transdiagnostic research, dimensional models of psychopathology, and normative neurodevelopment. *Current Opinion in Neurobiology*, 65, 120-128.
- Invited opinion piece

Parkes L, Tiego J, Aquino K, Braganza L, Chamberlain SR, Fontenelle L, Harrison BJ, Lorenzetti V, Paton B, Razi A, Fornito A, & Yucel M (2019). Transdiagnostic variations in impulsivity and compulsivity in obsessive-compulsive disorder and gambling disorder correlate with effective connectivity in cortical-striatal-thalamic-cortical circuits. *NeuroImage*, 202, 116070.

Parkes L, Fulcher B, Yucel M, & Fornito A (2018). An evaluation of the efficacy, reliability, and sensitivity of motion correction strategies for resting-state functional MRI. *NeuroImage*, 171, 415-436.

*Prochazkova L, ***Parkes L**, Dawson A, Youssef G, Ferreira GM, Lorenzetti V, Segrave RA, Fontenelle LF, & Yucel M (2018). Unpacking the role of self-reported compulsivity and impulsivity in obsessive-compulsive disorder. *CNS spectrums*, 23 (1), 51-58.

**These authors contributed equally*

Parkes L, Fulcher B, Yucel M, & Fornito A (2017). Transcriptional signatures of connectomic subregions of the human striatum. *Genes, Brain and Behavior*, 16 (7), 647-663.

Parkes L, Perry C, & Goodin P (2016). Examining the N400m in affectively negative sentences. A magnetoencephalography study. *Psychophysiology*, 53 (5), 689-704.

Senior author

Segrave RA, Hendrikse J, & **Parkes L** (2019). DBS, TMS and tDCS for obsessive compulsive disorder. In *A Transdiagnostic Approach to Obsessions, Compulsions and Related Phenomena*, 255-278. Cambridge University Press.

Consortium papers

Richie-Halford A, Cieslak M, Ai L, Caffarra S, Covitz S, Franco AR, Karipidis II, Kruper J, Milham M, Avelar-Pereira B, Roy E, Sydnor VJ, Yeatman J, **Fibr Community Science Consortium**, Satterthwaite TD, & Rokem A (2022). An open, analysis-ready, and quality controlled resource for pediatric brain white-matter research. *bioRxiv*.

Middle author

Gu S, Fotiadis P, **Parkes L**, *et al.* (2022). Network controllability mediates the relationship between rigid structure and flexible dynamics. *Network Neuroscience*, 6 (1), 275-297.

Aquino KM, Fulcher B, Oldham S, **Parkes L**, *et al.* (2022). On the intersection between data quality and dynamical modelling of large-scale fMRI signals. *NeuroImage*, 256, 119051.

Pines AR, Larsen B, Cui Z, Sydnor VJ, Bertolero MA, Adebimpe A, Alexander-Bloch AF, Davatzikos C, Fair DA, Gur RC, Gur RE, Li H, Milham MP, Moore TM, Murtha K, **Parkes L**, *et al.* (2022). Dissociable multi-scale patterns of development in personalized brain networks. *Nature communications*, 13 (1), 2647.

Den Ouden L, Suo C, Albertella L, Greenwood L-M, Lee RSC, Fontenelle LF, **Parkes L**, *et al.* (2022). Transdiagnostic phenotypes of compulsive behavior and associations with psychological, cognitive, and neurobiological affective processing. *Translational psychiatry*, 12 (1), 1-11.

Segal A, **Parkes L**, *et al.* (2022). Regional, circuit, and network heterogeneity of brain abnormalities in psychiatric disorders. *medRxiv*.

Murtha K, Larsen B, Pines A, **Parkes L**, *et al.* (2022). Associations between neighborhood socioeconomic status, parental education, and executive system activation in youth. *Cerebral Cortex*.

Srivastava P, Fotiadis P, **Parkes L**, & Bassett DS (2022). The expanding horizons of network neuroscience: From description to prediction and control. *NeuroImage*, 119250.

