

Mark Hurlstone

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Personal

Full name	Mark John Hurlstone
Date of birth	June 21, 1980
Nationality	British citizen

Employment

<i>2014–Present</i>	Lecturer School of Psychology, University of Western Australia
<i>2012–2014</i>	Postdoctoral Research Associate (Stephan Lewandowsky & Carmen Lawrence) School of Psychology, University of Western Australia
<i>2010–2011</i>	Postdoctoral Research Associate (Robert Hughes & Dylan Jones) School of Psychology, University of Cardiff

Education

<i>2006–2010</i>	PhD Experimental Psychology School of Psychology, University of York <i>Thesis title:</i> The problem of serial order in visuospatial short-term memory <i>Supervisors:</i> Prof. Graham Hitch & Prof. Alan Baddeley
<i>2005–2006</i>	MSc Reading, Language, & Cognition School of Psychology, University of York
<i>2001–2004</i>	BSc (Hons.) Psychology School of Psychology, University of Leicester

Prizes and Awards

2015	School of Psychology, University of Western Australia <i>Research Funding Achievement Award (Early Career)</i>
2006	Department of Psychology, University of York <i>Department prize for highest scoring MSc student</i>
2004	School of Psychology, University of Leicester <i>Wladyslaw Sluckin prize for highest scoring BSc student</i>

Research Interests

<i>Auditory distraction</i>	Testing a duplex mechanism account of auditory distraction and attentional selectivity in which some forms of distraction are resistible and others are ineluctable.
<i>Behavioural economics</i>	Applying insights from laboratory experiments and psychology to economics, particularly the economics of climate change and other ecosystem issues.
<i>Cognitive modelling</i>	Computational and mathematical modelling of cognitive processes; model evaluation and selection issues; models of choice behaviour and response time.
<i>Human memory</i>	Short-term and long-term memory; serial recall memory; free recall memory; sequence learning; relationship between time and memory.

Competitive Grants

2016	Department of Agriculture and Food WA Biosecurity Research & Development Fund: Ben White & Mark Hurlstone: <i>Using economic experiments to demonstrate the principles of successful biosecurity cooperation to producers</i> (\$75,000).
2015	Australian Research Council Discovery Project: Simon Farrell, Gordon Brown, Geoff Ward, & Mark Hurlstone: <i>Developing a integrated memory-based model of evaluation and choice</i> (\$347,000).
2014	Commonwealth Scientific and Industrial Research Organisation Climate Adaptation Flagship: Mark Hurlstone & Iain Walker: <i>Establishing a Behavioural Economics Laboratory at The University of Western Australia</i> (\$100,000).

2010	Department of Psychology, University of York: Graham Hitch, Mark Hurlstone, & Tom Hartley: <i>An oscillator model account of effects of the timing of items in short-term memory</i> (£2,500).
2008	Experimental Psychology Society: Mark Hurlstone & Simon Farrell: <i>Modelling fill-in and infill errors in serial short-term memory</i> (£2,000).
2008	The Nuffield Foundation: Mark Hurlstone & Graham Hitch: <i>Auditory distraction in verbal and spatial immediate serial recall</i> . (£3,600).

Citation Indices

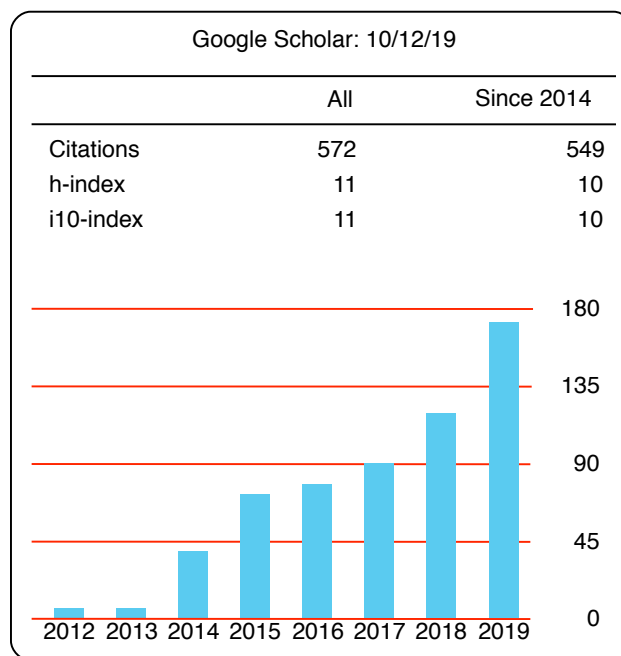


Figure 1: Google Scholar Citations.

Publications

Peer Reviewed Manuscripts - in preparation

Hurlstone, M. J. (2019, in preparation). Modelling response times in serial recall: A competitive queuing approach.

Hurlstone, M. J. (2019, in preparation). Reappraising the evidence against time-based accounts of serial recall.

Hurlstone, M. J. (2019, in preparation). Organisational factors in spatial free recall: Interaction of temporal and spatial clustering.

