Ian M. Lyons
Associate Professor

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1) Personal Information

A) Education

- •PhD University of Chicago (2012) • Psychology (Cognitive) • *Advisor* Sian L. Beilock
- •BS Brown University (2004) • Cognitive Science • *Honors* (with Steven A. Sloman)

B) Employment

- •Associate Professor

  Georgetown University • Psychology

  August 2023 – *Present*

- •Assistant Professor

  Georgetown University • Psychology

  August 2016 – 2023

- •Postdoctoral Fellow, Adjunct Professor

  University of Western Ontario • Developmental Psychology

  October 2012 – July 2016

  Advisor Daniel Ansari

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2) Publications

A) Peer-Reviewed Articles

•Publication Statistics [Google Scholar link]

•PhD Students and other lab trainees are underlined.

•**Self shown in bold.**

47) Johnson AD, Partika A, Martin A, **Lyons I**, Castle S, Phillips DA (in press). Public Preschool Predicts Stronger Third-Grade Academic Skills. *AERA Open*.

46) Delage V, Daker R, Trudel G, **Lyons IM**, Maloney EA (in press). It's a "Small World": Relations between Performance on Five Spatial Tasks and Five Mathematical Tasks in Undergraduate Students. *Canadian Journal of Experimental Psychology*.

45) Fioriti CM, Martell RN, Daker RJ, Malone EP, Sokolowski HM, Green AE, Levine SC, Maloney EA, Ramirez G, **Lyons IM** (in press). Examining the interplay between the cognitive and emotional aspects of gender differences in spatial processing. *Journal of Intelligence*.

44) Daker RJ, Viskontas IV, Porter GF, Colaizzi GA, **Lyons IM***, Green AE* (2023). Investigating links between creativity anxiety, creative performance, and state-level anxiety and effort during creative thinking. Scientific Reports, 13(1):17095. (*Co-senior-authors)

43) Skagenholt M, **Lyons IM**, Skagerlund K, Träff U (2023) Connectome-based predictive modeling indicates dissociable neurocognitive mechanisms for numerical order and magnitude processing in children. *Neuropsychologia*, 184:108563.

42) Daker RJ, Slipenkyj MS, Green AE*, **Lyons IM*** (2023). Evidence for Avoidance Tendencies Linked to Anxiety about Specific Types of Thinking. *Scientific Reports*, 13(1):3294. (*Co-senior-authors)

41) Daker RJ, Gattas SU, Necka EA, Green AE, **Lyons IM** (2023). Does Anxiety Explain Why Math-Anxious People Underperform in Math? *NPJ Science of Learning*, 8(1):6.

40) Li TY, Quintero M, Galvan M, Shanafelt S, Hasty LM, Spangler DP, **Lyons IM**, Mazzocco MMM, Brockmole JR, Hart SA, Wang Z (2023). The Mediating Role of Attention in the Association between Math Anxiety and Math Performance: An Eye-Tracking Study. *Journal of Educational Psychology*, 115(2): 229-40.

39) Daker RJ, Delage V, Maloney EA, **Lyons IM** (2022). Testing the specificity of links between anxiety and performance within mathematics and spatial reasoning. *Annals of the New York Academy of Sciences*, 1512(1):174-91.

38) Cortes RA, Peterson EG, Kraemer DJM, Kolvoord RA, Uttal DH, Dinh N, Weinberger AB, Daker RJ, **Lyons IM**, Goldman D, Green AE (2022). Transfer from Spatial Education to Verbal Reasoning and Prediction of Transfer from Learning-Related Neural Change. *Science Advances*, 8(32):eabo3555.

37) 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.

36) 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)

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35) 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.

34) 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.

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

32) 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.

31) 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)

30) 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.

29) 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.

28) 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.

27) 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.

26) Daker RJ, **Lyons IM** (2018). Numerical and Non-Numerical Predictors of First Graders' Number-Line Estimation Ability. *Frontiers in Psychology*, 9:2336.

25) **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)

24) **Lyons IM**, Beilock SL (2018). Characterizing the Neural Coding of Symbolic Quantities. *NeuroImage*, 178:503-18.

23) **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.

22) 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.

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21) 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.

20) 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.

19) **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.

18) **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.

17) 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.

16) 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.

15) **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.

14) **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.

13) **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.

12) **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.

11) **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.

11) 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.

10) **Lyons IM**, Beilock SL (2013). Ordinality and the Nature of Symbolic Numbers. *Journal of Neuroscience*, 33(43):17052-61.

9) **Lyons IM**, Beilock SL (2012). Math Hurts: Math anxiety predicts pain network activation in anticipation of doing math. *PLoS: ONE*, 7(10):e48076.

8) **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.