Zhang X, Chye Y, Braganza L, Fontenelle LF, Harrison BJ, **Parkes L**, *et al.* (2021). Severity related neuroanatomical alteration across symptom dimensions in obsessive-compulsive disorder. *Journal of Affective Disorders Reports*, 4, 100129.

Mahadevan AS, Cornblath EJ, Lydon-Staley DM, Zhou D, **Parkes L**, *et al.* (2021). Alprazolam modulates persistence energy during emotion processing in first-degree relatives of individuals with schizophrenia: a network control study. *bioRxiv*.

McGowan AL, **Parkes L**, *et al.* (2021). Controllability of structural brain networks and the waxing and waning of negative affect in daily life. *Biological Psychiatry Global Open Science*.

He X, Caciagli L, **Parkes L**, *et al.* (2021). Pathological and metabolic underpinnings of energetic inefficiency in temporal lobe epilepsy. *bioRxiv*.

Zhou D, Kang Y, Cosme D, Jovanova M, He X, Mahadevan A, Stanoi O, Brynildsen JK, Cooper N, Cornblath E, **Parkes L**, *et al.* (2021). Mindfulness promotes control of brain network dynamics for self-regulation and discontinues the past from the present. *PsyArXiv*.

Fallon J, Ward PGD, **Parkes L**, *et al.* (2020). Timescales of spontaneous fMRI fluctuations relate to structural connectivity in the brain. *Network Neuroscience*, 4 (3), 788-806.

Aquino KM, Fulcher BD, **Parkes L**, *et al.* (2020). Identifying and removing widespread signal deflections from fMRI data: Rethinking the global signal regression problem. *NeuroImage*, 212, 116614.

Maleki S, Chye Y, Zhang X, **Parkes L**, *et al.* (2020). Neural correlates of symptom severity in obsessive-compulsive disorder using magnetization transfer and diffusion tensor imaging. *Psychiatry Research: Neuroimaging*, 298, 111046.

Amiet D, Youssef GJ, Hagg LJ, Lorenzetti V, **Parkes L**, *et al.* (2020). Young adults with higher motives and expectancies of regular cannabis use show poorer psychosocial functioning. *Frontiers in Psychiatry*, 1449.

Oldham S, Fulcher B, **Parkes L**, *et al.* (2019). Consistency and differences between centrality measures across distinct classes of networks. *PloS one*, 14 (7), e0220061.

Sabaroedin K, Tiego J, **Parkes L**, *et al.* (2019). Functional connectivity of corticostriatal circuitry and psychosis-like experiences in the general community. *Biological Psychiatry*, 86 (1), 16-24.

Contreras-Rodriguez O, Burrows T, Pursey KM, Stanwell P, **Parkes L**, *et al.* (2019). Food addiction linked to changes in ventral striatum functional connectivity between fasting and satiety. *Appetite*, 133, 18-23.

Tiego J, Oostermeijer S, Prochazkova L, **Parkes L**, *et al.* (2019). Overlapping dimensional phenotypes of impulsivity and compulsivity explain co-occurrence of addictive and related behaviors. *CNS spectrums*, 24 (4), 426-440.

Jamadar SD, Ward PGD, Carey A, McIntyre R, **Parkes L**, *et al.* (2019). Radiotracer administration for high temporal

resolution positron emission tomography of the human brain: application to FDG-fPET. *JoVE (Journal of Visualized Experiments)*, 152, e60259.

Chamberlain SR, Tiego J, Fontenelle LF, Hook R, **Parkes L**, *et al.* (2019). Fractionation of impulsive and compulsive trans-diagnostic phenotypes and their longitudinal associations. *Australian & New Zealand Journal of Psychiatry*, 53 (9), 896-907.

Den Ouden L, Kandola A, Suo C, Hendrikse J, Costa RJS, Watt MJ, Lorenzetti V, Chye Y, **Parkes L**, *et al.* (2018). The influence of aerobic exercise on hippocampal integrity and function: preliminary findings of a multi-modal imaging analysis. *Brain Plasticity*, 4 (2), 211-216.

Bennett D, Oldham S, Dawson A, **Parkes L**, *et al.* (2017). Systematic overestimation of reflection impulsivity in the Information Sampling Task. *Biological Psychiatry*, 82 (4), e29-e30.