Hurlstone, M. J., & Farrell, S. (2019, in preparation). Associative chaining is not necessary to explain sequence learning.

Hurlstone, M. J., & Wang, S. (2019, in preparation). Leadership attenuates—but does not eliminate—intergenerational discounting in the climate game.

Hurlstone, M. J., White, B., McKie, G., & Tapsuwan, S. (2019, in preparation). The biosecurity game: A cooperation game for simulating the prevention of invasive pests.

Hurlstone, M. J., & Ecker, U. K. H., (2019, in preparation). Scientific certainty argumentation methods (SCAMs) and climate change: Exposing SCAMs shields against climate change misinformation.

Peer Reviewed Manuscripts - submitted

Bezdicek, O., Ballarini, T., Albrecht, F., Libon, D. J., Lamar, M., Ruzika, F., Roth, J., **Hurlstone, M. J.,** Mueller, K., Schroeter, M., & Jech, R. (2019, submitted). Serial order recall in working memory across the cognitive spectrum of Parkinson's disease and neuroimaging correlates.

Hurlstone, M. J., & Newell, B. R. (2020, forthcoming). Threshold uncertainty, early-warning signals, and the prevention of dangerous climate change.

Hurlstone, M. J. (2019, submitted). Modelling error patterns in verbal and spatial serial recall: Constraints for theories of short-term order memory.

Hurlstone, M. J., Thuijs, S., Rossen, I., & Ecker, U. (2019, submitted). Crafting normative messages to promote childhood vaccination.

MacFarlane, D., **Hurlstone, M. J., & Ecker, U. K. H.** (2019, submitted). Countering demand for unsupported health remedies: Do consumers respond to risks, lack of benefits, or both?

Hurlstone, M. J. (2019, in revision). Modelling immediate serial spatial recall performance in a macaque (*Macaca mulatta*).

Quinlan, P., & **Hurlstone, M. J.** (2019, in revision). Semantic chunking effects in verbal short-term memory: Constraints for resource models of item storage.

Peer Reviewed Manuscripts - published

Hurlstone, M. J. (2020, forthcoming). Serial recall. Invited book chapter contribution to Kahana, M., and Wagner, A. *The Oxford Handbook on Human Memory* (Oxford University Press). [IF = N/A; N-Citations = 0]

MacFarlane, D., **Hurlstone, M. J., & Ecker, U. K. H.** (2019). Reducing demand for unsupported health remedies: A taxonomy for overcoming psychological barriers. *Social Science & Medicine*. [IF = 3.71; N-Citations = 0; Top 20%]

Hurlstone, M. J., Price, A., Wang, S., Leviston, Z., & Walker, I. (2019). Activating the legacy motive mitigates intergenerational discounting in the climate game. *Global Environmental Change*. [IF = 10.43; N-Citations = 0; Top 20%]

Rossen, I., **Hurlstone, M. J., Dunlop, P., & Lawrence, C.** (2019). Accepters, fence sitters, or rejecters: Moral profiles of vaccination attitudes. *Social Science & Medicine*. Hurlstone joint 1st author. [IF = 3.71; N-Citations = 3; Top 20%]

Andreotta, M., Nugroho, R., **Hurlstone, M. J.**, Boschetti, F., Farrell, S., Walker, I., & Paris, C. (2019). [Contribution to special issue on "Using Big Data to Discover Principles of Cognition"] Analyzing social media data: A mixed-methods framework combining computational and qualitative text analysis. *Behavior Research Methods*. [IF = 3.60; N-Citations = 2; Top 20%]

Wang, S., **Hurlstone, M. J.**, Lawrence, C., Leviston, Z., & Walker, I. (2019). [Contribution to special issue on "The Cognitive Psychology of Climate Change"] Climate change from a distance: Psychological distance and construal level as predictors of pro-environmental engagement. *Frontiers in Psychology*. [IF = 2.46; N-Citations = 1]

Hurlstone, M. J. (2019). Functional similarities and differences between the coding of positional information in verbal and spatial short-term memory. *Memory*, 27, 147-162. [IF = 2.12; N-Citations = 2]

Xie, B., **Hurlstone, M. J.**, & Walker, I. (2018). [Contribution to special issue on "The Cognitive Psychology of Climate Change"] Correct me if I'm wrong: A group decision-making intervention improves reasoning in the climate stabilization task. *Frontiers in Psychology*. [IF = 2.46; N-Citations = 1]

MacFarlane, D., **Hurlstone, M. J.**, & Ecker, U. K. H. (2018). Contingency tables reduce demand for ineffective health products: Overcoming the illusion of causality. *Psychology & Health*, 15, 1-18. [IF = 2.23; N-Citations = 3; Top 20%]

