

## Employment

Assistant Professor

Georgetown University • Psychology

August 2016 – *Present*

Postdoctoral Fellow, Adjunct Professor

University of Western Ontario • Developmental Psychology

October 2012 – July 2016

*Advisor* Daniel Ansari

## Education

PhD University of Chicago (2012) • Psychology (Cognitive) • *Advisor* Sian L. Beilock

BS Brown University (2004) • Cognitive Science • *Honors* (with Steven A. Sloman)

## Publications

### *Peer-Reviewed Articles*

Hutchison JE, Ansari D, Zheng S, De Jesus S, **Lyons IM** (2022). Extending ideas of numerical order beyond the count-list from kindergarten to first grade. [Cognition, 223:105019](#).

Fias W\*, Sahan MI\*, Ansari D, **Lyons IM** (2021). From counting to retrieving: Neural networks underlying alphabet arithmetic learning. [Journal of Cognitive Neuroscience, 34\(1\):16-33](#). (\*Co-first authors)

Gattas SU, Bugden S, **Lyons IM** (2021). Rules of Order: Evidence for a novel influence on ordinal processing of numbers. [Journal of Experimental Psychology: General, 150\(10\):2100-2116](#).

Daker RJ, Gattas SU, Sokolowski HM, Green AE, **Lyons IM** (2021). First-year students' math anxiety predicts STEM avoidance and underperformance throughout university, independently of math ability. [NPJ Science of Learning, 6\(1\):1-13](#).

Ren Z\*, Daker RJ\*, Shi L\*, Sun J, Beaty RE, Wu X, Chen Q, **Lyons IM**, Green AE<sup>^</sup>, Qiu J<sup>^</sup> (2021). Connectome-Based Predictive Modeling of Creativity Anxiety. [NeuroImage, 225:117469](#). (\*Co-first authors, <sup>^</sup>Co-senior authors).

Hutchison JE, Ansari D, Zheng S, De Jesus S, **Lyons IM** (2020). The Relation between Subitizable Symbolic and Non-Symbolic Number Processing over the Course of the Kindergarten School Year. [Developmental Science, 23\(2\):e12884](#).

- Daker RJ, Cortes RA, **Lyons IM\***, Green AE\* (2020). Creativity Anxiety: Evidence for Anxiety that is Specific to Creative Thinking from STEM to the Arts. [\*Journal of Experimental Psychology: General\*, 149\(1\):42-57.](#) (\*Co-senior-author with Green)
- Tiberghien K, De Smedt B, Fias W, **Lyons IM** (2019). Distinguishing between Cognitive Explanations of the Problem Size Effect in Mental Arithmetic via Representational Similarity Analysis of fMRI Data. [\*Neuropsychologia\*, 132:107-120.](#)
- Hutchison JE, **Lyons IM**, Ansari D (2019). More Similar than Different: Gender Differences in Children's Basic Numerical Skills are the Exception not the Rule. [\*Child Development\*, 90\(1\):66-79.](#)
- Sokolowski HM, Hawes Z, **Lyons IM** (2019). What explains sex differences in math anxiety? A closer look at the role of spatial processing. [\*Cognition\*, 182:193-212.](#)
- Tiberghien K, Sahan MI, De Smedt B, Fias W, **Lyons IM** (2019). Disentangling neural sources of problem-size and interference effects in multiplication. [\*Journal of Cognitive Neuroscience\*, 31\(3\):453-67.](#)
- Daker RJ, **Lyons IM** (2018). Numerical and Non-Numerical Predictors of First Graders' Number-Line Estimation Ability. [\*Frontiers in Psychology\*, 9:2336.](#)
- Lyons IM\***, Ramirez G\*, Maloney EA, Rendina DN, Levine SC, Beilock SL (2018). Spatial Anxiety: A novel questionnaire with subscales for measuring three aspects of spatial anxiety. [\*Journal of Numerical Cognition\*, 4\(3\).](#) (\*Co-first-author with Ramirez)
- Lyons IM**, Beilock SL (2018). Characterizing the Neural Coding of Symbolic Quantities. [\*NeuroImage\*, 178:503-18.](#)
- Lyons IM**, Bugden S, Zheng S, De Jesus S, Ansari D (2018). Symbolic Number Skills Predict Growth in Nonsymbolic Number Skills in Kindergarteners. [\*Developmental Psychology\*, 54\(3\):440-57.](#)
- Necka EA, Faig KE, Van Hedger K, **Lyons IM**, Dimitroff SJ, Luhmann M, Puts DA, Norman GJ (2018). Women's attention to and memory for fertile- and non-fertile phase women across the menstrual cycle. [\*Adaptive Human Behavior and Physiology\*, 4\(3\):283-305.](#)
- Vogel SE, Haigh T, Sommerauer G, Spindler M, Brunner C, **Lyons IM**, Grabner RH (2017). Processing the order of symbolic numbers: a reliable and unique predictor of arithmetic fluency. [\*Journal of Numerical Cognition\*, 3\(2\):288-308.](#)
- Sasanguie D, **Lyons IM**, De Smedt B, Reynvoet B (2017). Unpacking symbolic number comparison and its relation with arithmetic in adults. [\*Cognition\*, 165:26-38.](#)
- Lyons IM**, Vogel S, Ansari D (2016). On the Ordinality of Numbers: A review of neural and behavioral studies. [\*Progress in Brain Research\*, 227:187-221.](#)
- Lyons IM**, Ansari D (2015). Foundations of children's numerical and mathematical skills: The roles of symbolic and nonsymbolic representations of numerical magnitude. [\*Advances in Child Development and Behavior\*, 48:93-116.](#)