Yücel M, Carter A, Allen AR, Balleine B, Clark L, Dowling NA, Gainsbury SM, Goudriaan AE, Grant J, Hayes A, Hodgins D, van Holst R, Lattimore R, Livingstone C, Lorenzetti V, Lubman D, Murawski C, **Parkes L**, *et al.* (2017). Neuroscience in gambling policy and treatment: an interdisciplinary perspective. *The Lancet Psychiatry*, 4 (6), 501-506.

Guo K, Youssef GJ, Dawson A, **Parkes L**, *et al.* (2017). A psychometric validation study of the Impulsive-Compulsive Behaviours Checklist: A transdiagnostic tool for addictive and compulsive behaviours. *Addictive behaviors*, 67, 26-33.

Jung WH, Yücel M, Yun J-Y, Yoon YB, Cho KIK, **Parkes L**, *et al.* (2017). Altered functional network architecture in orbitofrontostriatothalamic circuit of unmedicated patients with obsessivecompulsive disorder. *Human Brain Mapping*, 38 (1), 109-119.

Teaching Experience

Teacher's Assistant — **Philadelphia, PA**
University of Pennsylvania, Department of Bioengineering — *2020*
- Class: Network Neuroscience
- Course evaluation score: 3.57/4

Guest Lecturer — **Philadelphia, PA**
University of Pennsylvania, Department of Bioengineering — *2019*
- Class: Network Neuroscience

Guest Lecturer — **Melbourne, Australia**
Monash University — *2017 - 2018*
- Class: Neuroscience Methods

Recitation Tutor — **Melbourne, Australia**
Swinburne University — *2014 - 2015*
- Class: Undergraduate Psychology

Recitation Tutor — **Melbourne, Australia**
Swinburne University — *2013*
- Class: Undergraduate Physiology

Research Employment

Research Assisstant — **Melbourne, Australia**
Monash Biomedical Imaging — *2018*
- Analysis of positron emission tomography (PET) data

Research Engineer — **Melbourne, Australia**
Torus Games & Cogstate — *2016 - 2017*
- Developed gamified cognitive tests for neuroscience research

Magnetoencephalography Technician — **Melbourne, Australia**
Swinburne Univerisity — *2013*
- Collection, preprocessing, and analysis of Magnetoencephalography (MEG) data

Open Science Contributions

Toolkits

Network Control — *Python*
`https://github.com/BassettLab/control_package`

Reproducibility

`https://github.com/lindenmp/neurodev_cs_predictive` *Python*

- Code to reproduce results presented in *Parkes et al. (2021) Biological Psychiatry*

`https://github.com/lindenmp/normative_neurodev_cs_t1` *Python*

- Code to reproduce results presented in *Parkes et al. (2021) Translational Psychiatry*

`https://github.com/lindenmp/rs-fMRI` *Matlab*

- Code to reproduce results presented in *Parkes et al. (2018) NeuroImage* and *Parkes et al. (2019) NeuroImage*

Presentations

Invited Lectures & Presentations

Association for Psychological Science, Chicago, IL *May 2022*
Available on YouTube

Feindel Virtual Brain and Mind Lecture Series, McGill University, Canada *May 2022*

Mount Sinai, New York City, NY *Mar. 2022*

Vanderbilt University, Nashville, TN *Mar. 2022*

Rutgers University, New Brunswick, NJ *Mar. 2022*

University of Manchester, Manchester, United Kingdom *Feb. 2022*

The Douglas Research Centre, Montreal, Canada *Feb. 2022*

University of California, Los Angeles, CA *Feb. 2022*

Georgia State University, Atlanta, GA *Nov. 2021*

University of Pittsburgh, Pittsburgh, PA *Oct. 2021*
Available on YouTube

Organization for Human Brain Mapping, Oral Presentation *Jun. 2021*

DataPhilly, Philadelphia, PA *Mar. 2021*
Available on YouTube

Organization for Human Brain Mapping, Symposium *Jun. 2020*

Organization for Human Brain Mapping, Oral Presentation *Jun. 2020*

University of Pennsylvania, Philadelphia, PA *Sep. 2018*

Centre of Excellence for Integrative Brain Function, Melbourne, Australia *Mar. 2018*