Oberauer, K., Lewandowsky, S., Awh, E., Brown, G. D. A., Conway, A., Cowan, N., Donkin, C., Farrell, S., Hitch, G. J., **Hurlstone, M. J.**, Ma, Wei-Ji, Morey, C., Nee, D. E., Rouder, J., Schweppe, J., Vergauwe, E., & Ward, G. (2018; *note*: order of authorship is alphabetical after first two authors). Benchmarks provide common ground for model development: Response to the commentaries of Logie and Vandierendonck. *Psychological Bulletin*, 144(9), 972-977. [IF = 16.793; N-Citations = 0; Top 20%]

Oberauer, K., Lewandowsky, S., Awh, E., Brown, G. D. A., Conway, A., Cowan, N., Donkin, C., Farrell, S., Hitch, G. J., **Hurlstone, M. J.**, Ma, Wei-Ji, Morey, C., Nee, D. E., Rouder, J., Schweppe, J., Vergauwe, E., & Ward, G. (2018; *note*: order of authorship is alphabetical after first two authors). Benchmarks for models of short-term and working memory. *Psychological Bulletin*, 144(9), 885-958. [IF = 16.793; N-Citations = 28; Top 20%]

Wang, S., Leviston, Z., **Hurlstone, M. J.**, Lawrence, C., & Walker, I. (2018). Emotions predict policy support: Why it matters how people feel about climate change. *Global Environmental Change*, 50, 25-40. [IF = 10.43; N-Citations = 14; Top 20%]

Hurlstone, M. J., & Hitch, G. J. (2018). How is the serial order of a visual sequence represented? Insights from transposition latencies. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 44(2), 167-192. [IF = 2.86; N-Citations = 13]

Hurlstone, M. J., Wang, S., Price, A., Leviston, Z., & Walker, I. (2017). Cooperation studies of catastrophe avoidance: Implications for climate negotiations. *Climatic Change*, 140, 119-133. [IF = 3.34; N-Citations = 5; Top 20%]

Rossen, I., **Hurlstone, M. J.**, & Lawrence, C. (2016). Going with the grain of cognition: Applying insights from psychology to build support for childhood vaccination. *Frontiers in Psychology*, 7:1483. [IF = 2.46; N-Citations = 12]

Hartley, T., **Hurlstone, M. J.**, & Hitch, G. J. (2016). Effects of rhythm on memory for spoken sequences: A model and tests of its stimulus-driven mechanism. *Cognitive Psychology*, 87, 135-178. [IF = 4.54; N-Citations = 30; Top 20%]

Hurlstone, M. J., & Hitch, G. J. (2015). How is the serial order of a spatial sequence represented? Insights from transposition latencies. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 41, 295-324. [IF = 2.86; N-Citations = 25; Top 20% in 2015]

Hurlstone, M. J., Lewandowsky, S., Sewell, B., & Newell, B. (2014). The role of framing and normative messages in building support for climate policies. *PLoS ONE*. [IF = 3.23; N-Citations = 28; Top 20% in 2014]

Hurlstone, M. J., Hitch, G. J., & Baddeley, A. D. (2014). Memory for serial order across domains: An overview of the literature and directions for future research. *Psychological Bulletin*, 140, 339-373. [IF = 16.793; N-Citations = 202; Top 20%]

Unsworth, K. L., Russell, S. V., Lewandowsky, S., Lawrence, C., Fielding, K., Heath, J., Evans, A., **Hurlstone, M. J.**, & McNeill, I. (2013). Individual adaptation to climate change and psychological drivers: What about me? Factors affecting individual adaptive coping capacity across different population. *National Climate Change Adaptation Research Facility*. [IF = N/A; N-Citations = 4]

Farrell, S., **Hurlstone, M. J.**, & Lewandowsky, S. (2013). Sequential dependencies in recall of sequences: Filling in the blanks. *Memory & Cognition*, 41, 938-952. [IF = 2.46; N-Citations = 21]

Hughes, R., **Hurlstone, M. J.**, Marsh, J. E., Vachon, F., & Jones, D. M. (2013). Cognitive control of auditory distraction: Impact of task difficulty, foreknowledge, and working memory capacity supports duplex-mechanism. *Journal of Experimental Psychology: Human Perception and Performance*, 39, 539-553. [IF = 3.36; N-Citations = 124; Top 20% in 2013]

Hughes, R., Vachon, F., **Hurlstone, M. J.**, Marsh, J., Macken, W., & Jones, D. M. (2011). Disruption of cognitive performance by sound: Differentiating two forms of auditory distraction. In *Proceedings of the 10th International Congress on Noise as a Public Health Problem*. [IF = N/A; N-Citations = 12]

Theses

Hurlstone, M. J. (2010). *The problem of serial order in visuospatial short-term memory*. Unpublished PhD thesis, University of York, UK. [N-Citations = 5]

Hurlstone, M. J. (2006). *Top-down processing and temporal grouping in immediate serial recall*. Unpublished MSc thesis, University of York, UK.

Hurlstone, M. J. (2004). *The modularity of ordering processes in verbal and spatial short-term memory*. Unpublished BSc thesis, University of Leicester, UK.

Conference Papers

Hurlstone, M. J., & Newell, B. R. (April, 2018). Threshold uncertainty, early-warning signals, and the prevention of dangerous climate change. Experimental Psychology Conference, Hobart, Tasmania.

