

# Reilly Innes

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## RESEARCH PROFILE

My research focuses on modelling both neural and behavioral data to understand the relationship between brain and behavior. These techniques can allow us to answer new questions, test a wealth of hypotheses and discover the structural and functional underpinnings of decision making. My PhD had a focus on the theoretical and practical application of the detection response task (DRT), a quantitative measure of cognitive workload and an index of cognitive capacity. From my research training and employment at the University of Newcastle cognitive laboratory, I have gained experience in mathematical modelling, decision making, coding in R & JavaScript, strong skills in data analysis, scientific writing and an understanding of consumer choice & decision-making methodology. With these skills, I aim to extend my area of research further within computational cognitive neuroscience.

## EDUCATIONAL QUALIFICATIONS

2017 – 2021	<b>PhD in Cognitive Science</b>	University of Newcastle
2013 – 2016	<b>Bachelor of Psychology (Hons)</b>	University of Newcastle

## RESEARCH AND EMPLOYMENT EXPERIENCE

2021

### **Post-Doctoral Researcher**

*Working on ERC Consolidator Grant: Decision Mechanisms in Deep Brain Networks. The main goal of the grant is to combine mathematic psychology, experimental psychology and cognitive neurosciences to form a deeper, more informed insight into the cognitive processes and neural mechanics underpinning decision making.*

*Supervisor: Birte Forstmann.*

- Working on joint neural (fMRI) and behavioural modelling.
- Experience with state-of-the-art neuroscientific methods and techniques.
- Analysing behavioural data through complex cognitive models.
- Linking process models to neural underpinnings.

2021

### **Post-Doctoral Researcher**

*Completed initial work on ARC Discovery Grant focused on dynamics of decision making. Modelling involved complex models of decision making and capacity with time-varying elements. Additional responsibilities included work on academic projects including joint modelling with EEG data, cognitive modelling clinical groups behavioural data, measuring workload in defence*

*related environments and developing/programming 13 cognitive psychology experiments.*

*Supervisors: Professor Scott Brown, Dr. Guy Hawkins, Associate Professor Ami Eidels and Professor Juanita Todd.*

- Experience in joint neural and behavioural modelling.
- Experience coding multiple cognitive psychology tasks in JavaScript.

2019 – 2021

### **Research Assistant**

*Completed work in consultation with University of New South Wales (School of Economics) on a new estimation approach for complex cognitive models and a new model comparison method. For more details on the Particle Metropolis within Gibbs sampling method, please see [here](#) and for information on the model comparison method, see [here](#).*

*Supervisors: Professor Scott Brown and Dr. Guy Hawkins.*

- Developed new R package – [PMwG](#).
- Experience in joint computational cognitive modelling.
- Conducted parameter recovery and model selection exercises.
- Developed new advanced model selection analyses.
- Assisted in [documentation](#) and user guides.

2020 – 2021

### **Analyst**

*Worked as an analyst for the FluTracking program at Hunter New England Health.*

*Supervisor: Dr. Craig Dalton*

- Experience with large data sets (over 70,000 responses per week)
- Analysis using SAS and R
- Assisted in user testing and user experience

2017 – 2021

### **PhD in Cognitive Sciences**

*Title: Behavioural Measurement of Cognitive Workload.*

*Supervisors: Professor Scott Brown & Associate Professor Ami Eidels.*

- Experiments aimed to test the effectiveness and sensitivity of the DRT.
- Conducted modelling exercises in R and RJags. Results from this analysis are presented in an [academic journal article](#).
- Worked collaboratively with Airbus-Hensoldt since 2016.
  - Designed workload measurement task for a helicopter simulator.
  - Presented results to relevant collaborating stakeholders.
  - Wrote a [scientific journal article](#) and two technical reports presenting study outcomes.
- Worked collaboratively with the Royal Australian Air Force (RAAF).
  - Awarded Faculty of Science Best Industry Engagement 2019.
  - Implemented an annual testing session for ~15 applicants.
  - Instigated testing of a qualified personnel comparison group.
  - Presented results to relevant military personnel.

- Authored an [academic journal article](#) on modelling results.
- The project is an ongoing collaboration which began in 2017.
- Undertook relevant literature review.
- Awarded for best post-graduate presentations at national conferences.
- Pitched research at several Defence Collaboration meetings.

JAN – MAY 2018

### **Research Assistant**

*Completed work in consultation with NSW State Forest on implementing analyses for new data collection methods.*

- Coded a Random Forest analysis linking historical and new lidar data.

2016

### **Honours Thesis**

*Thesis Title: Evidence for an Applied Measure of Cognitive Capacity in a Laboratory Environment.*

- Implemented an in-lab experiment using the DRT on undergraduates.
- Completed an in-depth literature review and [published results](#).