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7) **Lyons IM**, Beilock SL (2012). Mathematics Anxiety: Separating the math from the anxiety. *Cerebral Cortex*, 22(9):2102-10.

6) **Lyons IM**, Beilock SL (2011). Numerical ordering ability mediates the relation between number-sense and arithmetic competence. *Cognition*, 121(2):256-61.

5) **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.

4) **Lyons IM**, Beilock SL (2009). Beyond Quantity: Individual Differences in Working Memory and the Ordinal Understanding of Numerical Symbols. *Cognition*, 113(2):189-204.

3) **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.

2) 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.

1) 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)

B) Chapters and Commentaries

3) 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.

2) **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.

1) 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.

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2) Funding

A) External Grants Funded

5) Funder: National Institute for Child Health and Human Development (NICHD)
Identifying Number: 1R01-HD100429-01A1
Title: Longitudinal Investigation into Declarative and Procedural Memory Brain Systems Supporting the Development of Math Skills
Dates: 09/04/2020 – 07/31/2025
Corresponding PI: Tanya Evans (University of Virginia)
Role: Co-Principle Investigator
Total Costs: $2,983,880
Total Costs, Georgetown Portion: $784,234

4) Funder: National Science Foundation (NSF), Education and Human Resources (EHR)
Identifying Number: CAREER-2041887
Title: Fast and Flustered: The Impact of Time-Pressure on Math Anxiety and Math Learning
Dates: 03/01/2021 – 02/28/2026
Corresponding PI: Ian M. Lyons
Role: Principle Investigator
Total Costs: $1,195,893
Total Costs, Georgetown Portion: $1,195,893

3) Funder: Cognitive Science Society
Glushko Dissertation Award
Title: Fast and Flustered: The Impact of Time-Pressure on Math Anxiety and Math Learning
Date: 07/01/2014
Corresponding PI: Ian M. Lyons
Role: Principle Investigator
Total Costs: $1,195,893
Total Costs, Georgetown Portion: $1,195,893

2) Funder: Natural Sciences and Engineering Research Council (Canada)
Banting Postdoctoral Fellowship
Title: Mathematics Anxiety: Its Neural Mechanisms and Influence on Academic Decisions and Performance in Higher Education
Dates: 06/01/2014 – 05/31/2016
Role: Primary Recipient
Total Costs: $140,000 (CAD)
Total Costs, Georgetown Portion: $1,195,893

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1) Funder: Fulbright Foundation (US State Department)
Title: Yunnan Minority Folklore Traditions on the Ancient Tea-horse Road (location: China)
Dates: 10/01/2004 – 09/30/2004
Role: Primary Recipient
Total Costs: $16,000
Total Costs, Georgetown Portion: $1,195,893

B) Internal Grants Funded

3) Institution: Georgetown University
Type: Pilot Grant
Title: Testing a Biomarker of Responsiveness to Interventions to Boost Math Performance
Year: 2021-2022
Amount: $20,000
Role: PI

2) Institution: University of Western Ontario
Type: Carrot Award (provided to recipients of Banting Postdoctoral Fellowship)
Title: Mathematics Anxiety: Its Neural Mechanisms and Influence on Academic Decisions and Performance in Higher Education
Year: 2014-2015
Amount: $30,000 CAD
Role: PI

1) Institution: University of Chicago
Type: Dissertation Fellowship
Title: A Sense of Order: Ordinality and the Meaning of Symbolic Numbers
Year: 2011-2012
Amount: $20,000
Role: Primary Recipient

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3) Teaching, Mentoring and Advising

A) Teaching

i) Undergraduate Courses

4) Mind, Brain and Education (PSYC-317)
First Taught: Fall 2020
Most Recently Taught: Spring 2023

2) Research Methods and Statistics (PSYC-002)
First Taught: Spring 2017
Most Recently Taught: Spring 2022

1) Information in the Brain (PSYC-130)
First Taught: Fall 2016
Most Recently Taught: Fall 2022

ii) Graduate Courses

1) Mind, Brain and Education (PSYC-514 / PSYC-517)
First Taught: Spring 2017
Most Recently Taught: Spring 2023

