Robert Taylor, PhD

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About Me

I am an internationally respected cognitive scientist with extensive research and computational modelling experience and have held research fellowships at leading universities around the world. My research has focused on the application of experimental methods to understand the neural mechanisms that limit human visual working memory and the development of computational models that describe these processes. This work has produced top tier journal publications and has been presented at international conferences. I have a strong background in both frequentist and Bayesian statistics, as well as experimental design. Since moving into New Zealand's public service, I have established a reputation as an excellent researcher within New Zealand Police and have been involved in several high-profile research projects, contributing to both experimental design and statistical analysis.

Academic Experience

University of Newcastle / Research Fellow

NOVEMBER 2018 - AUGUST 2019, NEWCASTLE, AUSTRALIA

Supervised by Dr. Guy Hawkins. My work focussed on understanding the neural processes underlying visual working memory and how visual working memory influenced choice behaviour.

University of Cambridge / Research Fellow

JANUARY 2017 - NOVEMBER 2018, CAMBRIDGE, UNITED KINGDOM

Supervised by Dr. Paul Bays. My work focussed on understanding the neural processes underlying visual working memory, using population coding to describe how visual features are maintained and recalled from visual memory.

University of New South Wales / Research Fellow

AUGUST 2014 - JANUARY 2017, SYDNEY, AUSTRALIA

Supervised by Dr. Chris Donkin. My work focussed on building, instantiating, and evaluating mathematical models of visual working memory.

General Academic Responsibilities

- Developed and tested computational models of human cognitive processes (R, MATLAB, C).
- Large scale simulations using high performance computing clusters.
- Design/programming of experimental protocols based upon in-depth reviews of literature and theory (Python, MATLAB).
- Grant reviewer for Swiss National Science Foundation.
- Publication of research projects in top tier journals and presentations at international conferences.
- Management of research programmes and delivered lectures for undergraduate courses.
- Thesis supervision.
- Ad hoc reviewer for: Behavior Research Methods; Journal of Mathematical Psychology; Journal of Experimental Psychology: Learning, Memory, & Cognition.

Professional Experience

Evidence-Based Policing Centre / Data Scientist

JULY 2020 - PRESENT, WELLINGTON

- Modelling and time-series forecasting of Police data using R and SAS statistical programmes.
- Responsible for visualisation and dissemination of critical insights to various Police decision-makers and stakeholders.
- Acted as a statistical liaison, providing consultation and peer review for ministerial reports and Police projects.
- Consistently produced high-quality research reports under changing circumstances and time pressure.

Evidence-Based Policing Centre / Evaluation Advisor

AUGUST 2019 - JULY 2020, WELLINGTON

- Responsible for evaluating Police trials to determine effectiveness of initiatives in order to improve Police practice and outcomes.
- Lead evaluator for the Armed Response Team (ART) trial and member of the ART Working Group alongside Police senior executives.
- Internal and external publication of information scans and research reports.
- Led publication of 200-page ART final report, which required synthesising contributions from other teams within Police.
- Effective management of multiple evaluation projects and delivery of high-quality reports under time pressure.

Education

Massey University / Doctor of Philosophy (Psych)

2015, PALMERSTON NORTH, NEW ZEALAND

Massey University / Master of Arts (Psych)

2011, PALMERSTON NORTH, NEW ZEALAND

Awards

- New Zealand Police Distinguished Scientist Award.
- Deans Award for Exceptional Doctoral Thesis.
- Massey University Vice-Chancellor Doctoral Scholarship.
- Massey University Masterate Scholarship.

Technical Skills

- Proficiency with statistical and computing languages, including R, Python, MATLAB.
- Manuscript preparation and typesetting with LaTeX.
- Programming of psychological experiments in MATLAB and Python.
- Strong statistical and psychological methods background, including Bayesian statistics.

Teaching / Workshops

- An Introduction to Bayesian ANOVA using JASP (U. Newcastle).
- An Introduction to Bayesian Hypothesis Testing using JASP (UNSW).
- PSYC3211 Cognitive Science (UNSW).

Publications

Published

Taylor, R. T., Tomic, I., Aagten-Murphy, D., & Bays, P. M. (2022). Working memory is updated by reallocation of resources from obsolete to new items. *Attention, Perception & Psychophysics.* DOI: 10.3758/s13414-022-02584-2.

Schneegans, S., **Taylor, R. T.,** & Bays, P. M. (2020). Stochastic sampling provides a unifying account of visual working memory limits. *Proceedings of the National Academy of Sciences*. Online first. DOI: 10.1073/pnas.2004306117.

Taylor, R. T., & Bays, P. M. (2020). Theory of neural coding predicts an upper bound on estimates of memory variability. *Psychological Review*, Online first. DOI: 10.1037/rev0000189.

Taylor, R. T., & Bays, P. M. (2018). Efficient coding in visual working memory accounts for stimulus specific variations in recall. *Journal of Neuroscience, 38,* 7132–7142. DOI: 10.1523/JNEUROSCI.1018-18.2018.

Bays, P. M., & **Taylor, R. T. (**2018). A neural model of retrospective attention in visual working memory. *Cognitive Psychology*, *100,* 43–52. DOI: 10.1016/j.cogpsych.2017.12.001.