## **TEACHING EXPERIENCE**

2019 – 2021

### **Honours Supervision**

*Assisted in supervising seven 4<sup>th</sup> year honours students.*

- Coded >15 JavaScript experiments.
- Conducted data cleaning procedures.
- Created usable data outputs.
- Implemented a Qualtrics and RedCap questionnaire.
- Edited draft thesis sections.

2020

### **Guest Lecturer**

*Research Development (PSYC6505)*

- Lectured in Bayesian Statistics and Research Methods.

2017 – 2019

### **Course Tutor**

*Introduction to Cognitive Psychology (PSYC2300)*

*Foundations of Science and Technology (SCIM1040)*

- Conducted two-hour tutorials.
- Prepared tutorial material.
- Marked laboratory reports.

## **ACADEMIC AWARDS**

2021

Runner-up International Symposium for Aviation Psychology Stanley Roscoe Student Paper Competition.

2020	Faculty of Science Winner 3 Minute Thesis (virtual).
2019	University of Newcastle Faculty of Science Best Industry Engagement Award. CBMHR 2019 Travel Grant (\$1500) to attend and present at Psychonomics.
2018	Prize for best presentation at Australasian Experimental Psychology Conference.
2017	Prize for best presentation at Australasian Experimental Psychology Conference. Prize for best presentation at Centre for Brain and Mental Health Research. Postgraduate Conference.
2016	University of Newcastle Faculty of Science Medal. Prize for Best Presentation at University of Newcastle Fourth Year Conference. University of Newcastle Summer Scholarship.

## TECHNICAL COMPETENCIES

- |              |                         |                  |
|--------------|-------------------------|------------------|
| • R          | • Cognitive Modelling   | • RedCap         |
| • JavaScript | • Qualtrics             | • SAS (beginner) |
| • JSPsych    | • Python (intermediate) | • JATOS          |
| • LaTeX      | • SPSS                  |                  |
| • JASP       | • Jamovi                |                  |
| • rjags      | • jsPsych               |                  |

## PUBLICATIONS

- **Innes R. J.**, Brown, S. (2021). Helps or hinders? Assessing the cognitive workload effects from assistance in a tracking task. *Currently under review at Journal of Experimental Psychology: Applied*.
- Howard, Z., Evans, N., **Innes, R. J.**, Brown, S., Eidels, A. (2021). How is multi-tasking different from increased difficulty? *Psychonomic Bulletin & Review*. <https://doi.org/10.3758/s13423-020-01741-8>
- Keuken, M. C., Alkemade, A., Stevenson, N., **Innes, R. J.**, & Forstmann, B. U. (2021). Structure-function similarities in deep brain stimulation targets cross-species. *Neuroscience & Biobehavioral Reviews*, 131, 1127-1135.
- **Innes, R. J.**, & Brown, S. (2022). Helps or hinders? Assessing the cognitive workload effects from assistance in a tracking task. *Under Revision at JEP: Applied*.
- **Innes, R. J.**, & Todd, J. (2022). Modelling distraction: How stimulus-driven attention capture influences goal directed behaviour. *Under Revision at Journal of Cognitive Neuroscience*.
- **Innes, R. J.**, Howard, Z. L., Thorpe, A., Eidels, A., & Brown, S. (2021). The effects of increased visual information on cognitive workload in a helicopter simulator. *Human Factors & Ergonomics*. <https://doi.org/10.1177/0018720820945409>
- **Innes, R. J.**, Howard, Z. L., Evans, N. J., Eidels, A., & Brown, S. (2021). A broader application of the detection response task to cognitive tasks and online environments. *Human Factors & Ergonomics*. <https://doi.org/10.1177/0018720820936800>
- **Innes R. J.**, Kuhne, C. (2020). An LBA account of decisions in the multiple object tracking task. *The Quantitative Methods for Psychology journal*. <https://doi.org/10.20982/tqmp.16.2.p175>

- Thorpe, A., **Innes, R. J.**, Townsend, J., Heath, R., Nesbitt, K., Eidels, A. (2020). Assessing cross-modal interference in the detection response task. *Journal of Mathematical Psychology*, 98, 102390. <https://doi.org/10.1016/j.jmp.2020.102390>