- Wang Z, Lukowski SL, Hart SA, **Lyons IM**, Thompson LA, Kovas Y, Mazzocco MM, Plomin R, Petrill SA (2015). Is Math Anxiety Always Bad for Math Learning? The Role of Math Motivation. [\*Psychological Science\*, 26\(12\):1863-76.](#)
- Necka EA, Sokolowski HM, **Lyons IM** (2015). The role of self-math overlap in understanding math anxiety and the relation between math anxiety and math performance. [\*Frontiers in Psychology\*, 6:1543.](#)
- Lyons IM**, Ansari D (2015). Numerical Order Processing in Children: From reversing the distance-effect to predicting arithmetic. [\*Mind, Brain and Education\*, 9\(4\):207-21.](#)
- Lyons IM**, Nuerk HC, Ansari D (2015). Rethinking the Implications of Numerical Ratio Effects for Understanding the Development of Representational Precision and Numerical Processing across Formats. [\*Journal of Experimental Psychology: General\*, 144\(5\): 1021-35.](#)
- Lyons IM**, Ansari D, Beilock SL (2015). Qualitatively different coding of symbolic and nonsymbolic numbers in the human brain. [\*Human Brain Mapping\*, 36\(2\): 475-88.](#)
- Lyons IM**, Price GR, Vaessen A, Blomert L, Ansari D (2014). Numerical Predictors of Arithmetic Success in Grades 1-6. [\*Developmental Science\*, 17\(5\):714-26.](#)
- Lyons IM**, Huttenlocher J, Ratliff KR (2014). The influence of cue-reliability and cue-representation on spatial reorienting in young children. [\*Journal of Cognition and Development\*, 15\(3\):402-13.](#)
- Wang Z, Hart S, Kovas Y, Lukowski S, Soden B, Thompson L, Plomin R, McLoughlin G, **Lyons IM**, Petrill S (2014). Who's Afraid of Math? Two Sources of Genetic Variance for Mathematical Anxiety. [\*Journal of Child Psychology and Psychiatry\*, 55\(9\):1056-64.](#)
- Lyons IM**, Beilock SL (2013). Ordinality and the Nature of Symbolic Numbers. [\*Journal of Neuroscience\*, 33\(43\):17052-61.](#)
- Lyons IM**, Beilock SL (2012). Math Hurts: Math anxiety predicts pain network activation in anticipation of doing math. [\*PLoS: ONE\*, 7\(10\):e48076.](#)
- Lyons IM**, Ansari D, Beilock SL (2012). Symbolic Estrangement: Evidence against a strong association between numerical symbols and the quantities they represent. [\*Journal of Experimental Psychology: General\*, 141\(4\):635-41.](#)
- Lyons IM**, Beilock SL (2012). Mathematics Anxiety: Separating the math from the anxiety. [\*Cerebral Cortex\*, 22\(9\):2102-10.](#)
- Lyons IM**, Beilock SL (2011). Numerical ordering ability mediates the relation between number-sense and arithmetic competence. [\*Cognition\*, 121\(2\):256-61.](#)
- Lyons IM**, Mattarella-Micke A, Cieslak M, Nusbaum HC, Small SL, Beilock SL (2010). The role of personal experience in the neural processing of action-related language. [\*Brain & Language\*, 112\(3\):214-22.](#)