B) Mentorship

i) Graduate

11) Raeanne Martell – Psychology (2021-Present), Primary Mentor
10) Cynthia Fioriti – Psychology (2021-Present), Primary Mentor
9) Marissa Laws – Interdisciplinary Program in Neuroscience (2021-Present), Thesis Committee
8) Michael Slipenkyj – Psychology (2019-Present), Primary Mentor
7) Cameron McKay – Interdisciplinary Program in Neuroscience (2019-2021), Thesis Committee
6) K. Breana Downey – Interdisciplinary Program in Neuroscience (2018-2020), Thesis Committee
5) Marisa Putnam – Psychology (2018-2019), Thesis Committee
4) Kruti Vekaria – Psychology (2017-2019), Thesis Committee
3) Charles Lynch – Psychology (2017-2018), Thesis Committee
2) Jane Hutchison – Psychology (2016-2021), Co-Primary Mentor
1) Richard Daker – Psychology (2016-2022), Co-Primary Mentor

ii) Postdoctoral

1) Rachel Pizzie – (2018-2020), Co-Primary Mentor
-Outcome: Assistant Professor (Tenure-Track), Galludet University (2020-Present)

iii) Undergraduate

28) Emma Cahill – Research Assistant (2023-Present)
28) Elizabeth Kronthal – Research Assistant (2023-Present)

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27) Nina Bajnauth – Research Assistant (2023-Present)
26) Bijan Tabrizian – Research Assistant (2022-Present)
25) Zach Whistler – Research Assistant (2022-Present)
24) Gaeun Lee – Research Assistant (2022-Present)
23) Sofia Danzo – Research Assistant (2022-Present)
22) Saba Nia – Research Assistant (2022-2023)
21) Brittany Lessin – Research Assistant (2021-2023)
20) Ilona Ponyatyshyn – Research Assistant (2021-2023)
19) Eleanor Ward – Research Assistant (2021-2023)
18) Isabella King – Research Assistant (2020-2023)
17) Yixuan Zhao – Research Assistant (2020-2022), *Honors (Psychology)*
16) Katie Ho – Research Assistant (2020-2021)
15) Theresa Kim – Research Assistant (2020-2021)
14) Liddy Kasraian – Research Assistant (2019-2021)
13) Hannah Kim – Research Assistant (2019-2021)
12) Kunbi Kolawole – Research Assistant (2019-2022)
11) Kieran Glowacki – Research Assistant (2019-2021)
10) Milton Yoon – Research Assistant (2019-2020), *Honors (Psychology)*
9) Vincent Miller – Research Assistant (2019-2020), *Honors (RISE – Biology)*
8) Quinn Do – Research Assistant (2019-2020)
7) Howard Tai – Research Assistant (2018-2020)
6) Alaina Chen – Research Assistant (2018-2019)
5) Angela Foley – Research Assistant (2018-2019)
4) Ava Cobarrubias – Research Assistant (2017-2020)
3) Allison del Castillo – Research Assistant (2017-2018)
2) Rob Cortes – Research Assistant (2016-2017)
1) Caitlin Murray – Research Assistant (2016-2020)

iv) Other

6) Jiuru Wang – (2024-present), Post-Baccalaureate RA
5) Erika Ikeda – (2023-present), Lab Manager
4) Ander Avdellas – (2021-2023), Lab Manager
3) Anita Grabowska – (2019-2021), Lab Manager
2) Kinney Van Hecke – (2018-2019), Post-Baccalaureate RA
1) Sylvia Gattas – (2017-2019), Lab Manager

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4) Service

A) 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

B) 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

C) Invited Lectures (non-conference)

15) Northwestern University – Psychology Department: *Math and Space in the Affective Domain: The Case of Anxiety* (Feb 2023)

14) George Mason University – Applied Developmental Science: *Math and Space in the Affective Domain: The Case of Anxiety* (Sep 2023)

13) Indiana University – Cognitive Science Colloquium: *Using Neuroimaging Data to Test Cognitive Hypotheses about Numerical Processing* (Oct 2019)

12) Georgetown University – Integrated Program in Neuroscience: *Using Neuroimaging Data to Test Cognitive Hypotheses about Numerical Processing* (Apr 2019)

11) Katholieke Universiteit (KU) Leuven: *Using Neuroimaging Data to Test Cognitive Hypotheses about Numerical Processing* (Mar 2019)

10) Fairfax School District – AP Psychology Teaching Workshop (Oct 2018)

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9) University of Graz: *Characterizing the Neural Coding of Symbolic Quantities* (Apr 2018)

8) Georgetown University: Junior Science and Humanities Regional Symposium, *Keynote* (Mar, 2018)

7) Temple University: *The Symbolic Number System* (Mar 2017)

6) University of Maryland, College Park: *The Symbolic Number System* (Nov 2016)

5) Northwestern University: *The Symbolic Number System* (May 2016)

4) Katholieke Universiteit (KU) Leuven: *Ordinality and the Nature of Symbolic Numbers* (June 2015)

3) Ghent University: *Ordinality and the Nature of Symbolic Numbers* (June 2015)

2) Ryerson University: *Mathematics Anxiety: Math, Anxiety, and the Brain* (Feb 2013)

1) Sir Frederick Banting High School: *Learning and Brain Plasticity* (Nov 2012)