Hurlstone, M. J., Hartley, T., & Hitch, G. J. (July, 2016). Effects of rhythm on memory for spoken sequences: A model and tests of its stimulus-driven mechanism. Paper presented at the Sixth International Conference On Memory, Budapest, Hungary.

Hurlstone, M. J. (July, 2016). Modelling immediate serial spatial recall in a macaque (*Macaca mulatta*): A competitive queuing approach. Paper presented at the Sixth International Conference On Memory, Budapest, Hungary.

Hurlstone, M. J. (July 2015). Cooperation studies of catastrophe avoidance: Implications for climate negotiations. WSEN, Murdoch University WA, Australia.

Hurlstone, M. J., Lewandowsky, S., Newell, B. R., & Sewell, B. (Dec, 2013). Curbing emissions: Framing and normative messages influence CO₂ abatement policy preferences. University of New South Wales, Sydney NSW, Australia.

Hurlstone, M. J., & Lawrence, C. (July, 2012). The impact of normative feedback on pro-environmental intentions and behaviour. National Climate Change Adaptation Research Facility Conference, Melbourne, Australia.

Hurlstone, M. J., & Lewandowsky, S. (July, 2012). Climate change coping and the effects of social norms and message framing on those with extreme worldviews. National Climate Change Adaptation Research Facility Conference, Melbourne, Australia.

Hurlstone, M. J., Hughes, R., & Jones, D. M. (November, 2011). Auditory distraction: The resistible and the ineluctable. Auditory Perception, Cognition and Action Meeting, Seattle, USA.

Hurlstone, M. J. (July, 2011). Memory for serial order across domains: Four common principles. Paper presented at the Fifth International Conference On Memory, York, U.K.

Hurlstone, M. J., Hitch, G. J., & Baddeley, A. D. (July, 2009). Modelling grouping effects in verbal and spatial short-term order memory. Paper presented at the Experimental Psychology Society, York, U.K.

Hurlstone, M. J., Hitch, G. J., & Baddeley, A. D. (Jan, 2009). How is the serial order of a visuospatial sequence coded? Insights from transposition latencies. Paper presented at the Experimental Psychology Society, London, U.K.

Hartley, T., **Hurlstone, M. J.,** & Hitch, G. J. (July, 2008). An oscillator model account of effects of the timing of items in short-term memory. Paper presented at the XXIXth International Congress of Psychology, Berlin, Germany.

Invited colloquia & workshops

2019, October.	Workshop: <i>Cognition and climate change: Can psychology help save the planet?</i> The University of Central Lancashire, UK.
2019, August.	Alumni Event: <i>Plastic, plastic everywhere: What's a person to do?</i> The University of Western Australia, Singapore.
2015, July.	Workshop: <i>Working memory benchmarks: Part II.</i> University of Zurich, Switzerland.
2014, July.	Workshop: <i>Working memory benchmarks: Part I.</i> University of Zurich, Switzerland.
2013, December.	Symposium: <i>Psychology and climate change.</i> University of New South Wales, Sydney NSW, Australia.

Teaching

- 2018–current *Guest lecturer, PSYC3303 Psychological Science in the Modern World.* This unit exposes students to the major debates, issues, and controversies in modern psychology. The unit examines a series of contemporary practical or theoretical issues and debates through a set of lectures addressing different social problems. The objective is that students use the skills taught to them in this and other units to appraise the theoretical and practical implications of various perspectives in any debate. The topics vary from year to year as key issues and debates in society and in the field of psychology change. Topics may include climate change, energy and water conservation, social conflict and educational disadvantage. I deliver a guest lecture providing behavioural economic insights into why the international climate change negotiations have proved so disappointing.
- 2017–current *Unit coordinator, PSYC3302: Psychological Measurement and its Application, School of Psychological Science, University of Western Australia.* This unit introduces students to the theoretical and practical underpinnings of psychological measurement. Topics covered include the theoretical and empirical bases of reliability and validity, classical and contemporary approaches to reliability and validity, test biases, responses biases, item response theory, state-trace analysis, and applications of psychological measurement to intelligence and personality testing. Teaching is by seminars (13×2 hours) and laboratory classes (13×2 hours). Evaluation is by class participation (5%), laboratory report (20%), SPSS Lab Exam (25%), and final exam (50%).
- 2016–current *Guest lecturer, PSYC2212 Psychology and Social Behaviour, School of Psychological Science, University of Western Australia.* This unit examines the factors that influence psychological functioning in a social environment. The unit considers some of the latest theories, research and applications in areas such as attitudes, stereotyping and prejudice, relationships, altruism and social groups. Teaching is by seminars (13×2 hours) and laboratory classes (5×2 hours). Evaluation is by laboratory class participation (10%), two laboratory reports (20% each), and final exam (50%). I delivered a guest lecture and laboratory class on the behavioural economics of human cooperation in 2016, and a further guest lecture on the behavioural economics of social preferences in 2018.
- 2012–current *Topic leader, PSYC3310: Specialist Topics in Psychology, School of Psychological Science, University of Western Australia.* This unit focuses on providing students with the opportunity to learn about and perform research in a specialist topic area of psychology. Teaching is by seminars (10×2 hours) and tutorials (10×2 hours) which are delivered to a small class of between 20–30 students. Evaluation is by small scale research project report (60%), research proposal (15%), ethics application (5%), class participation and informal group presentation (10%), and formal group presentation (10%). I have delivered topics in this unit spanning a wide range of areas including: Principles of Short-term and Episodic Memory, Psychology and Climate Change, Political Psychology, Behavioural Economics, and Behavioural Game Theory. From 2014–2016 I delivered two specialist topics in parallel with different groups of students.