Taylor, R.T., Thomson, H., Sutton, D., & Donkin, C. (2017). Does working memory have a single capacity limit? *Journal of Memory and Language, 93*, 67–81. DOI: 10.1016/j.jml.2016.09.004.

Konstantinidis, E., **Taylor, R. T.,** & Newell, B. R. (2017). Magnitude and incentives: revisiting the overweighting of extreme events in risky decisions from experience. *Psychonomic Bulletin & Review, 25,* 1925–1933. DOI: 10.3758/s13423-017-1383-8.

Kary, A., **Taylor, R. T.,** & Donkin, C. (2016). Using Bayes factors to test the predictions of models: A case study in visual working memory. *Journal of Mathematical Psychology, 72,* 210-219. DOI: 10.1016/j.jmp.2015.07.002.

Donkin, C., Kary, A., Tahir, F., & **Taylor, R. T. (**2016). Resources masquerading as slots: Flexible allocation of visual working memory. *Cognitive Psychology, 85,* 30-42. DOI: 10.1016/j.cogpsych.2016.01.002**.**

Hayes, B. K., Dunn, J. C., Joubert, A., & **Taylor, R. T. (**2016). Comparing single- and dual-process models of memory development. *Developmental Science, 20,* Online. DOI: 10.1111/desc.12469.

In Progress

Taylor, R. T., & Donkin, C. (Revise & Resubmit). Inferring the psychological representation of stimuli and the strength of memories from ranking responses in working memory tasks. *Computational Brain & Behavior.*

Donkin, C., **Taylor, R. T.,** & Le Pelley, M. (Revise & Resubmit). Evaluating models of visual working memory using a ranking task. *Psychological Review.*

Aagten-Murphy, D., Szinte, M., **Taylor, R. T.,** & Deubel, H. (Submitted). Visual landmarks calibrate auditory space across eye movements. *eLife.*

Theses / Dissertations

Taylor, R. T. (2015). *Hierarchical Bayesian modeling of criterion variance in probabilistic categorisation as an analogue to signal detection.* Ph.D Dissertation. Massey University, New Zealand. Retrieved from http://hdl.handle.net/10179/7397.

Taylor, R. T. (2010). *Criterion variance in signal detection theory: the interactive effect of knowledge of results and task difficulty on binary decision tasks.* MA Dissertation. Massey University, New Zealand. Retrieved from http://hdl.handle.net/10179/2340.

Conference Presentations / Talks

First author presentations only

Taylor, R. T. (April, 2019). *Examination of doubly stochastic processes in a neural model of visual working memory.* Talk presented at the 46th Australasian Society for Experimental Psychology conference, Wellington, New Zealand.

Taylor, R. T. (February, 2019). *Examination of doubly stochastic processes in a neural model of visual working memory.* Talk presented at the Australian Mathematical Psychology Conference Melbourne, Australia.

Taylor, R. T., & Bays, P. M. (May, 2018). *Efficient coding in visual working memory accounts for stimulus-specific variations in recall.* Poster presented at the 18th Annual Meeting of the Vision Sciences Society, St Pete Beach, Florida.

Taylor, R. T., & Bays, P. M. (April, 2018). *Efficient coding in visual working memory accounts for stimulus-specific variations in recall.* Talk presented at the 45th Australasian Society for Experimental Psychology conference, Tasmania, Australia.

Taylor, R. T., & Bays, P. M. (November, 2017). *Efficient coding in visual working memory accounts for stimulus-specific variations in recall.* Poster presented at the 47th Annual meeting of the Society for Neuroscience, Washington, DC, USA.

Taylor, R. T., Thomson, H., Sutton, D., & Donkin, C. (April, 2016). *Does working memory have a single capacity limit?* Talk presented at the 43rd Australasian Society for Experimental Psychology conference, Melbourne, Australia.

Taylor, R. T., Donkin, C., & Le Pelley, M. (July, 2015). *Using ranking judgements to compare models of visual working memory.* Poster presented at the 56th Annual Meeting of the Psychonomic Society, Chicago, Illinois, USA.

Taylor, R. T., Donkin, C., & Le Pelley, M. (July, 2015). *Using ranking judgements to compare models of visual working memory.* Talk presented at the Society for Mathematical Psychology conference, Newport Beach, California, USA.

Taylor, R. T., Donkin, C., & Le Pelley, M. (April, 2015). *Using ranking judgements in visual working memory.* Talk presented at the 42nd Australasian Society for Experimental Psychology conference, Sydney, Australia.

Taylor, R. T., Donkin, C., & Le Pelley, M. (February, 2015). *Ranking in visual working memory.* Talk presented at the Australian Mathematical Psychology Conference, Shoal Bay, Australia.

Taylor, R. T., & Podd, J. V. (April, 2013). *The interactive effect between knowledge of results and task difficulty in binary discrimination tasks.* Poster presented at the 40th Australasian Experimental Psychology Conference, Adelaide, Australia.

Invited Talks

Taylor, R. T. (2016). *Evaluating the evidence for discrete slots in visual working memory.* School of Psychology, University of Newcastle, Australia.

References

Available on request.