- Lyons IM**, Beilock SL (2009). Beyond Quantity: Individual Differences in Working Memory and the Ordinal Understanding of Numerical Symbols. [\*Cognition\*, 113\(2\):189-204.](#)
- Lyons IM**, Ansari D (2009). The Cerebral Basis of Mapping Nonsymbolic Numerical Quantities onto Abstract Symbols: An fMRI training study. [\*Journal of Cognitive Neuroscience\*, 21\(9\):1720-35.](#)
- Beilock SL, **Lyons IM**, Mattarella-Micke A, Nusbaum HC, Small SL (2008). Sports experience changes the neural processing of action language. [\*Proceedings of the National Academy of Sciences \(USA\)\*, 106\(36\):13269-73.](#)
- Ansari D\*, **Lyons IM\***, van Eimeren L, Xu F (2007). Linking visual attention and number processing in the brain: The role of the temporoparietal junction in small and large number processing, [\*Journal of Cognitive Neuroscience\*, 19\(11\):1845-53.](#) (\*Co-first-author with Ansari)

## *Chapters and Commentaries*

- Ansari D, **Lyons IM** (2016). [\*Cognitive Neuroscience and Mathematics Learning: How far have we come? Where do we need to go?\*](#) *ZDM Mathematics Education*, 48(3): 379-383.
- Lyons IM** (2015). [\*Numbers and Number Sense\*](#). In: Wright JD (editor-in-chief), *International Encyclopedia of the Social & Behavioral Sciences*, 2nd edition. Vol 17: 46-56. Oxford: Elsevier.
- Beilock SL, **Lyons IM** (2008). [\*Expertise and the mental simulation of action\*](#). In: Markman KD, Klein WMP, Suhr JA (Eds.), *The Handbook of Imagination and Mental Simulation*, Psychology Press.

## Grants and Fellowships

1R01-HD100429-01A1 – *Longitudinal Investigation into Declarative and Procedural Memory Brain Systems Supporting the Development of Math Skills*

National Institute for Child Health and Human Development (NICHD)  
\$2,983,880 (09/04/2020 – 07/31/2025)

CAREER-2041887 – *Fast and Flustered: The Impact of Time-Pressure on Math Anxiety and Math Learning*

National Science Foundation (NSF), Education and Human Resources (EHR)  
\$1,195,893 (03/01/2021 – 02/28/2026)

Banting Postdoctoral Fellowship – *Mathematics Anxiety: Its Neural Mechanisms and Influence on Academic Decisions and Performance in Higher Education*

Natural Sciences and Engineering Research Council (Canada)  
\$140,000 CAD (2014)

University Research Grant – *Mathematics Anxiety: Its Neural Mechanisms and Influence on Academic Decisions and Performance in Higher Education*

University of Western Ontario, Office of the Vice President, Social Sciences Faculty

*\$30,000 CAD* (2013)

William Rainey Harper Dissertation Fellowship – *A Sense of Order: Ordinality and the Meaning of Symbolic Numbers*

University of Chicago, Social Sciences Division

*\$20,000 USD* (2011)

Fulbright Fellowship (China) – *Yunnan Minority Folklore Traditions on the Ancient Tea-Horse Road*

Fulbright Foundation

*\$16,000 USD* (2004)

## Awards and Distinctions

APS Rising Star Award

Association for Psychological Science (2015)

Robert J. Glushko Dissertation Prize

Cognitive Science Society

*\$10,000 USD* (2014)

Starkey Duncan Award for Outstanding Graduate Student Teaching

University of Chicago, Psychology Department (2011)

John Dewey Lectureship Prize

University of Chicago, Psychology Department

*\$5000 USD* (2010)

## Invited Lectures

- George Mason University – Applied Developmental Science *The Curious Case of Quantity: Evolution, Culture, and Short-Term Memory* (Apr 2020)
- Indiana University – Cognitive Science Colloquium *Using Neuroimaging Data to Test Cognitive Hypotheses about Numerical Processing* (Oct 2019)
- Georgetown University – Integrated Program in Neuroscience *Using Neuroimaging Data to Test Cognitive Hypotheses about Numerical Processing* (Apr 2019)
- Katholieke Universiteit (KU) Leuven *Using Neuroimaging Data to Test Cognitive Hypotheses about Numerical Processing* (Mar 2019)
- University of Graz *Characterizing the Neural Coding of Symbolic Quantities* (Apr 2018)
- Temple University *The Symbolic Number System* (Mar 2017)
- University of Maryland, College Park *The Symbolic Number System* (Nov 2016)
- Northwestern University *The Symbolic Number System* (May 2016)
- Katholieke Universiteit (KU) Leuven *Ordinality and the Nature of Symbolic Numbers* (June 2015)
- Ghent University *Ordinality and the Nature of Symbolic Numbers* (June 2015)
- Ryerson University *Mathematics Anxiety: Math, Anxiety, and the Brain* (Feb 2013)