Manuscript Reviewing

I am an ad hoc reviewer for the following journals:

Acta Psychologica / *Canadian Journal of Experimental Psychology* / *Environment & Behavior* / *Frontiers in Psychology* / *Journal of Clinical and Experimental Neuropsychology* / *Journal of Environmental Psychology* / *Journal of Experimental Psychology: General* / *Journal of Experimental Psychology: Applied* / *Journal of Experimental Psychology: Human Perception & Performance* / *Journal of Experimental Psychology: Learning, Memory, & Cognition* / *Journal of Mathematical Psychology* / *Journal of Memory and Language* / *Memory / Memory & Cognition* / *Nature Climate Change* / *PLoS ONE* / *Psychological Bulletin* / *Psychological Review* / *Psychological Science* / *Social Science & Medicine* / *Quarterly Journal of Experimental Psychology*.

Grant Reviewing

Australian Research Council (Discovery, Linkage, DECRA)

Service

2018–current	Deputy Chair of External Colloquia Committee and member of Indigenous Working Group, School of Psychological Science, University of Western Australia
2017–current	Member of Undergraduate Education Committee, School of Psychological Science, University of Western Australia
2016–2017	Member of External Colloquia Committee & Deputy Chair of Ethics Committee, School of Psychological Science, University of Western Australia

Research Supervision

PhD ($N = 6$)

Completed ($N = 1$)

2014–2019	Susie Wang (co-supervised with Carmen Lawrence, Iain Walker, & Zoe Leviston)
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Ongoing ($N = 6$)

2020–	Li Qian Tay (co-supervised with Ullrich Ecker)
2017–Current	Anthony Di Pietro (co-supervised with Simon Farrell)
2016–Current	Matthew Andreotta (co-supervised with Iain Walker & Fabio Boschetti)

Georgiana Cheuck (co-supervised with Simon Farrell)
Douglas McFarlane (co-supervised with Ullrich Ecker)
Blake Cavve (co-supervised with Simon Farrell)

Honours ($N = 31$)

2019	Matthew Mortimer, Julia Nunn, Emma Sharpe, Kate Woolhouse, Christopher Zhao
2018	Cassandra Mircev, Emma Vincan, Mathew Walzciek
2017	Andrew Dawson, Savannah Robertson
2016	Andrew Dobson, Jordan Illey, Alexandra Kenyon, Catherine Mazza, Caitlin McAuliffe, Jesse Reid, Simon Thuijs, Belinda Xie
2015	Matthew Andreotta, Marianne Campbell, Grace McKie, Annabel Price
2014	Jemma Heart, Jay Kinkade, Jessica Sipes, Emily Tuckey
2013	Mei Jae Lai, Sarah Meredith, Isabelle Stacey
2012	Shaun Markovic, Brittany Sewell

Technical Skills

I am a proficient user of \LaTeX , MATLAB, Python, and R.

I have experience of developing, implementing, and testing cognitive models, including both algebraic and simulation models. The latter includes neural networks and sequential sampling models, such as random walk and accumulator models. I am also experienced in the use of a number of model evaluation and selection methods, including: least squares and maximum likelihood parameter estimation; polytope optimization algorithms; information criteria approaches (e.g., AIC and BIC); parameter space partitioning; landscaping; cross validation and generalization methods; bootstrapping methods.

Teaching Statement

My teaching is characterised by high production values, a commitment to transparency of learning objectives, assessment criteria, and expectations, and the application of insights from psychology to improve student performance, satisfaction, and well-being. Some strategies and techniques that I employ to achieve these goals are summarised below.

Improving learning and retrieval

Research in learning and memory shows that people exhibit a natural preference for representing information in a hierarchically organised manner. So strong is this preference that even when presented with information that is devoid of such structure, people will spontaneously impose a hierarchical structure upon it. To this end, the content in my lectures is always organised hierarchically, and I make this hierarchical organisation salient in my lecture slides by including a prominent sidebar (Fig. 1) that conveys the organisation of the material to-be-covered, as well as the current position within the hierarchy. Students in my units have repeatedly told me that they like this approach because when I am delivering the lecture content the presence of the overall lecture structure in the sidebar serves as a scaffold for understanding how something that I am discussing fits within the broader lecture content. Students also find that this structure is a useful revision and memory retrieval aid.