Swinburne Univerisity, Melbourne, Australia *Jun. 2016*

Students of Brain Research, Melbourne, Australia *Jun. 2015*

Australasian Cognitive Neuroscience Conference, Melbourne, Australia *Jun. 2013*

Posters (first-author)

Network controllability in transmodal cortex predicts positive psychosis spectrum symptoms *2021*
Organization for Human Brain Mapping

Network controllability in transmodal cortex predicts positive psychosis spectrum symptoms *2021*
Society of Biological Psychiatry

Psychopathology explain individuals unique deviations from normative neurodevelopment *2020*
Organization for Human Brain Mapping

Impulsivity and compulsivity correlate with effective connectivity in corticostriatal circuits *2019*
Organization for Human Brain Mapping

Impulsivity and compulsivity correlate with effective connectivity in corticostriatal circuits *2018*
Australasian Cognitive Neuroscience Conference

Evaluating the efficacy and sensitivity of motion correction strategies for rs-fMRI *2018*
Organization for Human Brain Mapping

Efficacy, reliability, and sensitivity of motion correction strategies for resting-state functional MRI *2017*
IEEE International Symposium on Biomedical Imaging

Efficacy, reliability, and sensitivity of motion correction strategies for resting-state functional MRI *2017*

Academic Service

Journal Peer Review

- PNAS, Science Advances, Nature Protocols, NeuroImage, Human Brain Mapping, Network Neuroscience, Scientific Reports, Biological Psychiatry, Psychological Medicine, Neuropsychologia, Developmental Cognitive Neuroscience, NeuroImage: Clinical, Psychiatry Research: Neuroimaging, Harvard Review of Psychiatry, International Gambling Studies, Journal of Cerebral Blood Flow & Metabolism

Committees

Organization for Human Brain Mapping, Open Science Special Interest Group *2022 - 2023*
Treasurer

Organization for Human Brain Mapping, Student and Postdoc Special Interest Group *2019 - 2021*
Treasurer

Australasian Cognitive Neuroscience Society, Early Career Researchers Committee *2017*
Committee Member

Australasian Cognitive Neuroscience Society, Executive Committee *2017*
ECR Representative

Students of Brain Research *2016*
Treasurer

Supervision & Mentorship

Ashlea Segal *2018 - present*
Graduate Student, Monash University

Tayla Currie *2018*
Undergraduate Honors Student, Monash University

John Fallon *2017*
Undergraduate Honors Student, Monash University

Luisa Prochazkova *2016*
International Visiting Scholar, Monash University

Kristina Sabaroedin *2016*
Undergraduate Honors Student, Monash University

Lauren Den Ouden *2016*
Undergraduate Honors Student, Monash University

Stuart Oldham *2016*
Undergraduate Honors Student, Monash University

Danielle Amiet *2016*
Undergraduate Honors Student, Monash University

Outreach & Community Engagement

Neuroimaging Best Practices Beyond Open Science *2021*
Organization for Human Brain Mapping, Student and Postdoc Special Interest Group

- Moderator

Link with Mentors *2021*
Organization for Human Brain Mapping, Student and Postdoc Special Interest Group

- Moderator

International Mentoring Programme *2021*
Organization for Human Brain Mapping, Student and Postdoc Special Interest Group

- Mentor

Network Control Theory for Neuroscientists, Education Workshop *2020*
Organization for Human Brain Mapping

- Organizer, presenter

Link with Mentors *2020*

Organization for Human Brain Mapping, Student and Postdoc Special Interest Group

- Moderator

NeuroDay *2018*

Methodist Ladies' College, Melbourne, Australia

- Organizer, presenter

BMH Mentor Forum *2018*

Brain & Mental Health Research Hub, Monash University

- Organizer, mentor

MBI Student Forum *2014 - 2015*

Monash Biomedical Imaging, Monash University

- Organizer, mentor, presenter