## Service

### *Community Talks/Panels*

AP Psychology Teaching Workshop – Fairfax School District (October, 2018)

Junior Science and Humanities Regional Symposium – Keynote (March, 2018)

Academic Job Interview Panel • University of Western Ontario (April 2015)

Postdoctoral Experience Panel • University of Chicago (January, 2015)

Banting Postdoctoral Fellowship Panel • University of Western Ontario (June 2014)

Speaker: *Scholars to Leaders Talk Series* • University of Western Ontario (Nov 2014)

Professional Development Lecture • *Learning and Brain Plasticity* • Sir Frederick Banting High School (Nov 2012)

### *Journal Reviewer*

Acta Psychologica • American Educational Research Association (AERA) Open • Applied Neuropsychology: Child • Brain and Behavioral Functions • Brain and Language • Brain Imaging and Behavior • British Journal of Developmental Psychology • Canadian Journal of Experimental Psychology • Cognition • Cognitive Development • Cognitive, Affective and Behavioral Neuroscience • Cognitive Psychology • Cognitive Science • Cortex • Developmental Psychology • Developmental Science • Educational Psychology • Experimental Psychology • Frontiers in Human Neuroscience • Frontiers in Cognitive Psychology • Human Brain Mapping • Journal of Cognition and Development • Journal of Cognitive Neuroscience • Journal of Experimental Child Psychology • Journal of Experimental Psychology: General • Journal of Experimental Psychology: Human Perception and Performance • Journal of Experimental Psychology: Learning, Memory and Cognition • Journal of Numerical Cognition • Language, Learning and Development • Learning and Individual Differences • Learning and Instruction • Mind, Brain and Education • Nature Communications • NeuroImage • Neuron • Neuropsychologia • PLoS One • Proceedings of the National Academy of Sciences USA • Proceedings of the Royal Society B • Psychological Research • Psychological Science • Psychonomic Bulletin and Review • Quarterly Journal of Experimental Psychology • Thinking and Reasoning

### *Grant Reviewer*

National Science Foundation (NSF) – Education and Human Resources Core Research Program (Grants Panel and Ad Hoc Reviewer) • National Research Agency, France (Agence Nationale de la Recherche, ANR) • Flanders Research Foundation (Fonds Wetenschappelijk Onderzoek – Vlaanderen, FWO) • Israel Science Foundation • Natural Sciences and Engineering Research Council (NSERC) of Canada – Biological Systems and Functions

## Teaching

### *Courses*

- Mind, Brain and Education (Graduate) *Lecturer* (Georgetown University)
- Information and the Brain *Lecturer* (Georgetown University, University of Chicago)
- Research Methods and Statistics *Lecturer* (Georgetown University)
- Cognitive Psychology *Lecturer* (Georgetown University, University of Chicago)
- The Mind *Lecturer* (University of Chicago)

### *Student Advising (Current)*

- Richard Daker *PhD Student* (Georgetown University)
- Cynthia Fioriti *PhD Student* (Georgetown University)
- Raeanne Martell *PhD Student* (Georgetown University)
- Michael Slipenkyj *PhD Student* (Georgetown University)
- Yixuan Zhao *Honor's Thesis* (Georgetown University)

### *Student Advising (Previous)*

- Jane Hutchison *PhD Student* (Georgetown University)
- Dasoo Yoon *Honor's Thesis* (Georgetown University)
- Vincent Miller *Honor's Thesis* (Georgetown University)
- Taylor Annett *Honor's Thesis* (University of Western Ontario)
- Hye-Sang Chang *Master's Thesis* (University of Chicago)
- Jenna Horwitz *Honor's Thesis* (University of Western Ontario)
- Sonia Lahr-Pastor *Honor's Thesis* (University of Chicago)
- Danielle Rendina *Master's Thesis* (University of Chicago)