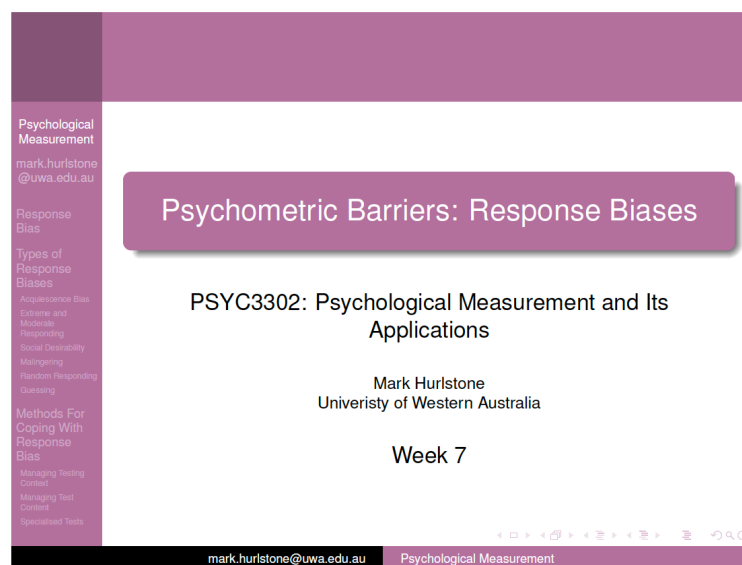


Figure 2: Using a prominent sidebar to represent the hierarchical structure of a lecture.

Improving attention and engagement

One of the major challenges for any lecturer is getting students to devote their full attention to the lecture material so that they understand the concepts involved. This is a serious challenge in my units where the average lecture lasts almost two hours, which is a long time to expect students to be able to maintain focused attention. However, I have discovered a strategy for dealing with this problem that exploits the human need for cognitive closure. The ‘need for cognitive closure’ is a cognitive style construct that has been studied by social and personality psychologists, which refers to the desire for a firm answer to questions, and an aversion to uncertainty and ambiguity. In my teaching, I exploit this psychological

tendency by posing each lecture as a ‘mystery’, with the mystery becoming ever deeper as the lecture unfolds, and with the resolution to the mystery only being offered at the conclusion of the lecture (Fig. 2). This strategy keeps students steadfastly focused to the mystery story due to its unresolved nature, which promotes cravings for cognitive closure.

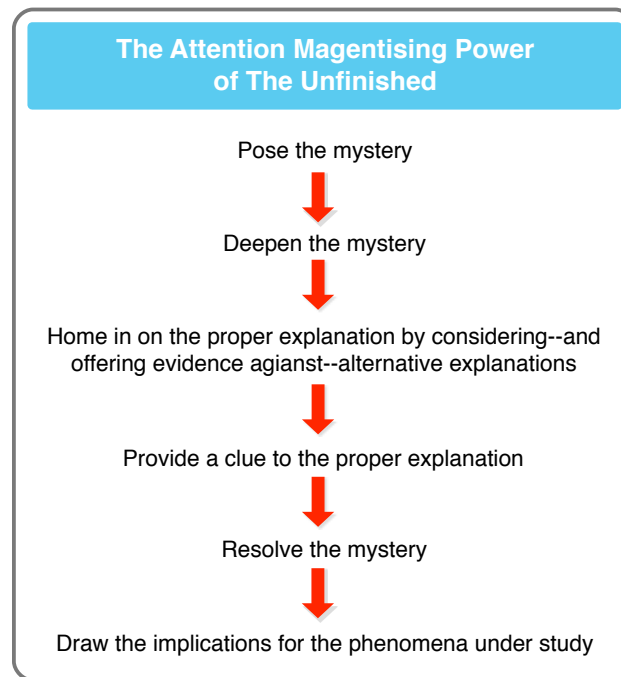


Figure 3: Mysterious stories engage focused attention by promoting a need for cognitive closure.

Reducing uncertainty

It is often said that ‘uncertainty is the enemy of action’. Indeed, research in psychology and economics shows that even relatively low levels of uncertainty can have an adverse impact on planning, judgement, and decision-making. Uncertainty is pervasive, even in university teaching, but I try to eliminate the ‘needless uncertainty’ that we as lecturers sometimes impose on our students. For example, writing the psychology lab report is a difficult task, and psychology students have to master a variety of things including how to structure their reports, what to discuss—and not to discuss—in different sections, the accepted reporting conventions in different sub-fields (e.g., experimental psychology, social and personality psychology, clinical psychology etc), and the complexities of APA style. You simply cannot teach students these things in a ‘one-size-fits-all’ lab report handbook. For students to master the art of writing lab reports well, they need the number of degrees-of-freedom on how a report should be written to be reduced, by providing them with some concrete guidance on how to organise their reports. To this end, in my units, I inform my students what literature is relevant in introduction, the precise sub-sections to include in their methods and what to mention in each, what analyses to report in their results and what figures or tables to use to summarise their data, and how to structure their discussions. By doing so, students get to focus exclusively on the content of their writing and their understanding of the topic, rather than grapple with the many deep uncertainties about what they should, and should not, be doing. As another example, in my PSYC3302 final exam, I make sure that the questions are ‘content valid’, meaning that each lecture in the unit is represented equally in the exam in terms of the number of test items, and I tell my students this from the outset. I also provide them with examples of the multiple-choice test item formats that they

will be subjected to. This has the effect of reducing exam anxiety amongst students who know that even if their memory or comprehension of certain lectures fails them, it will not overly compromise them in terms of their final mark.