## PRESENTATIONS

- **Innes, R. J.**, Eidels, A., Brown, S. (2017). Evidence for an Applied Measure of Cognitive Capacity in a Laboratory Environment. *Experimental Psychology Conference*, 2017.
- **Innes, R. J.**, Howard, Z. L., Eidels, A., Brown, S. (2017). An objective measure of cognitive workload: Evaluation and practical Application. *CBMHR Postgraduate Conference*, 2017
- **Innes, R. J.**, Howard, Z. L., Eidels, A., Brown, S. (2018). Biting off more than you can process: Group differences in cognitive workload. *Experimental Psychology Conference*, 2018.
- **Innes, R. J.**, Howard, Z. L., Thorpe, A., Eidels, A., Brown, S. (2019). Flying blind: Does adding information really help? *Australasian Mathematical Psychology Conference*, 2019.
- **Innes, R. J.**, Howard, Z. L., Eidels, A., Brown, S. (2019). A measurement tool for comparing cognitive workload differences (poster). *Society for Computers in Psychology Conference*, 2019.
- **Innes, R. J.**, Brown, S. (2019). Joint modelling group differences from military personnel. *Society for Mathematical Psychology Conference*, 2020.
- **Innes, R. J.**, Kuhne, C. (2020). Modelling decisions of the multiple object tracking task. *Australian Mathematical Psychology Conference*, 2020.
- Cooper, G., Cavallaro, J., **Innes, R. J.**, Kuhne, C., Hawkins, G., Brown, S. (2020). Hierarchical Bayesian parameter estimation with the Particle Metropolis within Gibbs sampler. *Society for Mathematical Psychology Conference*, 2020.
- **Innes, R. J.**, Cooper, G., Cavallaro, J., Kuhne, C., Hawkins, G., Brown, S. (2021). Particle Metropolis within Gibbs: An R package for Bayesian Hierarchical Modelling. *Australian Mathematical Psychology Conference*, 2021.
- Howard, Z., Eidels, A., **Innes, R. J.**, Loft, S. (2021). Using Past and Present Indicators of Human Workload to Explain Variance in Human Performance. *Australian Mathematical Psychology Conference*, 2021.
- **Innes, R. J.**, Howard, Z. L., Thorpe, A., Brown, S., Eidels, A. (2021). The Effects of Increased Visual Information on Cognitive Workload in a Helicopter Simulator. *International Symposium on Aviation Psychology*, 2021.
- **Innes, R. J.**, Todd, J., Brown, S. (2021). Modelling the distraction task using the LBA and neural covariates. *Society for Mathematical Psychology Conference*, 2021.

## CONFERENCES ATTENDED

2021	Society of Mathematical Psychology	Virtual
	International Symposium for Aviation Psychology	Virtual
	IMCN Terra Incognito	Virtual
	Australasian Mathematical Psychology	Newcastle, Australia
2020	Society of Mathematical Psychology	Virtual
	CBMHR Postgraduate Conference	Newcastle, Australia
	Australasian Mathematical Psychology	Coogee, Australia
2019	Psychonomics	Montreal, Canada
	Society for Computers in Psychology	Montreal, Canada
	Mathematical Psychology Society	Montreal, Canada
	Australasian Mathematical Psychology	Melbourne, Australia

	Airbus Industry and Innovation Day Defence Showcase Workshop	Sydney, Australia Newcastle, Australia
2018	Experimental Psychological Society Conference Sydney Postgraduate Psychology Conference	Hobart, Australia Sydney, Australia
2017	Experimental Psychological Society Conference CBMHR Postgraduate Conference Defence Industry Showcase Day	Shoal Bay, Australia Newcastle, Australia Newcastle, Australia

## PROFESSIONAL DEVELOPMENT

2020	<b>JavaScript Workshop</b> <i>Attended a semester-long JavaScript coding course, run in conjunction with Newcastle Cognition Lab, aimed at developing skills in coding cognitive science experiments for online use.</i>
2019	<b>JATOS Experiment Documentation (Newcastle Cognition Lab).</b> <i>Wrote documentation on how to implement new JATOS server interactions with old/current JavaScript experiments.</i>  <b>GGplot Workshop (Newcastle Cognition Lab).</b> <i>Conducted a short workshop on how to use ggplot in R.</i>  <b>Newcastle Cognition Lab Writing Club.</b> <i>Organised a writing club consisting of a small group of Newcastle Cognition Lab researchers.</i>
2018	<b>Complex Human Data Summer School</b> <i>Attended the CHD Summer School, hosted by University of Melbourne. The summer school included workshops from Danielle Navarro, Amy Perfors, Charles Kemp and Simon Dennis.</i>
2017	<b>JavaScript Coding.</b> <i>Coded several Discrete Choice Experiments (in js) for honours students.</i>

## PROFESSIONAL MEMBERSHIPS

Psychonomic Society – Student  
Society of Mathematical Psychology - Affiliate  
Reilly Innes

## COMMUNITY SERVICE

2022	Department of Psychology Social Committee Member
2021	Formed the Newcastle Psychology Post Graduate Society.
2021	Coded 13 javascript experiments, all of which are openly accessible and easily implemented.
2021	Presented tutorial session on PMwG to UNSW (March) and UQ (May).
2020	Developed R Package 'pmwg' as well as accompanying tutorial material with the aim of promoting more accessible modelling practice.
2019 – 2021	Volunteer presenter at various university outreach sessions.

## REFEREES

### Professor Scott Brown

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