Reducing stereotype threat

Stereotype threat is a serious—yet often overlooked—problem in university teaching. For example, the stereotype that certain ethnic groups are less intelligent than others and that women are less skilled in maths and statistics than men creates stress and anxiety for people who are subjected to such negative stereotypes. The latter stereotype is especially problematic in the units that I teach, as they all involve a strong quantitative component. To mitigate stereotype threat, in the very first lecture of my units I employ a socio-psychological intervention developed by Carol Dweck that has been shown to be remarkably effective at reducing this problem. Specifically, I teach my students about the “growth mindset” theory of intelligence, according to which intelligence is not fixed and unchangeable, but rather is malleable and improvable with hard work and effort. This encourages students to see setbacks as being the result of insufficient effort or poor strategy, rather than an inherent inability to perform a task. Such attributions, in turn, encourage students to cope with setbacks resiliently by redoubling their efforts and seeking help.

Promoting a sense of belonging

To learn effectively, students need to feel that they belong. If students feel that they are struggling relative to their peers—whether this is real or imagined—then their sense of belonging is eroded, and their academic and health outcomes will take a downward turn. To promote a sense of belonging, in the first lecture of my units I employ another socio-psychological intervention, which entails telling students that it is common to doubt one’s ability and experience academic difficulties, and the very act of feeling concerned about these experiences is testament that a student belongs at a university. I back this message up with anecdotes—sometimes personal—about students struggling and questioning their belonging before ultimately succeeding. Research shows that this intervention fosters feelings of belonging and improved health and academic outcomes.

Research Statement

My research interests include both basic and applied work in human cognition, environmental economics and psychology, and individual and collective decision-making. Current interests revolve around the following three broad themes.

Short-term memory for serial order

One stream of basic research focuses on understanding the mechanisms underpinning the encoding and retrieval of serial order information from short-term memory—a competency essential for higher level acts of cognition such as vocabulary acquisition and language production. I have marshalled together evidence from behavioural, computational, and electrophysiological studies, which supports the notion that sequences from different cognitive domains (verbal, visual, spatial, and motoric) are planned and performed using a competitive queuing mechanism in which items are simultaneously activated in parallel, and the most active item is output[1, 2]. In verbal short-term memory, several lines of evidence indicate that within the competitive queuing system, serial order is represented by a mechanism combining a primacy gradient of activations over items, associations between items and position markers, with suppression of items once they have been retrieved. Using computational simulations and behavioural experiments, I have provided evidence for the operation of the same representational mechanism in non-verbal short-term memory, both in human[3, 4] and nonhuman primates[5]. These results suggest that the brain has converged on common mechanisms and codes for representing serial order across different domains, and that these mechanisms and codes may be evolutionarily ancient solutions to the problem of serial order. Notwithstanding these similarities across domains and species, I have presented evidence that in humans, there is some divergence in the way that positional information is represented in the verbal and nonverbal domains, suggesting that modality-specific mechanisms—rather than a domain-general system—might be responsible for coding position[6, 4]. With my collaborators, I have developed a model of short-term memory, speech perception, and language production that elucidates the nature of the positional codes that might be used in verbal short-term memory. In the model, positional information is represented by a timing signal—a population of bottom-up driven oscillators, or frequency sensitive detectors, that become entrained to the temporal rhythm of an auditory-verbal sequence. The model can explain a number of findings that are beyond the purview of earlier models of verbal short-term memory, and additionally accounts for syllabic-constraints on lexical access in speech recognition (i.e., pre-lexical cues to speech segmentation) and speech errors (e.g., Spoonerisms) in language production[7]. Recently, I was one of several experts that contributed to an ambitious effort to create an accepted set of empirical benchmarks for short-term memory and working memory to facilitate theoretical developments in these fields[8, 9].

Psychology of climate change

A second applied stream of research examines the psychological factors that promote and inhibit individual and collective action on climate change. One line of work in this stream has examined ways to try to increase citizens generally low willingness to prioritise climate policies for reducing emissions. This work has shown that support for climate policies can be bolstered by: (1) reframing the costs of reducing emissions as a ‘foregone gain’—incomes rise in the future but not by as much as in the absence of emission cuts—rather than as an ‘actual loss’—incomes decrease relative to baseline expected future levels, and (2) conveying social-norming information about the emissions policy preferences of other individuals[10]. In other work, my colleagues and I have shown that the generally low willingness citizens have toward prioritising climate policies is linked with the hypothetical, social, spatial, and temporal psychological distance of climate change[11]—climate change is generally perceived as a phenomenon that will have uncertain impacts on other people, in other places, in the distant future. This raises the possibility that public support for climate policies might be increased by making climate change feel psychologically closer. However, our research has shown that such reframing is ineffective[11], and that the key to reduc-

ing psychological distance is by triggering strong emotional and visceral responses by underscoring how climate change will harm the ‘objects of care’ that people love and cherish[12]. We have further shown that perceived distance from climate change along the temporal and social distance dimensions, which gives rise to intergenerational discounting—the tendency for current actors to prefer smaller benefits for themselves now, rather than larger benefits for future others—can be reduced, and beneficence to future generations increased, by activating the ‘legacy motive’—the inherent drive that people possess to leave a positive legacy that will outlive their mortality. This motive can be activated by priming people with thoughts of death (mortality salience), feelings of power and responsibility toward future generations, and by promoting feelings of intergenerational reciprocity—the desire to ‘pay forward’ to future generations the benefits left to us by past generations[13]. Perhaps most important of all, citizens need to understand the pressing need to reduce emissions ‘now’, rather than ‘wait-and-see’ or ‘go slow’. Appreciating this simple fact requires that citizens understand stock-flow relationships and the mathematical concept of accumulation—to stabilise atmospheric levels of CO₂, the inflow of CO₂ from emissions and the outflow of CO₂ through absorption must be equalised. Studies have repeatedly shown that individuals fare poorly when assessed on their understanding of this climate stabilisation problem. However, we have shown that reasoning performance is greatly increased if people attempt the climate stabilisation problem in groups, rather than as individuals[14]. Group discussion serves to invalidate the faulty reasoning strategies used by some individual group members, thus increasing the proportion of group members who possess the correct mental model of the CO₂ system. We argue on the basis of these results—and others[15]—that policy-making and public education would benefit from group-based practices.

Cooperating to avoid catastrophe

Another line of applied work uses economic experiments and game theoretic analyses to examine the factors that spur and inhibit group efforts to avoid catastrophic collective-risks. The collective-risk scenario I am most interested in is global efforts to avoid crossing a threshold for dangerous climate change. Although the Paris Climate Agreement identifies a dangerous threshold of 2°C, it is widely recognised that this target is a political tool, and that there is in fact considerable scientific uncertainty regarding the location of the threshold for dangerous climate change. I have shown in the laboratory that this threshold uncertainty is a major impediment to cooperation—when the threshold is known with certainty, groups can coordinate their efforts to prevent catastrophe, but when the threshold is uncertain coordination collapses, and cooperation is elusive[16]. The obvious solution to this problem is to try to reduce uncertainty about the location of the dangerous threshold, through the identification of early-warning signals of approaching climate thresholds. However, I have shown in the laboratory that such signals—even when they signify a 70%–90% reduction in threshold uncertainty—do not change the probability of groups averting catastrophe; cooperation remains soberingly elusive[16]. If this picture is not bleak enough, additional work in the laboratory has shown that the cooperation problem is exacerbated even further under more realistic conditions that factor into account the effects of intergenerational discounting on group decision-making[13]. When the benefits of cooperation accrue to decision makers in the present, high levels of cooperation are sustained, whereas when the benefits accrue to future generations, intergenerational discounting destroys all prospects of cooperation. In an analysis of the dangerous climate change game literature[17], I have argued that results such as these suggest that the Paris Climate Agreement is doomed to fail unless strategic enforcement mechanisms can be built into the agreement that reward cooperation and deter defection.

Another collective-risk dilemma I have studied in the laboratory pertains to the supply of various weakest-link public goods—public goods whose provision (or lack thereof) depends upon the actions of those individuals that contribute the least. Herd immunity from disease through vaccination is a good example of such weakest-link public goods, but the scenario I have studied emulates the weakest link public good of biosecurity protection amongst farmers to prevent catastrophic crop losses from agricultural pest outbreaks[18]. This work has shown that the perception of risk is a major predictor of cooperation—when the perception of risk is low, the game is a classical Prisoners’ dilemma in which the dominant strategy

is defection; however, when the perception of risk is high, the game is a coordination game in which the focal strategy is cooperation. I have additionally shown that the ability of players to communicate with one another, boosts cooperation in both risk scenarios. Recent work suggests the benefit of communication arises because it allows conditional cooperators—players who are willing to cooperate provided that other players are willing to do so too—can identify one another, and be confident that their cooperation will be reciprocated. Moreover, in well-mixed groups where the fraction of cooperators will be higher than defectors, we find that a simple binding majority voting rule can allow cooperators to override the influence of defectors, ensuring that high levels of cooperation are sustained[19]. These results suggest that biosecurity cooperation can be promoted by providing early-warning signals of the risk of impending outbreaks, and by developing coordinating institutions that foster communication, and allow democracy to dictate the course of action that all individuals must take to safeguard the commons.

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